

LIMITED LIABILITY COMPANY "AVTOZAVOD "GAZ"
(LLC "AVTOZAVOD GAZ")

VALDAI
VEHICLES FAMILY
OPERATING INSTRUCTIONS
33104-3902111 ИЭ

RUSSIA
NIZHNIY NOVGOROD

Introduction

"VALDAI" vehicles are intended for transportation of goods over different roads in moderate climate conditions at the ambient air temperature from plus 45° C to minus 45° C.



"VALDAI" vehicles family presented in this Operating Instructions comprises the following models:

GAZ-33104 vehicle — 4x2 type with three-seat cabin.

GAZ-331041 vehicle — 4x2 type with three-seat cabin and extended wheel base.

GAZ-331043 vehicle — 4x2 type with six-seat cabin and extended wheel base.

The manufacturer reserves the right to constantly alter its vehicle design, therefore some units and parts may slightly differ from those described in this Operating Instructions.

You can surely expect reliable operation of the vehicle provided you observe maintenance schedule specified in this Operating Instructions and Service Book¹⁾.

1) Service Book for 'VALDAI' vehicle is attached to this Operating Instructions.

1. VEHICLE IDENTIFICATION DATA

Identification number of the vehicle (VIN) and identification numbers of cabin or all-metal body, engine and cargo body vehicle chassis refer to the vehicle identification data.

Vehicle Identification Number (VIN) appears on the right frame side member before the rear spring front bracket (Fig.1.1).

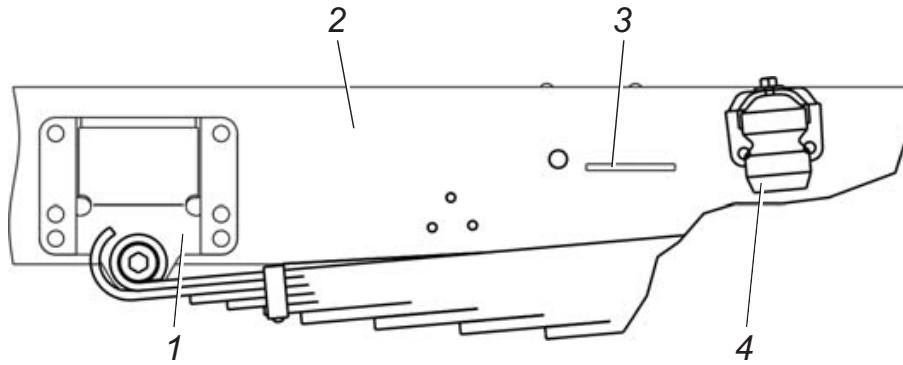


Fig. 1.1. Location of VIN or Chassis Number:

1 — rear spring rear bracket; 2 — frame side member, right; 3 — location of identification number; 4 — rubber restraint cushion

Example of Vehicle Identification Number:

★X96 331040★50000125★, where:

X96 — manufacturer international identification code,

331040 — vehicle index,

5 — model year code,

0000125 — vehicle serial number.

Model year is a period equal on the average to calendar year during which the vehicles with identical design features are being manufactured.

Chassis identification number is marked on the right side member of the frame of cargo body vehicles intended for supplying to other plants for manufacturing special vehicles (Fig. 1.1).

Example of Chassis Number:

★331040★50000125★, where:

331040 — chassis index,

5 — model year code,

0000125 — chassis order number.

Cab identification number is located under the hood on the front outer panel, on the left in direction of vehicle movement (see Fig. 1.2, arrow "A" view).

Example of Cab (Body) Number:

★33104050000125★, where:

331040 — cabin index

5 — model year code,

0000125 — cabin serial number.



Fig. 1.2. A — Location of Cab Identification Number

Д-245.7 E2 engine number is stamped on the nameplate (Fig. 1.3) located on the cylinder block in the middle portion on the right-hand side.



Fig. 1.3. Д-245.7 E2 Engine Nameplate

The nameplate contains the following data:

a — engine index;

b — engine serial number

Vehicle identification data also appear on manufacture's plate (Fig. 1.4) located on the rear pillar of the cab right door.

Chassis, cab and engine numbers refer to the identification data of chassis and special configuration vehicles for supplying to the other plants for making their own special vehicles having their own index. Nameplate "GAZ" is not installed and vehicle identification number does not appear on chassis and the above vehicles.

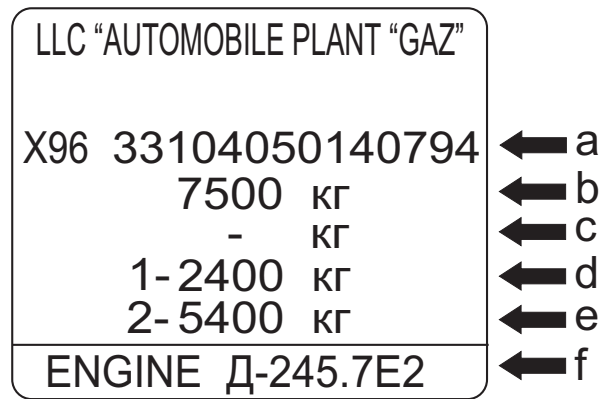


Fig. 1.4. **Manufacture's Plate with Vehicle Identification Data, where:**

- a — vehicle identification number;
- b — gross vehicle weight;
- c — gross vehicle weight with trailer;
- d — maximum front axle weight;
- e — maximum rear axle weight;
- f — engine index

2. USEFUL HINTS

1. Procedure of engine starting is described in section 6.2. "Engine Starting and Stopping".

After cold engine starting do not run it immediately at high speed because cold oil passes slowly to rubbing surfaces and they may be got damaged at the engine high speed.

2. The engine efficient performance and its wear mostly depend on engine operating temperature. It is necessary to maintain coolant temperature within the limits of 80–95° C. At the ambient air temperature of 5° C and below install cold weather radiator cover.

3. Do not operate the starter continuously for more than 15 seconds. For the second attempt of engine starting, allow not less than 30 seconds. Not more than three engine starting attempts are permissible. Should the engine fail to fire after these attempts, check the starter power circuits, the starter itself, the engine fuel system and the storage battery for good condition.

Never move the vehicle using the starter and turn on the starter with the running engine.

4. After cold engine starting do not run it at high speed. Warm the engine up at 1000-1400 rpm. Never drive the vehicle with cold engine. Coolant temperature before starting movement should be not less than 40° C.

5. If the engine has been operated at heavy duty cycle let it run for 3 minutes at idle speed before stopping to decrease smoothly the temperature of turbocharger to avoid its premature damage.

6. To prevent damaging of the gearbox when towing the vehicle, disconnect the propeller shaft flange from the axle drive. Then fix reliably the disconnected end of the propeller shaft via a wooden block to the vehicle nearest frame element.

7. Do not eliminate free axial displacement of steering arm pin ball head as to drag link because the travel equal to 3,4 mm with the shut-down engine is required for power steering drive proper operation.

8. To avoid dislocating of relative position of the steering gear and steering wheels, never set out the adjustment of the drag link length (except for the cases specified in given Operating Instructions).

9. To avoid overheating of power steering drive system, do not run the engine for a long time at high speed (more than 30 minutes) when the vehicle is at parking place.

10. With operating engine do not keep the steering wheel turned as far as it will go for more than 15 sec. because it may cause damage of the power steering pump. Never start the engine with power steering tank empty or insufficient oil level.

11. When the ambient air temperature is below -35° C fill the power steering system with special liquid (see subsection "Lubrication Chart").

12. Watch out for tightness of air pipelines, cylinders and pneumatic valves. Break of air tightness reduces braking efficiency.

13. To avoid storage batteries failure, timely switch over regulated voltage level.

14. If any of the red pilot lamps lights up on the instrument cluster or buzzer operates on the run, stop the vehicle, detect and eliminate the trouble.

15. The brake pads are to be replaced at service stations only.

3. SAFETY PRECAUTION RULES

Strictly follow the safety precaution rules during vehicle operation.

Never warm up the engine in the enclosed space. The engine exhaust gases contain toxic end product of fuel combustion, monoxide carbon including (gas without fume and color), which, when inhaling, causes severe intoxication and it may even lead to fatal case. It is also not recommended to turn on the passenger compartment ventilation at parking place with the operating engine.

4. SPECIFICATIONS

4.1. GENERAL DATA

Vehicle model	GAZ-33104	GAZ-331041	GAZ-331043
Vehicle type	Biaxial, cargo, with rear axle drive		
Vehicle capacity, kg:			
– with cargo body without canvas top	3605	3445	3150
– with cargo body and with canvas top	3500	3330	3045
Vehicle gross mass, kg	7400	7400	7400
Vehicle kerb mass, kg:			
– with cargo body without canvas top	3500	3730	3800
– with cargo body and with canvas top	3605	3845	3905
Overall dimensions, mm			
– length	6050	7565	6770
– width (over mirrors)	2643	2643	2643
– height (over cabin, unladen)	2260	2260	2265
– height (over canvas top, unladen)	3060	3060	3060
Wheelbase, mm	3310	4000	4000
Front wheels track, mm	1740	1740	1740
Rear wheels track (between centres of twin tyres), mm	1701	1701	1701
Ground clearance, fully laden, mm	177	177	177
Minimum turning radius (front outer track), not more, m	6,4	7,7	7,7
Maximum speed with full load without trailer on flat, smooth highway, km/h	95	95	95
Fuel consumption ¹⁾ when running with constant speed, l/100km:			
– 60 km/h	13,5	13,5	13,5
– 80 km/h	18,0	18,0	18,0
Overhang angles (fully laden), deg.:			
– front	27	27	27
– rear	14	10	14
Maximum climable gradient for fully laden vehicle, % (degree)	25 (14)	25 (14)	25 (14)
Cargo body loading height, mm	1070	1070	1070

4.2. ENGINE AND ITS SYSTEMS

Model	D-245.7 E2
Type	Diesel, 4-stroke, with turbocharger, with supercharged air cooling, liquid cooling
Number of cylinders and their arrangement	4, vertical in-line
Cylinders firing order	1–3–4–2
Direction of crankshaft rotation	right

1) The fuel consumption specified is not considered to be a rate but serve only for determining of vehicle technical state.

Cylinder bore and piston stroke, mm	110x125
Displacement, l	4.75
Compression ratio	17
Rated power, net, kW (h.p.), not less: at 2400 min ⁻¹ engine speed	86.7 (117.2)
Maximum torque, net, N•m (kgf•m): at 1300-1600 min ⁻¹ engine speed	413 (42.1)
Minimum engine idle speed, min ⁻¹	800
Maximum idle speed limited by governor, min ⁻¹ , not more	2600
Ventilation system	open
Fuel injection pump	In-line, 4-plunger, valve type, 773-20-05 (Я3ТА) with full range rpm governor and booster fuel pump
Booster fuel pump	Plunger type, for manual and automatic fuel priming
Injectors	ЯЗДА 455.1112010-50, closed type; injection point pressure 23,5+1.2MPa (230 kgf/cm ²)
Fuel filters:	
— coarse filter	Gravitation filter with gauze element
— fine filter	With paper renewable filter element
Oil system	Combined: under pressure and spraying
Oil cooler	Full-flow, constantly operating
Oil filter	Full-flow, with renewable filter element
Cooling system	Liquid, closed, with forced coolant circula- tion, with expansion tank
Supercharging system	Gas turbine, with one turbocharger C14 with radial centripetal turbine, centrifugal compressor and air cooler of supercharging air of secondary surface type

4.3. TRANSMISSION

Clutch	Single-plate, dry, friction type, with torque vibration damper on driven plate. With di- aphragm pressure spring. With hydraulic drive
Gearbox	Mechanical, 5-speed, with constant gear mesh, with synchro-mesh unit on II and III, IV and V gears
transmission ratios:	
— 1st gear	6.555
— 2nd gear	3.933
— 3d gear	2.376
— 4th gear	1.442
— 5th gear	1.000
— reverse gear	5.735
Cardan drive	Two open type divided propeller shafts, three universal joints on needle bearings

Final drive	Bevel, hypoid type
— transmission ratio	3.417
Differential	Bevel, gear-type
Axle shafts	Full floating

4.4. RUNNING GEAR

Frame	Stamped, riveted
Wheels	Disk type, with 6,00x17,5 rim
Tires	Pneumatic, radial, size 215/75R17,5
Front wheel geometry:	
— camber	Max. 1°
— pivot transverse inclination	8°
— lengthwise inclination of king pin	5°
— toe-in (of every wheel to vehicle longitudinal axis)	7"±3"
Springs	Four, longitudinal, semi-elliptic with additional springs in rear suspension
Shock absorbers	Hydraulic, telescopic, dual acting. Mounted on the front axle

4.5. STEERING SYSTEM

Type of steering gear	Screw-ball nut
— transmission ratio	19.8 (in the middle position)
Power steering	Hydraulic, integrated, built in steering gear. Power steering pump is a gear-type. HIII-14
Steering column	Height and tilt adjustable

4.6. BRAKE SYSTEM

Service brake system	Double-circuit, with pneumatic drive
Brake gears	Disk type
Emergency brake system	Each circuit of service brake system
Parking brake system	With pneumatic drive of brake chambers with spring energy accumulators installed on rear wheel disk brakes

4.7. ELECTRICAL EQUIPMENT

Wiring system	Single wire. Negative terminals are connected to vehicle frame
Rated voltage, V	12
Alternator	A/C, with built-in voltage regulator and rectifier block, 1631.3701-10
Storage battery	Two (6CT 110A)
Starter	AZS 3385"Искра"
Headlamps	62.3711-19

Turn indicator repeaters	5302.3726000 or 112.03.30.00.000-01
Front marker lights	265.3712
Rear lights	7442.3716.000-11 or 8502.3716-01
Side marker light	4472.3731
Headlamp aiming device control unit	БҮК-24 or 281.3769 or 231.3769
Engine control switch	2126-3704010-50 or 2108-3704010-80
Windshield wiper	60.5205 or 70.5205
Windshield washer	1202.5208, 1102.5208
Horns	22.3721/221.3721

4.8. CABIN AND CARGO BODY

Cabin	Metal, three— or six-seat		
Cargo body	Metal, with rear flap and body sides		
Cargo body dimensions (inner), mm:	GAZ-33104	GAZ-331041	GAZ-331043
— length	3494	5000	3494
— width	2176	2176	2176
— body side height	518	518	518

4.9. MAIN ADJUSTMENT AND CHECKING DATA

Clearance between valve stems and rocking levers on cold engine, mm	
— intake	0,25 ^{+0,05} _{-0,10}
— exhaust	0,45 ^{+0,05} _{-0,10}
Oil pressure (at oil temperature of 80–85° C), kPa (kgf/cm ²):	
— at rated engine speed 2400 min ⁻¹	250–350 (2.5–3.5)
— at minimum idle speed	80 (0.8)
Rated engine coolant temperature, °C	80–95
Minimum engine idle speed, min ⁻¹	800
Variable voltage, V	13.3–14.9
Fan and alternator belts sag under 4 daN (4 kgf), mm	12–17
Clutch pedal free travel, mm	10–30
Clutch pedal full travel, mm	190
Brake pedal free travel, mm	9–16
Total play of steering wheel in the position corres- ponding to vehicle straightforward run with run- ning engine, deg., not more	10 ¹⁾ ; 25
Tire air pressure, kPa (kgf/cm ²)	
— front wheels	530 ⁺¹⁰ (5.4 ^{+0.1})
— rear wheels	620 ⁺¹⁰ (6.3 ^{+0.1})

1) For the vehicle within warranty period.

5. CONTROLS AND INSTRUMENTS

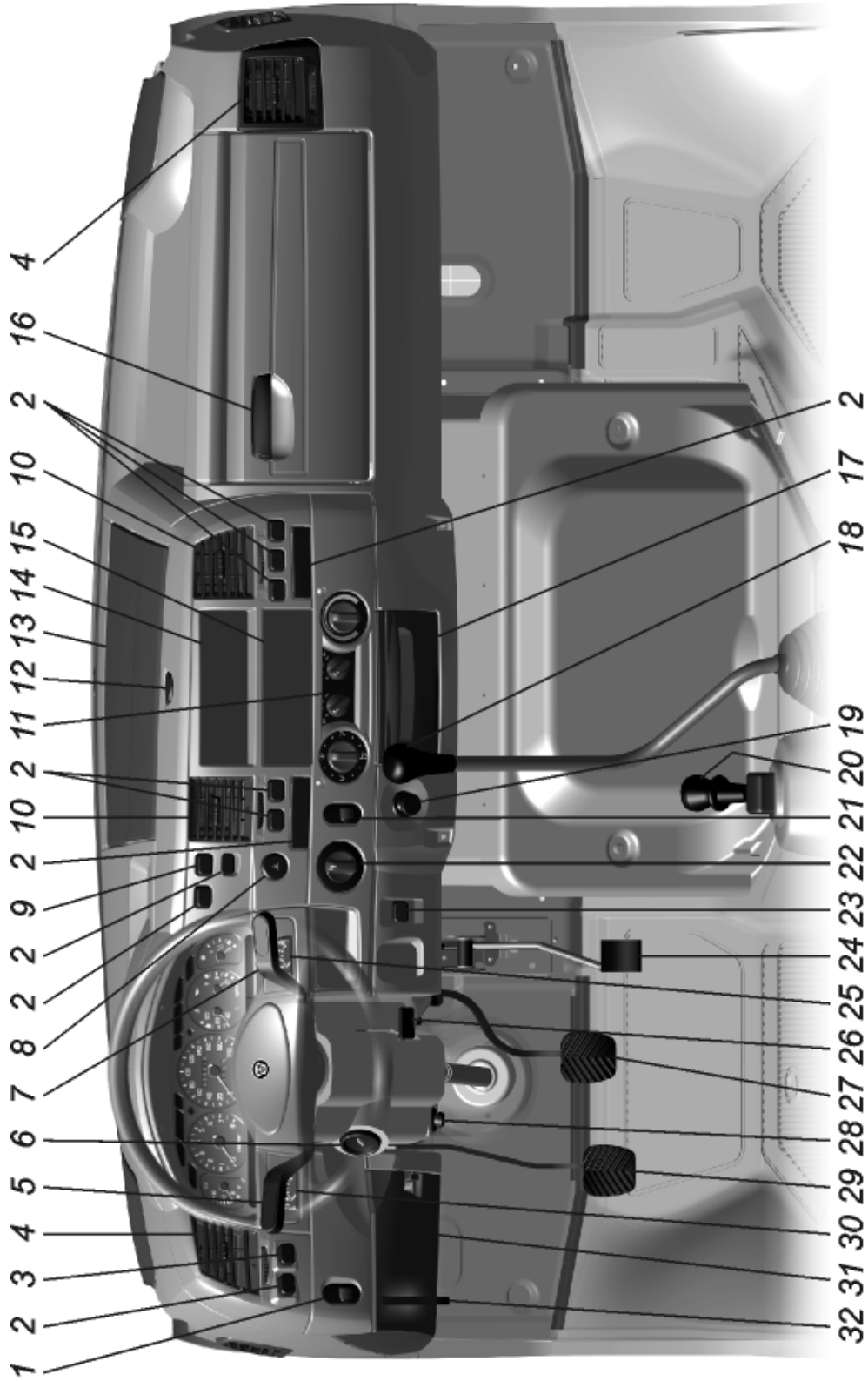


Fig. 5.1. Controls

Positions of controls are given in fig. 5.1.

1 — headlamp aiming device control knob depending on vehicle loading (see subsection 8.5).

2 — plugs.

3 — warning lamps condition check-up switch.

4 — side ventilation grids.

5 — turn indicators, dimmer and horn¹⁾ switch lever. The switch lever has six fixed positions (from I to VI) and four non-fixed positions "A" (fig. 5.2 and 5.3).

If the lever is in position I, and master light switch knob 22 — in position II, the lower beam is on. When the lever is moved to position II upper beam is switched on and blue indicator lights up.

Pulling the lever repeatedly from position I along the steering column (non-fixed position) switches on headlamp upper beam for a short time. Depressing the switch lever button (in any position of the lever) turns on the horn¹⁾ (non-fixed position) — see fig. 5.2.

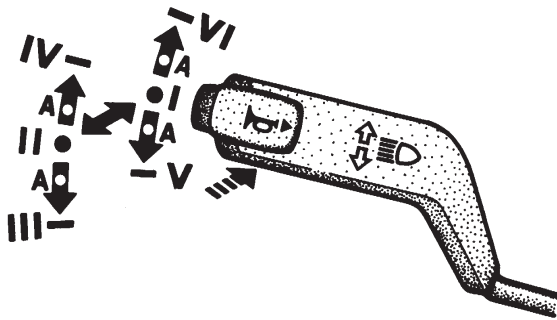


Fig. 5.2. Turn indicator and dimmer switch lever (with horn)

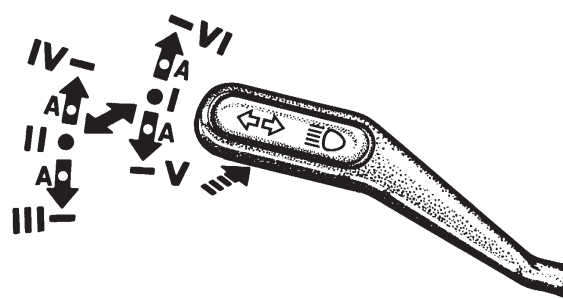


Fig. 5.3. Turn indicator and dimmer switch lever (without horn)

To operate turn indicators move the lever from positions I or II up to positions VI or IV (right turn) or down to positions V or III (left turn). A green warning light comes on flashing on the instrument cluster.

After the turn is completed the switch lever is automatically returned to position I or II. To switch on turn indicators momentarily shift the switch lever to suitable "A" non-fixed position. When released the lever returns to position I or II.

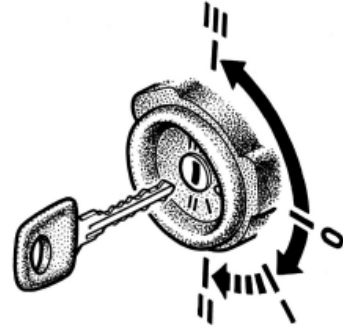
6 — engine control, starter and anti-theft device switch. The key positions are given in fig. 5.4:

1) On some of the vehicles the horn is switched on by means of windshield wiper and washer control lever (see Fig. 5.6).

- 0 — all Off, the key cannot be pulled out, anti-theft device is not engaged;
- I — engine control switch is On; the key cannot be pulled out;
- II — engine control switch and starter are On; the key cannot be pulled out;
- III — engine control switch is Off; when the key is withdrawn, the anti-theft device is engaged.

To release the anti-theft device fit the key, then gently swinging the steering wheel to both sides turn the key to position 0.

Fig. 5.4. Engine control, starter and anti-theft device switch.



7 — windshield wiper, washer and horn ¹⁾ switch lever.

The positions of the lever (fig. 5.5 and 5.6):

- 0 — windshield wiper is OFF;
- I — low speed of windshield wiper;
- II — high speed of windshield wiper;
- III — intermittent operation of windshield wiper.

In case the control lever is not equipped with horn switch (fig. 5.5), to turn on windshield wiper and washer momentarily pull the lever (in the direction of the arrow) from position 0.

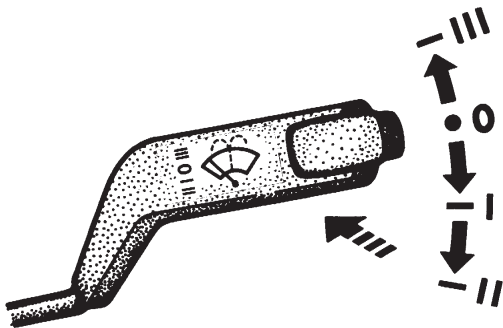


Fig. 5.5. Windshield wiper and washer lever positions (without horn)

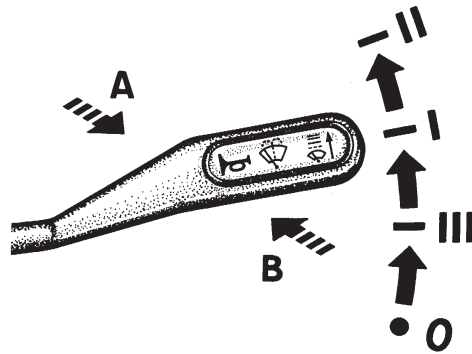


Fig. 5.6. Windshield wiper and washer lever positions (with horn)

1) On some of the vehicles the horn is turned on by turn indicators and dimmer switch lever (see Fig. 5.2).

In case the control lever is equipped with horn switch (fig. 5.6), to turn on windshield wiper and washer momentarily push the lever from position 0 in the direction of arrow "A" and to turn on the horn pull the lever (from any position) in the direction of arrow "B".

Windshield washer can be also switched on from all lever positions. Windshield wiper operates only when the engine control switch is on.

8 – emergency flasher warning system button switch. When in switched-on position all turn indicator bulbs and red bulb inside the button switch (fig. 5.7) are flashing simultaneously.

Emergency flasher warning system should be switched on in case of vehicle accidental stop in order to inform other drivers and maintenance services about stationary vehicle on the roadway.



Fig. 5.7. Emergency flasher warning system button switch.

9 – rear row seats dome lamp switch of the cab (for vehicles with two rows of seats).

10 – central ventilation grids.

11 – heating and ventilation control panel.

12 – lock button for documents box cover.

13 – documents compartment cover.

14 – space for radio set/cassette player.

15 – plug.

16 – glove box lock handle.

17 – ashtray. Removal of ashtray is shown in fig. 5.8.

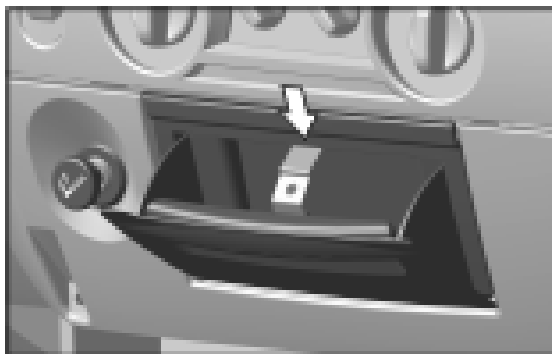


Fig. 5.8. Ashtray

To empty the ashtray pull it, push spring catcher upwards and remove the ashtray from its slot. Fit the ashtray back lifting-up the spring catcher.

18 — gearbox lever.

Engage reverse gear only after full stop of the vehicle. When reverse gear is engaged the backing light goes on in the tail lamps.

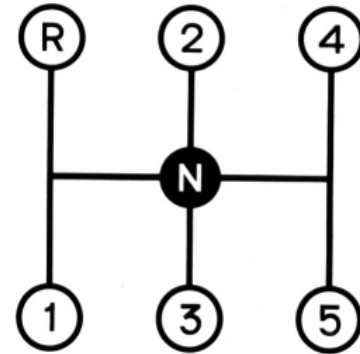


Fig.5.9. Changeover layout:

19 — cigarette lighter. To use the lighter, push its handle and release it. The lighter kick-out with a click means that the coil is hot. Do not reuse the lighter sooner than in 30 s.

20 — parking brake lever. For braking the vehicle pull the brake control lever up. If the engine control switch is on warning lamp 9 (fig. 5.14) is flashing on the instrument cluster. For releasing the brake pull up the control lever lock coupling. With the brake released the warning lamp goes out.



Fig. 5.10. Parking brake lever

21 — instrument lighting control knob.

22 — master light switch. The switch has five fixed positions (fig. 5.11):

0 — all external lighting is OFF.

I — clearance lights, instrument cluster lighting, rear license plate lamp and some electrical equipment controls lighting is ON.

II — additionally upper or lower beam is ON depending on the position of turn indicators and dimmer switch lever (position I or II correspondingly).

- III — additionally (from position I or II) front fog lamps¹⁾ are ON.
- IV — additionally (from position III) rear fog light is ON.

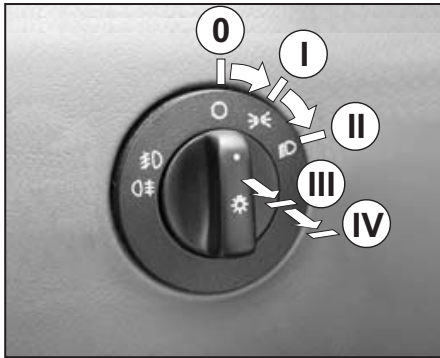


Fig. 5.11. Positions of master light switch handle.

- 23 — ABS diagnostics button.
- 24 — accelerator pedal.
- 25 — brakes rear circuit pressure gauge.

26 — steering column adjustment control lever (fig. 5.12). Pulling the lever and moving it upwards (within the limits of 90°) results in releasing of the steering column. After that the steering wheel can be set in the handy position for a driver and locked in this position by setting the lever to the initial position.

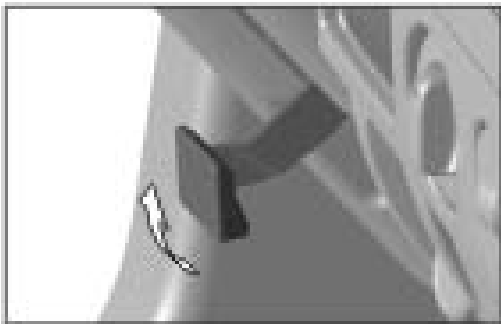


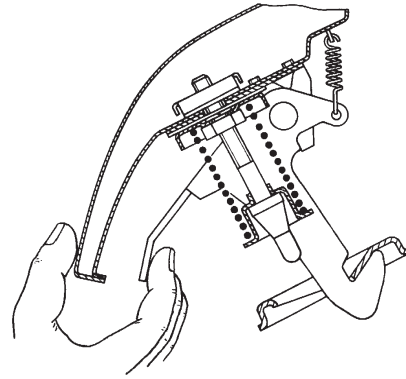
Fig. 5.12. Steering column adjustment control lever.

- 27 — service brake pedal.
- 28 — storage battery remote button switch.
- 29 — clutch pedal.
- 30 — brakes front circuit pressure gauge.
- 31 — fuse blocks.

32 — hood release lever. To open the hood pull lock handle to release the catch of the lock and open the hood slightly, then push the handle back home.

1) Mounted on some of the vehicles

Fig. 5.13. Releasing of hood latch.



To open the hood completely, move aside the latch mounted on the lower front edge of the hood (fig. 5.13).

Arrangement of instruments is shown in Fig. 5.14.

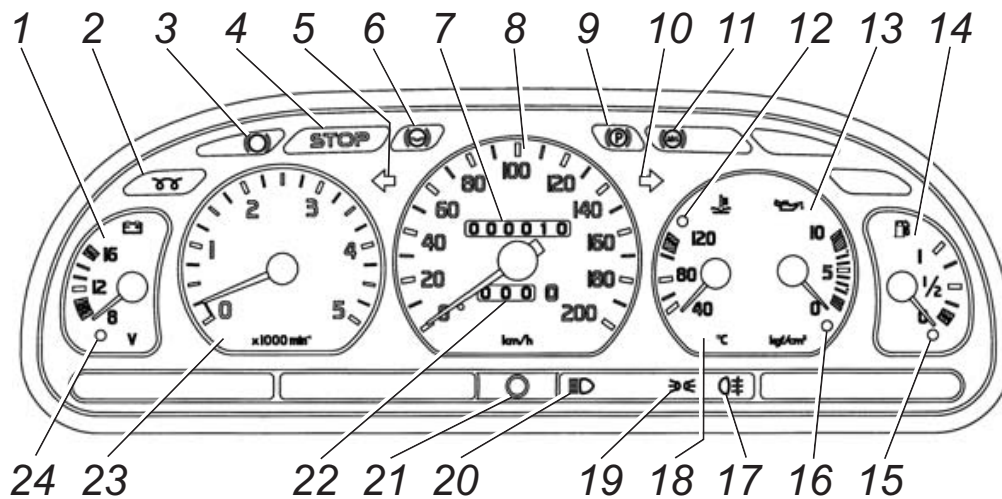


Fig. 5.14. Instrument cluster.

1. Voltmeter.
2. Warning lamp (orange) of glow plugs cutting-in.
3. Warning lamp of brake linings wear.
4. Warning lamp (red) "STOP".
5. Warning lamp (green) of left turn indicators.
6. Reserve warning lamp.
7. Total distance counter.
8. Speedometer.
9. Warning lamp (red) of parking brake engagement.

Starts flashing after turning on the engine control switch, when the parking brake is engaged.

- 10. Warning lamp (green) of right turn indicators.**
- 11. Warning lamp (red) of anti-lock brake system (ABS) malfunction.**
- 12. Warning lamp (red) of engine overheating.**

If the lamp lights up shut down the engine and eliminate the reason of overheating.

13. Oil pressure gauge.

14. Fuel gauge.

15. Warning lamp (orange) of low fuel level in the tank. It lights up, when less than 10 liters of fuel remain in the tank.

16. Warning lamp (red) of oil pressure drop. Lights up when the engine control switch is turned on. Should the lamp light up under normal conditions, shut down the engine immediately and check oil level in the crankcase.

17. Warning lamp (orange) of rear fog light turning on.

18. Coolant temperature gauge.

19. Warning lamp (green) of clearance light turning on.

20. Warning lamp (blue). Lights up when upper beam is on.

21. Trip distance counter reset button.

22. Trip distance counter.

23. Tachometer.

24. Warning lamp (red) of storage battery discharge.

6. Doors, Seats and Seat Belts

Doors. To open the door from outside, pull handle 2 (Fig. 6.1). The doors are equipped with locks that can be locked from outside with key inserted in lock release 3.

From inside the doors are locked by pushing down button 1.

To open the door from inside pull handle 4 with lock button 1 pulled up only.

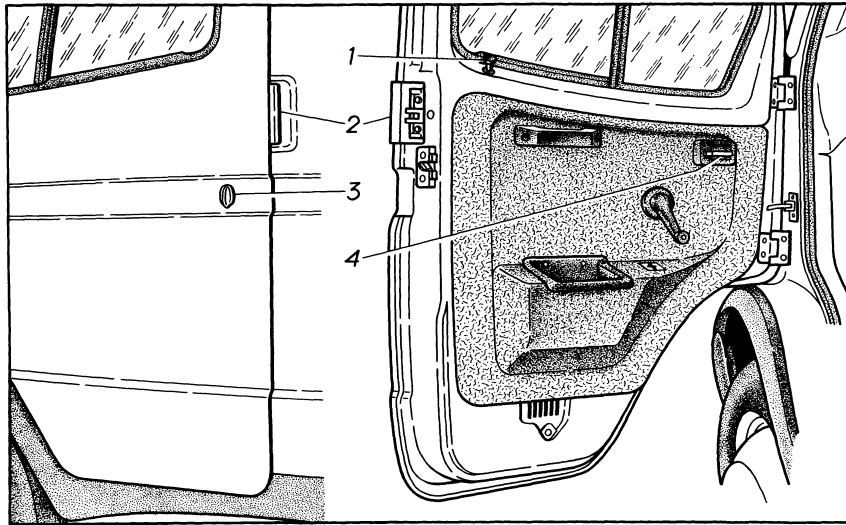


Fig. 6.1. Cab Doors

1 — button; 2 — handle; 3 — lock release; 4 — handle

Never drive the vehicle with opened or partially closed doors.

Seats. For seating convenience the driver seat is adjustable. By turning handle 2 (Fig. 6.2) the seat can be moved in lengthwise direction. Required seat backrest tilt is adjusted by rotation handwheel 3.

For driver's convenience seat tilt is also adjusted by means of nuts 1.

GAZ-331043 vehicle is equipped with the second row of seats — two double-seat passenger seats.



Fig. 6.2. Driver Seat

1 — adjusting nut; 2 — locking handle; 3 — backrest tilt handwheel.

To gain access to the rear passenger seats, the front passenger seat to be moved in the direction of the driver seat. This seat shifting mechanism is similar to that of the driver's seat. Before driving the vehicle shift the passenger seat to the extreme right position by all means, otherwise safety belt will be ineffective.

Seat belts are effective equipment to protect the driver and any passengers from severe injury in road accidents.

Vehicles are equipped with two types of seat belts. Inertia reel type with three anchorage points for driver and passengers of single and outer seats as well as lap type with two anchorage points for passengers of centre seats. Adjustment of the inertia reel type belts is not required. As for the lap type belts, personal adjustment of its length is necessary because intimate mating of webbing to hips must be ensured. Changing of webbing length is performed by means of regulator.

To fasten the belt (Fig.6.3) it is necessary to pull the belt webbing slowly by the tongue over the shoulder and across the chest and push it into the buckle nearest the wearer; a click will indicate that the belt is locked.

Upper portion of the belt should pass across the centre of the shoulder so that it is not resting on your neck or under the arm and must have intimate mating with the upper part of your body.

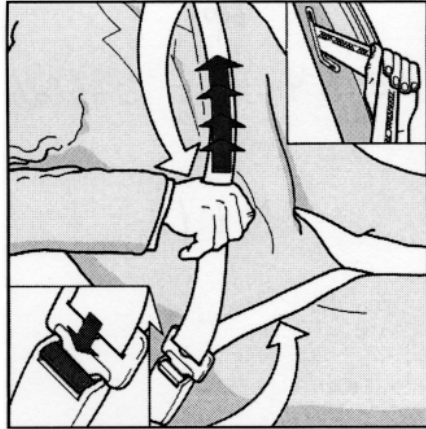


Fig. 6.3. Fastening by Seat Belt

Lap portion of the belt should be positioned as low on the hips as possible. Otherwise release the belt and adjust its length.

To release the belt, press the red panel on the buckle. The belt will automatically retract to its stowed position.

Pregnant women should also wear the seat belt. But she should position the lap portion of the belt low so that it does not come across the abdomen.

Warning!

The belts which underwent critical loading in a road accident or they became frayed, cut and had other damages must be renewed by new ones in assembly.

Never make any changes in the seat belt design.

Never attempt to use the seat belt for more than one person.

Keep hard or fragile objects such as glasses, fountain pens away from the belt as they may inflict additional injuries.

The belt should not be squeezed or twisted. Keep sharp edges of the objects in vehicle passenger compartment away from the belt.

If dirty, clean the belt with mild soap and lukewarm water only. Never iron the belt webbing.

7. New Vehicle Running-in

The running-in duration is specified as 1000 km. During this period the vehicle requires special care and special servicing as well as the following recommendations should be strictly adhered to:

1. After starting until loading the engine, let it run for 2–3 minutes first at minimum idle speed with the gradual increase up to 1500 rpm.
2. To avoid premature wear of units and parts the vehicle speed should not exceed 60 km/h.
3. Do not overload the engine. The vehicle load must not exceed 3000 kg. Driving the vehicle with trailer is prohibited. Besides, driving the vehicle over tough roads, deep mud and so on should be avoided during this period.
4. Watch the condition of all fastening joints of the vehicle. Loose nuts should be timely tightened up. Particular emphasis should be placed upon securing of pitman arm, propeller shaft wedges, steering knuckle arms, tie and drag link joints, spring U-bolts, wheels and silencer intake pipes flanges.
5. During running-in period tandem transportation of the vehicles (or their chassis) by their partial loading of one on the other is permitted when delivering to customer in self-propelled way over the road of improved type.

In such way of transportation the storage batteries of the trailing vehicle should be removed and carried on the master vehicle. Then it is necessary to disconnect propeller shaft flange from axle drive gear and undo screws "A" of energy storage batteries (see Fig. 8.1).

During running-in period carry out all vehicle maintenance works specified in section "Running-in" of the service book.

8. Vehicle Operation

8.1. ENGINE STARTING

8.1.1. Starting of cold engine

Prior to engine starting check coolant level in engine cooling system and oil level in engine crankcase. When starting from cold, glow plugs bolting installed in cylinder heads turn on automatically.

Engine cold starting is carried out in the following sequence:

1. Turn on the storage batteries switch.
2. After the long-term (for several days) parking before starting the engine it is recommended to prime the fuel by hand fuel priming pump.
3. Move the gearshift lever into the neutral position.
4. Depress the clutch pedal all the way down.
5. Turn engine starter key to position I (instrument cluster and engine control system — ON). In doing so red warning lamp in the oil pressure gauge and warning lamp of turning on glow plugs bolting will illuminate.
6. When warning lamp goes out switch on the starter (for not more than 15 seconds) turning the key to non-fixed position II (instrument cluster and starter are switched on).
7. Once the engine starts release the key, which will automatically return to position I. Red warning lamp in the oil pressure gauge goes out.
8. Release the clutch pedal.

Should the engine fail to start it is necessary to make another attempt repeating the above procedures. Allow not less than 1 minute before the second attempt. After the third unsuccessful attempt, find and eliminate the trouble.

Do not run the engine at idle speed for more than 15 min.

Load the engine (start driving the vehicle) when the coolant temperature in the cooling system reaches 40° C.

Start the engine from cold with 15W/40 oil at the ambient air temperature not lower than minus 15° C. When filling the engine with low-viscous thickened oils of type M-4/8II, 5W/40, 5W/50 cold starting temperature may be lowered up to minus 25° C.

Starting of the warm engine should be carried out in the same sequence, as the starting of the cold engine, in so doing it is not necessary to disengage the clutch.

8.1.2. Starting of cold engine at low temperatures

At ambient air temperatures below -25°C (when the engine filled with low-viscous oil) and below -15°C (when the engine filled with winter grade oils) the following methods of engine warming-up are recommended prior to engine starting:

a) engine heating with hot water. With the drain cock of the cylinder block opened, hot water of $70-80^{\circ}\text{C}$ is being poured in the radiator until water temperature reaches $30-40^{\circ}\text{C}$ in the engine cooling system and warm water flows from the drain cock. It is recommended to pour the water into the system swiftly and continuously. To avoid water freezing in the engine radiator, hood the grill with the radiator cover.

b) filling the engine with hot oil. In this case drain oil from the engine into clean dishware. The oil should be heated up to $70-80^{\circ}\text{C}$ and poured into the engine right before starting.

Never start and run the engine with the empty cooling system. At long-term parking to avoid radiator and engine freezing, drain water from the cooling system and watch that all water was drained and it did not freeze in the radiator and cylinder block drain cocks. For this purpose prick the cocks. To expedite water drain from the system, open the radiator filler cap. When water is drained leave the cocks open.

8.1.3. Engine Stopping

Prior to engine stopping let it run for 3–5 min. at medium speed and then at idle speed so as to reduce the temperature of coolant, oil and turbocharger.

To stop the engine release the accelerator pedal, turn off the instruments with the key and battery switch.

8.2.VEHICLE DRIVING

It is recommended to start vehicle driving with the engine warmed up. If there is no such possibility and the engine is warming up on the moving vehicle it is advisable at low temperature of ambient air and after prolonged parking to drive some time at low gears and low engine speed. As oil warms up it is necessary to shift to higher gears in succession.

After wading, driving through heavy rain or after washing the vehicle braking surfaces become coated with moisture. This will affect braking efficiency until disks, drums and brake linings are dried by intermittent light application of the brakes.

When moving over the pools it is necessary to lower the speed to avoid hydroplaning, which may cause skidding and loss of control; the danger increases with the tires worn.

Drive the vehicle where possible without sharp acceleration and deceleration for this will lead to the increasing tires wear and higher fuel consumption.

To provide long and trouble-free operation of the gearbox, observe the following requirements, which will guarantee easy and noiseless gear shifting:

1. When shifting the gears, move the lever smoothly having first completely disengaged the clutch. Too quick gear shifting will result in premature wear of synchromesh gears or their breakdown. To increase useful life of the synchromesh gears it is recommended to shift from the higher to the lower gear using a double clutch method with the intermediate increase in the engine speed with the gearshift lever in the neutral position. Never try to change gears if the clutch is not disengaged completely. Do not operate the pedal and the lever simultaneously.

2. Do not engage the clutch if the gear is not changed completely.

8.3. BRAKING AND PARKING

Pneumatic disk brakes ensure steady braking efficiency. Nevertheless brake the vehicle smoothly avoiding abrupt braking.

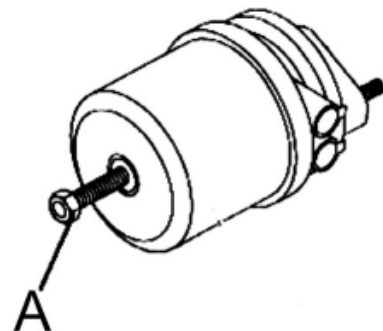
Do not turn off the instruments and do not remove the engine control switch key whilst the vehicle is in motion. With the engine stopped the compressed air pressure drops in the brake system receivers as well as the ABS is deactivated.

Moreover with the key removed the steering shaft will become locked by the anti-theft device and this will result in the loss of vehicle control.

In case one of the brake system circuits goes out of order the second circuit provides the vehicle braking. When the parking brake is engaged, its releasing is possible by mechanical means only.

To provide towing of the broken vehicle it is necessary to remove screws "A" of emergency brake release (see Fig. 8.1).

Fig. 8.1. Vehicle emergency brake release



When stopping the vehicle on upgrade or slope, it is necessary to engage the parking brake and shift, respectively, into the first or reverse gear.

To avoid freezing of the brake pads to the disks after a long driving over a wet road at sharp temperature variations, it is necessary to dry the pad linings by smooth braking when moving to the parking place.

8.4. HEATING AND VENTILATION OF THE CAB

Heating

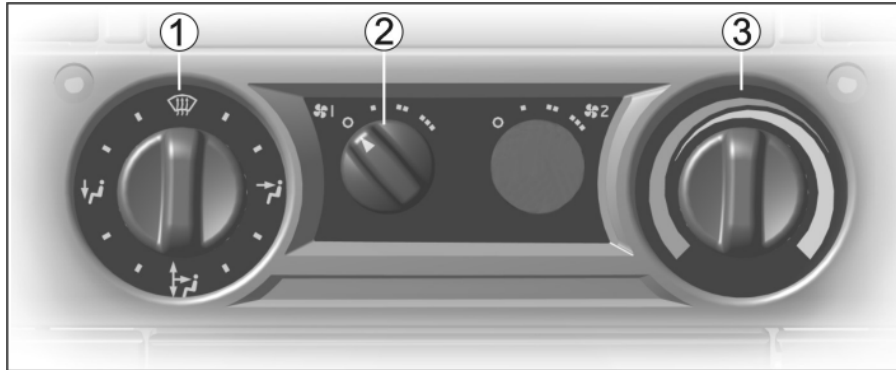


Fig. 8.2. Heating and ventilation control panel:

1 — handle of air distribution control in the cab:



— air flow is directed to the windscreen and door windows;



— air flow is directed to the chest of the driver and passenger;



— air flow is directed to the windscreen and door windows, to the chest and feet of the driver and passenger;



— air flow is directed only to the feet of the driver and passenger.

2 — control handle of air amount supplied to the cab. It has four positions:

○ — off;

□ — slow speed of the blower;

□ □ — normal speed of the blower;

□ □ □ — fast speed of the blower.

3 — handle of air temperature control in the cab (passenger compartment). The handle extreme left position (wide part of the blue symbol) activates the ventilation mode. The intermediate and extreme right positions (wide part of the red symbol) activate the heating mode.

Defrosting and Demisting

To remove quickly frost and condensate from the windscreen and door windows do the following:

- turn handle 1 (Fig. 8.2) of air distribution control to position of directing air to the windscreen and door windows;
- turn handle 3 of air temperature control to the extreme right position (wide part of the red symbol);
- turn handle 2 of air amount control to the fast speed of the blower.

To achieve a favourable climate in the cab (passenger compartment):

- turn handle 1 of air distribution control to the chosen position;
- set the air temperature you prefer (temperature of outside air or hot air from the heater) by turning handle 3 of air temperature control;
- turn handle 2 of air amount control from position ○ to one of the three positions to get the desirable rate of air flow coming to the passenger compartment.

Central and side ventilation grids on the instrument panel have handles (levers) for shutters control. Shifting of them changes the direction of air flow, increases or decreases the amount of air coming to the passenger compartment or completely closes the channel of air supply.

Ventilation

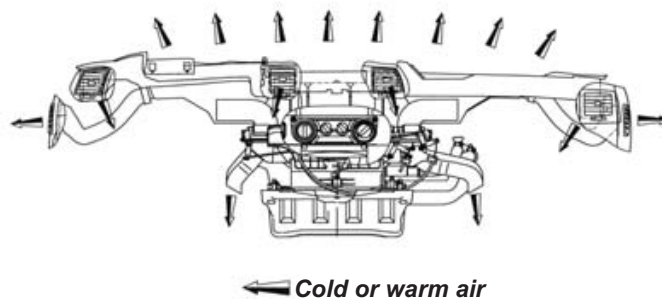


Fig. 8.3. Distribution of Air Flows in the Vehicle Cab

To cut in the ventilation:

- turn handle 3 (fig. 8.2) to the extreme left position (wide part of the blue symbol);

- choose the mode of air distribution by turning handle 1;
- turn handle 2 to get the desirable rate of the air flow coming to the passenger compartment;
- adjust the direction of air flows by turning the shutters of ventilation grids.

To make heating and ventilation effective be sure that the grid of the hole for air intake located on the hood before the windscreen is free from leaves, snow, etc.

8.5. LIGHTING AND LIGHT SIGNALING DEVICES

Caution! Headlamp-block with marking OAO "OCBAP" lenses are made of plastic material. That is why **never** use fuels and other aggressive fluids, as well as dry brushes and wiping waste for cleaning from dust and dirt.

Remove the dirt from these parts with water jet only.

Headlamps. To replace dipped beam and clearance lamp bulbs it is necessary to remove rubber cover 3 (Fig 8.4).

To replace main beam bulb remove rubber covers 3 and 5, and unscrew connector 1 to replace turn indicator bulb.

Knob 2 is designed to adjust the direction of light beam in horizontal plane. Vertical adjustment of the light beam is carried out through opening 4 using hexagon spanner or crosshead screwdriver.

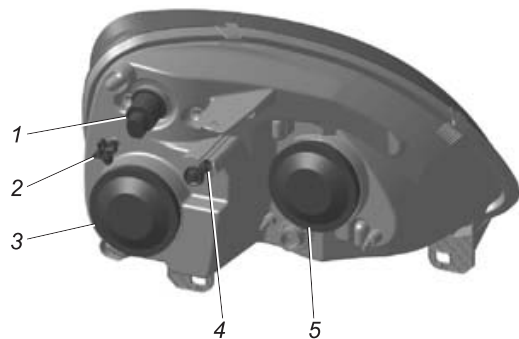


Fig. 8.4. **Headlamp-block**

1 — connector; 2 — light beam horizontal adjustment knob; 3 and 5 — rubber covers; 4 — opening for light beam vertical adjustment

Additional vertical adjustment of the dipped beam depending on vehicle loading is performed from the cabin by means of the headlamp aiming device control unit handwheel.

On an unladen vehicle it is necessary to make "0" on the handwheel coincident with "•" mark on the control unit housing.

On a fully laden vehicle it is necessary to make "4" on the handwheel coincident with "•" mark on the control unit housing.

Adjust the headlamps in the following sequence:

- check air pressure in tires. Bring it, if necessary, to the required level;
- place the unladen vehicle on a level ground at 5 m distance from the screen (Fig.8.5);
- bring "0" on the handwheel into coincidence with the mark on the housing of the headlamp aiming device control unit;
- turn on the dipper beam;
- adjust the light beams by knobs 2 (Fig. 8.4) and through opening 4 for each headlamp in turn.

Caution! When fitting a halogen bulb in the headlamp, do not touch the bulb glass with the fingers to avoid luminous flux reduction or bulb rapid destruction during its operation.

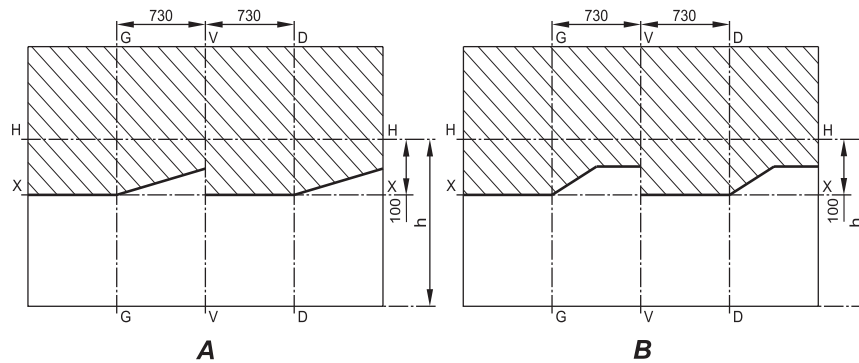


Fig. 8.5. Screen Layout for Headlamps Adjustment:

A – headlamps with "AL" marking on the lenses; B – headlamps with "OCBAP" marking on the lenses; h – height of vehicle headlamp dipper beam center; Y–Y – vehicle axis;

The horizontal section of light and shade border of adjusted headlamps must coincide with line X–X (Fig. 8.5A, 8.5B), the inclined section of the light and shade border must correspond to Fig. 8.5A (with "AL" marking on the lenses) and Fig. 8.5B (with "OCBAP" marking on the lenses), and the points of horizontal and inclined sections of the light and shade border intersection must coincide with G–G and D–D lines.

Turn indicators and hazard light. The vehicle is equipped with electronic flasher unit of turn indicators and hazard light, which also monitors pilot lamps serviceability.

If, when switching on the turn indicator, pilot lamp flashes two times faster it means that one of the turn indicator bulbs from the vehicle right or left side is faulty (loose connection or blowing out).

If turn indicator pilot lamp does not illuminate but turn indicator bulbs are in good repair, the pilot lamp should be checked for serviceability.

If, when switching on the turn indicators, its bulbs and pilot lamp do not light it means that fuse or turn indicator flasher unit (or its circuit) are faulty.

Tail lamps. The vehicle is provided with the tail lamps including: braking lights, clearance lights, turn indicator lights, backing lights and fog lights.

The provision is made to install a separate fog lamp on buses and vans.

The set of horns 22.3721/221.3721 is installed under the hood on the upper panel of the radiator cowl.

Carry out fine adjustment of the horn sound, if required. For this purpose loosen the lock nut of the screw located on the rear side of the horn. Adjust the sound by turning the screw to the one or the other side. Tighten the lock nut.

8.6. FUSES

Under the hood on the right there is a fuse box БИП-4. 90A fuse protects glow plugs control circuit and alternator circuit.

40 A fuse protects lighting circuit of the vehicle. 60 A fuse protects engine shutdown solenoid control circuit.

60 A fuse (utmost) protect general positive circuit of the vehicle.

On the left two fuse boxes БИП-13 are installed under the instrument panel.

БИП-13 Fuse Boxes

Upper fuse box fuses protect the circuits of:

1. 25A — ABS control unit.
2. 15A — hazard light.
3. 14A — frame switch, radio and cassette player.
4. 10A — windscreen wiper, windscreen washer.
5. 10A — headlamps relay.
6. 10A — braking lights.
7. 20A — horn, horn relay, cigarette lighter.
8. 20A — main heater, heater electric pump.
9. 15A — auxiliary heater.
10. 10A — instrument cluster, boozzer, backing light, speed sensor, windshield wiper relay.
11. 5A — ABS control unit.
12. 15A — dryer relay, starter locking relay, glow plugs control unit, fan electric coupling, engine shutdown solenoid.
13. 10A — turn indicators, headlamps relay.

Lower fuse box fuses protect the circuits of:

1. 25A — spare.
2. 15A — right headlamp main beam.
3. 15A — left headlamp main beam.
4. 10A — right headlamp dipper beam.
5. 10A — left headlamp dipper beam.
6. 10A — fog lamps, fog lamps pilot lamp.
7. 20A — spare.
8. 20A — spare.
9. 15A — under hood lamp, driver dome lamp, dome lamp of the second row seats.
10. 10A — illumination (instruments, switches, cigarette lighter).
11. 5A — spare.
12. 15A — right clearance light, headlamp aiming device, licence plate lamp, glove box lamp.
13. 10A — left clearance light, clearance pilot lamp, marker light on the cab roof.

Note: Vehicles are provided with the set of spare fuses. A fuse puller is available in the set of the spare fuses to assist removal of the faulty fuse. The electric circuits protected by the fuses are also shown on schematic electrical diagram.

8.7. GENERATOR SET

The vehicle is equipped with AC alternator with built-in rectifier and integral voltage regulator. Maximum current output of alternator is 65A.

During operation check the generator set functioning using voltage indicator installed in the instrument cluster.

Basic operation rules

1. Never interconnect the voltage regulator and the alternator leads, and connect them to the ground even for a short time because it will cause the voltage regulator failure.
2. Never run the engine with the storage battery disconnected.
3. Never start the engine with the alternator + lead disconnected for it will cause the generation of high voltage on the alternator rectifier dangerous for the rectifier diodes.
4. It is prohibited to check the alternator and regulator circuit for good condition by continuity test using megohmmeter or indicator lamp powered

from network exceeding 36 V. Carry out wire insulation check using megohmmeter or lamp powered from network exceeding 36 V when alternator and regulator semiconductor devices are disconnected only.

5. Do not allow the direct water splashing on the alternator and regulator during vehicle washing.

6. When servicing the alternator brush assembly it is necessary to:

- wipe brush holder and the brushes with clean cloth soaked in gasoline;
- check brushes consistency, absence of their jamming in the brush holders and reliability of their contact with collector;
- brushes worn up to 8 mm are subject to replacement.

8.8 STARTER

The starter is a DC series-wound electric motor with the drive consisting of a drive gear and a backlash roller clutch. The starter is engaged with the use of the engine control switch key.

Maintenance service of the starter reduces to periodical checking of starter and wires fastening and cleanout of dirt.

Starter operation instructions:

1. It is forbidden to set the vehicle in motion by the starter. It may result in failure of the starter. In case of emergency it is allowed to move the vehicle for not more than 5 m.

2. In winter do not persist in starting the cold engine by cranking it with the starter for a long time without preliminary heating of the engine. This may lead to failure of the starter and storage battery.

8.9. ANTI-LOCK BRAKE SYSTEM

The vehicles are equipped with anti-lock brake system (ABS) made by "KNORR-BREMSE". ABS is effective in case of emergency braking on the roads with diverse road surface (example: asphalt-ice) and it prevents locking of the wheels being in the least favorable road adherence condition (on the ice) ensuring minimum braking distance of the vehicle for this road surface (ice) while maintaining its stability and response.

Attention!

To get the best effect during emergency braking of the vehicle using ABS it is necessary to press the brake pedal with maximum effort pushing the clutch pedal simultaneously.

The electrical part of the ABS consists of 4 speed sensors (located in the vehicle's wheel assemblies), 3 input choppers (on vehicle frame), control unit

(CU) of ABS (in cabin at the right under the instrument panel), ABS diagnostic button (in the middle of the instrument panel), ABS failure warning lamp (on the right in the instrument cluster) and ABS harness connecting sensors and input choppers with ABS CU.

Two supply circuits are connected to ABS CU: for input choppers via 1st 25A fuse in the upper fuse block and direct for ABS CU via 11th 5A fuse in the upper fuse block.

The instrument cluster is provided with the warning lamp. It lights up for several seconds each time the engine control switch is turned on and then goes out. It evidences that ABS system circuits connected to ABS CU are in sound condition. If the warning lamp lights continuously or it lights up during vehicle movement it indicates that ABS circuits went out of order (but service brake system maintains serviceability as if without ABS). ABS failure warning lamp is also lights up automatically at constrained disconnection of supply socket from ABS control unit.

When ABS failure is confirmed the troubleshooting should be carried out at service station.

ABS electrical diagram is shown in Fig. 8.6.

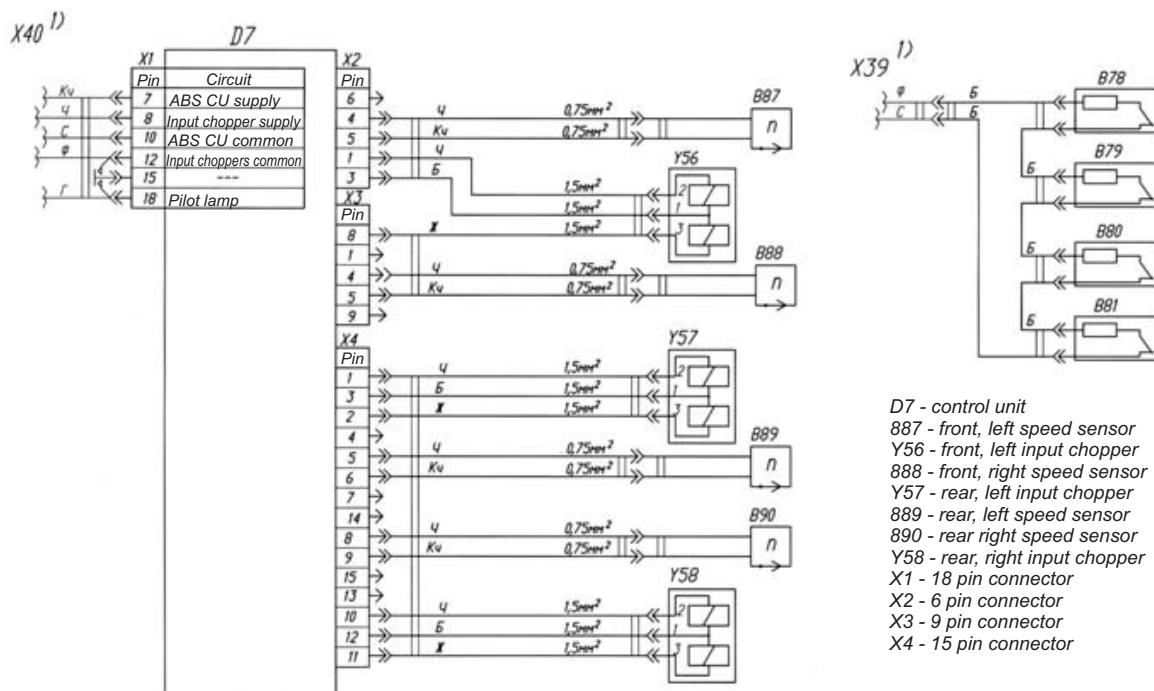


Fig. 8.6. ABS System Electric Circuit Diagram

¹⁾See vehicle electrical equipment diagram

8.10 TOWING DEVICE

Front and rear towing devices consist of towing fork with pivot bolt locked at below with cotter pin.

Before towing the vehicle remove the front licence plate to make access to the towing fork. For towing the vehicle in heavy road conditions with small turning radiuses and so on, it is recommended to remove the bumper to prevent its damage. In so doing it is necessary to undo 4 screws of bumper middle part fastening and one nut (17 mm width across flat) at each side of bumper sidewalls fastening.

9. Vehicle Maintenance

This section describes the works, which should be carried out regularly within the intervals between the maintenance operations stated in the Service Book.

9.1. CHECKING ENGINE OIL LEVEL

Check engine oil daily prior to engine starting. When doing so park the vehicle on level ground. The oil level must be between "II" and "0" marks on the oil dipstick (nearer to "II" mark). Bring it to the proper level if required.

Pour fresh engine oil via the filler neck covered with the cap.

9.2. CHECKING OIL LEVEL IN GEARBOX AND REAR AXLE

Check oil level on an unladen vehicle standing on level ground with the units cold.

Oil level in the gearbox (Fig. 9.1) should be to the level of the filler hole lower edge.

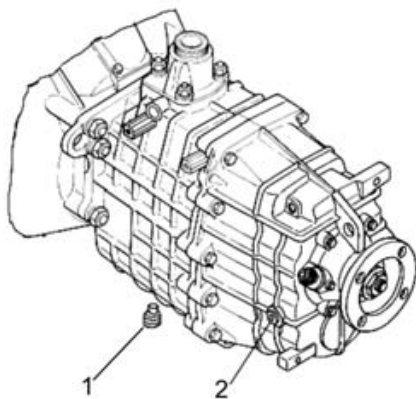
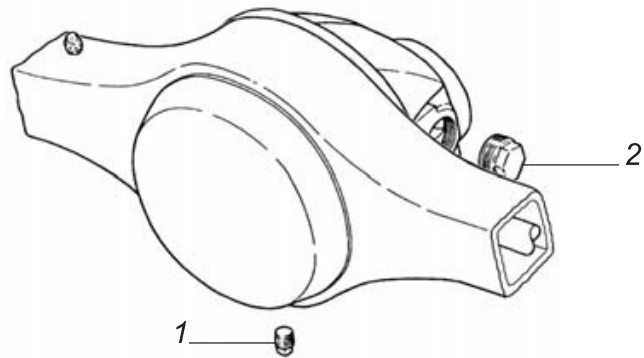


Fig. 9.1. Checking Oil Level in Gearbox:

- 1 — drain hole plug
- 2 — filler hole plug

Fig. 9.2. Checking Oil Level in Rear Axle

- 1 — drain hole plug;
- 2 — filler hole plug



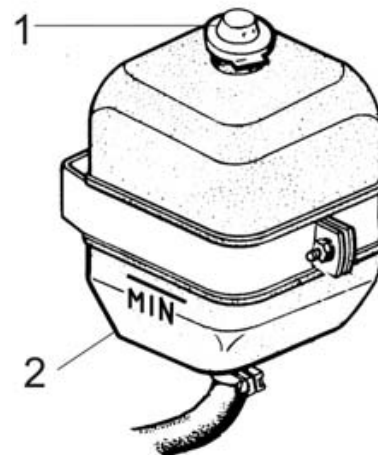
Oil level in the rear axle (Fig. 9.2) should be to the level of the filler hole lower edge.

9.3. CHECKING COOLANT LEVEL

Checking the coolant level in expansion tank 2 (Fig. 9.3) should be carried out only when the engine is cold.

Fig. 9.3. Checking Coolant Level in Expansion Tank:

- 1 — plug;
- 2 — tank



The coolant level should be at MIN mark or 30–50 mm above it.

Add anti-freeze mixture through the expansion tank hole covered by cap. If the coolant level falls frequently, inspect the cooling system for leakage.

9.4. CHECKING BRAKE LINING WEAR RATE

On the sliding calipers 1 of all disk brake gears, marking is made (see Fig. 9.4).

According to the position of "P" mark on the sliding caliper 1 against flange "R" of caliper body 2 it is possible to determine the brake lining thickness without wheel removing.

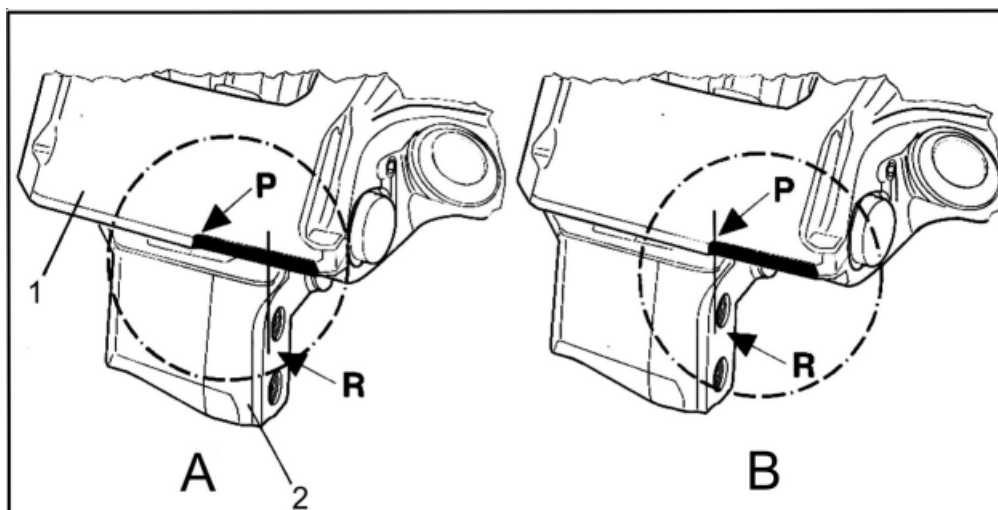


Fig. 9.4. Checking Brake Lining Wear Rate

In Fig. 9.4 "A" "P" mark position is shown when the brake pads are new. When mark position corresponds to the position shown in Fig. "B", friction linings and brake disk thickness should be checked with the wheels removed. Moreover, brake pad wear indicator is installed in every disk brake to determine friction linings wear. After reaching of any brake pad limiting wear the indicator lights up on the instrument panel.

9.5. CHECKING BRAKE FLUID LEVEL IN CLUTCH MASTER CYLINDER TANK

The level of the brake fluid in the clutch master cylinder tank should be 15–20 mm below upper edge of the tank (Fig. 9.5).

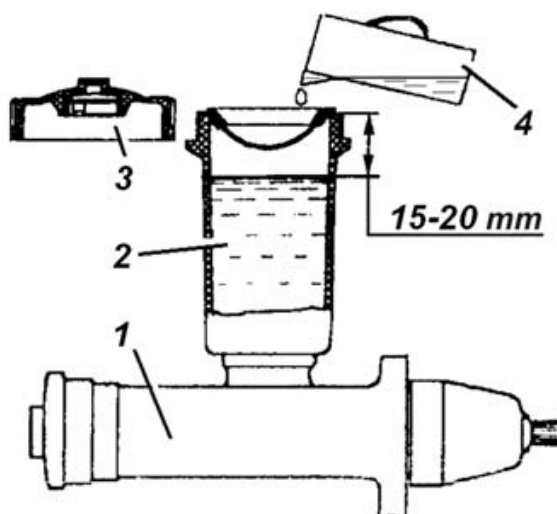


Fig. 9.5. Checking Fluid Level in Clutch Master Cylinder Tank

1 — service cylinder; 2 — tank; 3 — cap;
4 — reservoir

9.6. CHECKING STORAGE BATTERY ELECTROLYTE LEVEL

Storage battery electrolyte level should be between MIN and MAX marks (Fig. 9.6) on the semi-translucent battery housing and in case of their absence — to the lower edge of the filler hole.

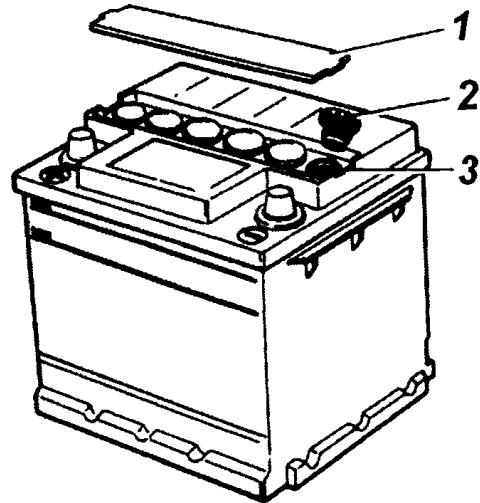


Fig. 9.6. Storage Battery

1 — cover; 2 — plug; 3 — filler hole

If the electrolyte level is below the standard it is necessary to remove cover *1*, unscrew plugs *2* and add distilled water through holes *3* up to the required level; then screw in plugs *2* having preliminary checked the vent holes in them for cleanness and place back cover *1*. After that wipe the battery outer surfaces with clean rags soaked in 10% solution of ammonia spirit or sodium bicarbonate.

Always keep the battery terminals and cable clamps clean as well as make sure that they are securely tightened.

Care should be taken to ensure correct polarity when the battery is reconnected after removal from the vehicle (positive terminal is bigger than negative).

Prior to installation on the vehicle charge the battery bringing the density up to 1.25–1.27 g/cm³. Depending on climatic zone of the vehicle operation the electrolyte density should be corrected (see storage battery operating instructions).

During the prolong parking of the vehicle disconnect the storage battery from the vehicle frame to ensure fire safety precautions.

Battery switch. To disconnect the storage battery during the prolong parking or the repairing of electric equipment the battery switch is installed under the hood on the battery plate. It operates by short pressing on the button 28 (See Fig. 5.1), placed on the fuse block bracket.

The battery can be switched off or on also by immediate pressing on the switch button, covered with rubber cap.

To avoid the damage of electric equipment it is not allowed to switch off the storage battery with the engine running.

9.7. CHECKING OIL LEVEL IN POWER STEERING RESERVOIR

Power steering system reservoir is installed under the hood on the bracket fastened on the left headlamp case stiffener.

The level of oil should be between MAX and MIN marks available on the reservoir body.

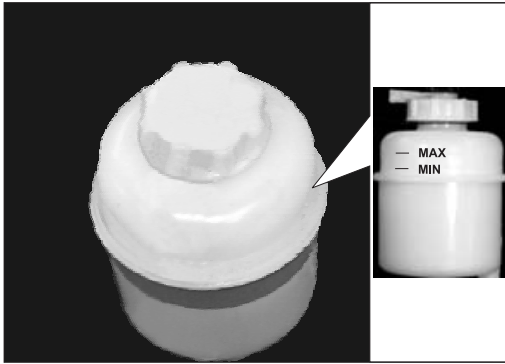


Fig. 9.7. Checking Oil Level in Power Steering Reservoir

9.8. ENGINE ACCESSORIES DRIVE BELT TENSION

Fan belt tension (Fig. 9.8) should be checked by pressing with 4,0 daN (4,0 kgf) force on the side middle between pulleys of crankshaft and alternator in doing so the belt sag amount must be within 12–17 mm. To adjust the belt tension it is necessary to loosen alternator fasteners, turn it and tension the belt. Tighten alternator fasteners.

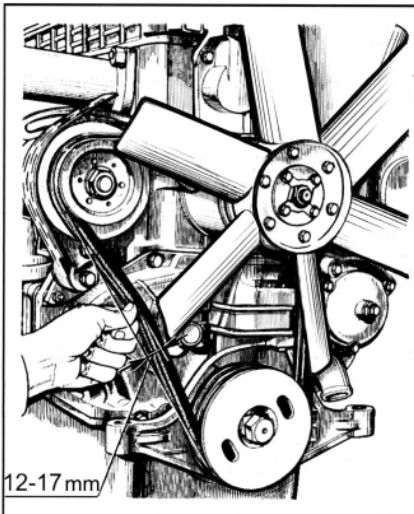


Fig. 9.8. Checking Fan Belt Tension

9.9. WHEELS AND TIRES CARE

In the process of vehicle operation it is necessary to timely tighten the loose wheel nuts to avoid damaging the fastening holes, remove rust from the wheels and restore their colour.

To ensure maximum service life of the tires the following rules should be observed:

- maintain the required air inflation pressure in the tires. Pressure should be checked when the tires are cold before starting out. When stopping during a trip carry out visual inspection of the tires and inflation pressure in them. Never drive the vehicle with the underinflated tires even for a short distance. Pressure should not be reduced in warm tires because during the vehicle movement pressure increase is inevitable due to heating of air inside them;

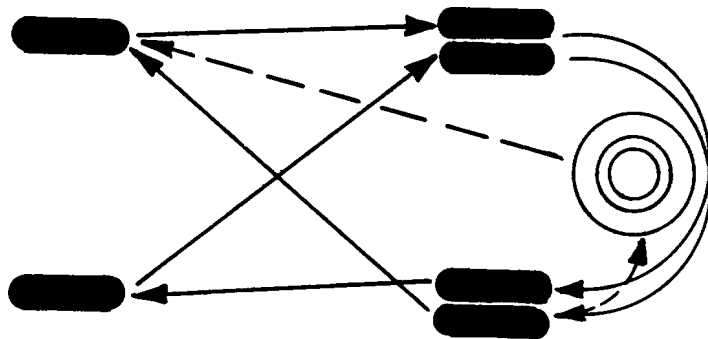
- check and balance the wheels with tires on a special stand at the service station. The allowable residual unbalance from each side of the wheel with tire should not exceed 100 g on the wheel rim;

- on returning from a trip and when at halt inspect the tires and remove the foreign objects. The vehicle should be parked on clean and dry place. Avoid oil, gasoline, oil paint getting on the tires;

- prevent vehicle standing with underinflated tires;

- rotate the tires (Fig. 9.9), if necessary to get even wear of all tires, spare one including, as well as to provide proper selection of the tires for each axle. The tires on an axle should be of the same tread wear and more reliable tires should be installed on the front axle of the vehicle.

Fig. 9.9. Tire Rotation Diagram



Maximum permissible rate of tread wear corresponds to residual depth of the tread grooves equal to 1.6 mm which is determined by measurement or by tread wear indicators. These indicators of 1.6 mm high will appear as wide bands incorporated in the tread pattern and marked on the tire sidewalls by TWI marks.

9.10. CHANGING A WHEEL

Replace the wheel in the following sequence:

- apply the handbrake;
- place chocks under the wheels from the side opposite to the wheel to be removed;
- loosen six nuts of the wheel to be removed;
- place the jack (Fig. 9.10) under front axle beam or rear axle near the wheel to be lifted and drive out screw 2 by hand as far as it will go. In case of loose ground, place a pad or a firm board under the jack base;

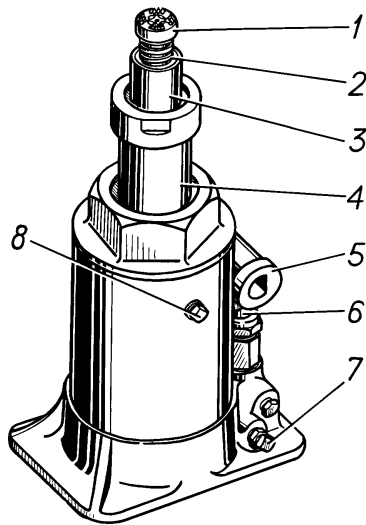


Fig. 9.10. Jack

1 — head; 2 — screw; 3 and 4 — operating plungers; 5 — handle; 6 — delivery plunger; 7 — shut-off needle; 8 — plug

- screw shut-off needle 7 all the way clockwise, insert tommy bar into handle 5 and rocking the tommy bar make lifting of the vehicle so that the wheel clears the ground by 4–5 mm;

In case of failure of lifting by the jack, open shut-off needle 7 and rock the tommy bar several times to remove air which could get into the working chamber.

Plunger lift-off limitation is mechanical, by effort increasing on the handle at the end of the lifting stop the lifting.

- remove six nuts of the wheel, replace the wheel and fit the nuts;
- lower the vehicle slowly opening shut-off needle 7 of the jack by turning it in a counterclockwise direction;
- tighten six nuts and remove the chocks;
- adjust the tire pressure.

When using and storing the jack the following rules should be observed:

1. To maintain vehicle stability place chocks under the wheels of the opposite side and apply the handbrake.

2. Do not work beneath the vehicle with the lifting jack as the only support.

To carry out adjustment and mounting/dismounting operations lift the vehicle on the jack and then lower it on suitable stands.

3. In storage jack screw 2 should be driven all the way in, the operating and delivery plungers must take the lowermost position and shut-off needle 7 be unscrewed through 1 or 2 revolutions.

4. Fill the jack with clear filtered oil BMT3-C or MFE-10A up to the level of the filler hole.

At the ambient air temperature up to – 40° C application of transformer oil is permissible.

Never use oils of other grades and liquids including brake fluid.

Jack failures should be eliminated timely. Seepage of oil in the plungers and shut-off needle is eliminated by tightening the packing gland nuts. Oil leakage through the joints of the body is corrected by tightening the body head. Worn packing glands should be replaced.

Jack failure results from air presence in the working chamber or due to valve sticking. To eliminate failure tap lightly on the delivery plunger handle several times and continue the lifting. To prevent air from getting into the working chamber of the jack, do not lift the operating plunger by hand with the shut-off needle closed.

Incomplete lifting of the jack operating plunger occurs due to shortage of oil. Regularly check the oil level in the jack and replenish, if required. The oil level in the vertically positioned jack should reach the filler throat closed with plug 8.

Failure in operation except for mentioned reasons may result from dirt, which got inside the jack. To clean the jack interior of dirt, unscrew the jack body head, pour clean kerosene into the body and pump the jack several times with the shut-off needle open. Drain kerosene and pour fresh oil.

9.11. CAB CARE

Wash the vehicle in a shadow. Do not use soda, kerosene, gasoline as well as seawater. If after washing with water the cab is not clean enough you may use shampoo and other vehicle cosmetics available in the market.

Use clean sponge and soft cloth with plenty of water and do not rub too hard.

Tar spots should be removed with castor or petrolatum oil. A mild soap solution or pure water may easily clean the plastic parts. Never use gasoline or solvents for the above purpose.

On detecting corrosive spots it is necessary to remove the rust to pure metal, prime and apply corrosion-resisting mastic.

At frosty weather you should not wash the vehicle out-of-door or drive with wet or just washed cab, because by water freezing cracks may appear on painted surface.

You should not keep the vehicle under rubberised cover or place rubber articles on bodywork painted surface because dark spots may appear which cannot be removed with car polish.

To retain elasticity of rubber seals at low temperatures, it is recommended to smear them with glycerine at regular intervals.

In the process of vehicle operation non-corrosive coating of the cab may fail with time that is why it is necessary to perform corrosion-resisting treatment at regular intervals at service stations.

Hidden pockets additional corrosion protective treatment areas diagram of the cab is shown in Fig. 9.11.

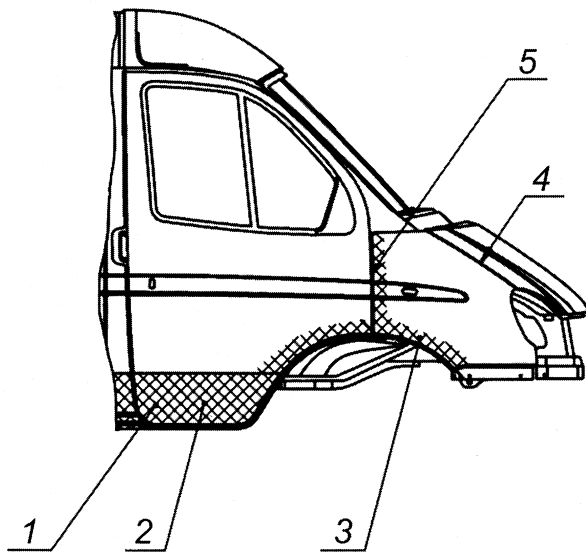


Fig. 9.11. Hidden Pockets Additional Corrosion Protective Treatment Areas Diagram of the Cab

1 — foot steps hidden pockets; 2 — door pockets; 3 — front fender with mudguard contact area; 4 — hood pocket around the periphery; 5 — door hinges area

9.12. TYPES OF MAINTENANCE

The following types of maintenance are established:

1. Daily maintenance (EO).
2. Maintenance one "A" (TO-1) — after 10000 km of run.
3. Maintenance two "B" (TO-2) — after 20000 km of run.
4. Seasonal maintenance "C" (CO).

Seasonal maintenance is performed once a year along with maintenance one "A" or two "B".

9.13. PROCEDURES CARRIED OUT DURING MAINTENANCE

9.13.1. Daily Maintenance (EO)

Procedure description	Specifications	Tools and materials
1	2	3
Check the level of:		
— oil in engine crankcase	See item 9.1	Visually
— fluid in cooling system	See item 9.3	Visually
— fluid in clutch master cylinder tank	See item 9.5	Visually
— oil in power steering reservoir ¹⁾	See item 9.7	Visually
Check service brake system for sound condition.	1. With the engine running, the brake pedal should not reach the cab floor. 2. With the engine running, the buzzer should not work except for the time necessary for receiver feeding after the engine starting.	Visually
Check operation of parking brake system	Parking brake handle should easy move and securely tune in parking position.	
Check tire inflation pressure, bring to the specified, if required	Check when tires are cold. Air inflation pressure values see in subsection 4.10 "Main adjustment and checking data"	Manometer
Check steering wheel total play	Total play over steering wheel rim should not exceed 25° (10° — for the vehicles during the warranty period) in each side from the neutral position	
Check operation of instruments, windshield wiper, illumination and warning devices	With the engine running make sure that the devices are in sound condition by their successive turning on	Visually

1) In case of oil low level in the reservoir, check power steering system for tightness

9.13.2. Periodic Maintenance (TO-1, TO-2, CO)

Procedures for periodic maintenance are stated in the service book supplied with the vehicle.

9.13.3. Vehicle Lubrication

1.Never use fuels, oils and liquids of other grades except for those specified in subsections 9.13.4 and 9.14.

2.Prior to lubrication remove dirt from grease nipples and plugs to avoid its penetration into the vehicle's mechanisms.

3.Lubricate with grease gun until fresh lubricant comes out from all joints and seals.

4.When the engine oil is changed for another grade or company the lubricating system should be flushed with flushing oil.

Never mix (top up) engine oil of different grades and different companies.

9.13.4. Lubrication Chart

Description of lubrication points	Number of points	Quantity of lubricant	Description of lubricant
1	2	3	4
Engine oil system	1	12 l	In summer — engine oils: M-10Г ₂ or M-10Г ₂ К ААИД1 or engine oil М10ДМ ААИД2. In winter — engine oils: M-8Г ₂ or M-8Г ₂ ААИД1 or, engine oil: М8ДМ ААИД2. All-season: engine oil SAE 15W-40 Api CF-4; CF-4/SG (up to –15° C); SAE 5W-40 Api CF-4; CF-4/SG (up to –25° C);
Gearbox case	1	6 l	At the temperature from –25° C to +40° C — oil "Супер Т-3". Substitutes — oils ТСп-15К, "Девон Супер Т", "Лукойл ТМ5" SAE 85W-90. At the temperature from –40° C to +20° C — oil "Лукойл ТМ5" SAE 75W-90
Universal joint needle bearings	3	4 g	Oil "Супер Т-3". Substitute — oil "Девон Супер Т", "Лукойл ТМ5" SAE 85W-90

1	2	3	4
Propeller shaft slip joint	1	200 g	Oil "Супер Т-3". Substitute — oil "Девон Супер Т", "Лукойл ТМ5" SAE 85W-90
Intermediate propeller shaft bearing	1	50 g	Grease Литол-24. Substitute — grease ЛИТА
Steering knuckle pivot bearings	4	30 g	Solid oil Ж or solid oil С
Rear axle housing and rear wheels hub bearings	1	8 l	At the temperature from -25° C to +40° C — oil "Супер Т-3". Substitute — oil "Девон Супер Т", "Лукойл ТМ5" SAE 85W-90 At the temperature from -40° C to +20° C — oil "Лукойл ТМ5" SAE 75W-90
Front wheels hub bearings	4	400±30 g	Grease Литол-24. Substitute — grease ЛИТА
Rear wheel hub seal	2	20 g	Grease Литол-24
Shock absorbers	4	550 cm ³	АЖ-12Т. Substitute fluid — spindle oil АУ
Power steering system	1	1.3 l	Hydraulic oil "Р"
Steering shaft sealing	1	5 g	Grease Литол-24. Substitute — grease ЛИТА
Steering gear universal joints	3	6 g	Grease Литол-24. Substitutes — solid oil С, solid oil Ж
Master clutch cylinder refilling tank	1	0.2 l (system capacity)	Brake fluid "РОСДОТ". Substitute fluid "Томь" class III grade А
Storage battery terminals	4	4 g	Lubricant ПВК or solid oil
Door locks and linkages (inner and outer)	14	20 g	Oil ВМГЗ or МГЕ10А
Door lock releases	2	4 g	Grease Литол-24. Substitute — grease ЛИТА
Cab door limiters	2	2 g	Grease Литол-24. Substitute — grease ЛИТА
Hood lock	1	1 g	Oil ВМГЗ or МГЕ10А
Hood lock control	1	15 g	Grease Литол-24. Substitute — grease ЛИТА
Hood hinges	2	2 g	Oil ВМГЗ or МГЕ10А
Engine cooling system	1	16 l	Coolant ТОСОЛ-А40М, ОЖ-40 "Лена", ТЕРМОСОЛ-А40

9.14. EQUIVALENTS OF RUSSIAN AND FOREIGN FUELS, OILS, LUBRICANTS AND FLUIDS

Russian fuel, oil, lubricant, fluids	Foreign fuel, oil, lubricant, fluids	Recommended t° ranges, °C (ambient)
1	2	3
Diesel oil Л-0,5 3-0,5-35	2D (ASTM975-81) 1D (ASTM975-81)	Above 0° C From 0° C to -20° C
Engine oils		
M-10Г ₂ К or M-10Г ₂ M-10ДМ		ABOVE +5° C
M-8 Г ₂ К or M-8 Г ₂ M-8 ДМ	APISF 4 ACE 2E2: SAE 15W-40 SAE 10W-40 SAE 5W-40	Below -5° C From +45° C to -15° C From +35° C to -20° C From +35° C to -25° C
Transmission oils		
"SUPER T-3 (TM-5)" or "UFALUB UNITRANS" or "DEVON SUPER T (TM-18)"	API GL-5, SAE 85W90, MIL-L-2105B	From -25° C up to +50° C
Lubricants		
Litol-24	Mil-G-18709A, Mil-G-10924C	from -40° C to +60° C
Fat or synthetic solid oil	Mil-G-10924C	from -40° C to +50° C
Lubricant (ПБК) ЛИТА No.158	Mil-C-11796B SM-1C-4515A (Ford) NICO GREASE 57 "Nico International Inc." or Alvania Grease 2 (MoS ₂) "Shell International Petroleum Co. Ltd"	From -40° C to +50° C For cold climatic zone
Graphite grease YCc-A	VV-G-671d 078.01 (RFA)	

1	2	3
Power steering oil Oil grade "A" Oil grade "P"	ATF ISO-6074-HM-22	For tropic climatic zone From -35°C to $+45^{\circ}\text{C}$
Spindle oil AY Oil BMГЗ	ISO-6074-HH-22 ISO-6074-HV-15	From -25°C to $+45^{\circ}\text{C}$ For cold climatic zone
Shock absorber fluid АЖ-12Т Oil MГE-10A	VTL9150-033 ISO-6079-HV-15	Above -45°C For cold climatic zone
Brake fluids "POCДOT" "TOMБ"	DOT-4 SAE J1703 FMVSS 116 DOT-3 SAE J1703 FMVSS 116	For all climatic zones For moderate climatic zone
Coolants: ТОСОЛ-А40М ОЖ-40 "Лена" ТОСОЛ-А65М ОЖ-65 "Лена"	Antifreezing agent with corrosion inhibitor complex and foam-quencher	From -40°C to $+50^{\circ}\text{C}$ For cold climatic zone

While choosing the lubricant or fluid give preference to the following companies: Shell, Mobil, Castrol, British Petroleum, Agip, Gulf.

9.15. PARTS TO BE REPLACED ON THE VEHICLE DURING MAINTENANCE

During vehicle maintenance the following parts are subject to replacement:

1. Fine fuel filter element.

Filter element designation is 240-1117030.

Fine fuel filter care includes draining sediment at regular intervals and replacement of filter element.

To drain sediment from fine fuel filter it is necessary to unscrew plug 4 (Fig. 9.12) and drain sediment until clean fuel appears then tighten the plug.

To renew filter element it is necessary to:

- drain fuel from the filter removing plug 4;
- unscrew cover retaining nuts and remove cover 1;
- withdraw filter element 2 from the body;
- clean the inside of the filter body;
- reassemble the filter with new filter element;

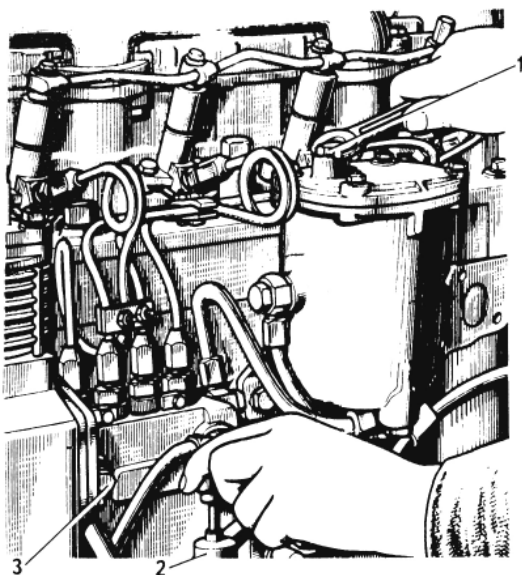


Fig. 9.12. Fine Fuel Filter Element Replacement:

1 — filter cover; 2 — filter element; 3 — filter body; 4 — plug

- unscrew plug 3 (Fig. 9.13) on fuel pump housing to bleed air and unscrew union 1 by 1–2 turns on the fine fuel filter;
- prime the system by means of booster pump 2, when fuel appears screw in union 1 first and then tighten plug 3.

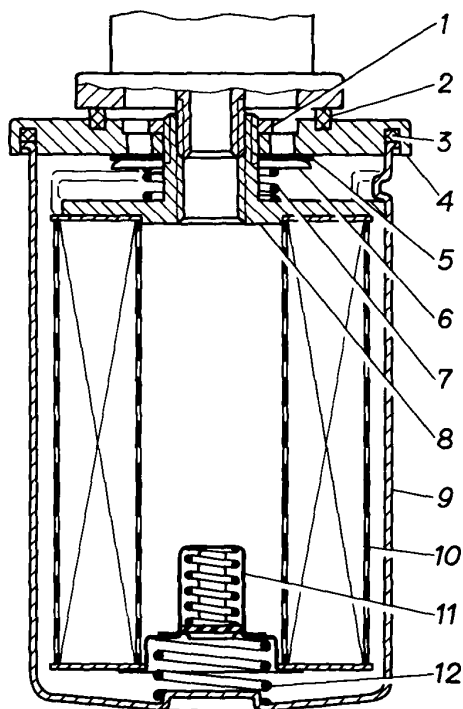


Fig. 9.13. Air Bleeding from Fuel System

1 — union; 2 — booster pump; 3 — plug

2. Air filter element.

Filter element designation is 4301-1109013-10 or 4301.1109013-20.

3. Oil filter, solid, replaceable.

Filter designation is Φ M009-1012005.

When installing the filter, lubricate the rubber gasket with engine oil and screw the filter onto the engine cylinder block.

As soon as the gasket touches the cylinder block, add more 3/4th of the turn. Installation of the filter is carried out by hands effort only.

Instead of filter Φ M009-1012005 it is allowed to use the filters-substitutes X149, firm "ACDelco" (France) and L37198, company "Purolator" (Italy) with basic dimensions:

- diameter — 95–120 mm
- height — 140–153 mm
- mounting thread $\frac{3}{4}$ " — 16UNF.

4. Filter element of power steering system reservoir ШHKΦ 453473.

In case of installation of power steering system reservoir ЯМЗ.993.004 the latter is replaced in assembly.

5. Filter element of dryer 1117793, firm "Knorr-Bremse".

10. Supplements

Supplement 1

10.1. FILLING CAPACITIES

Fuel tank,	105
Engine cooling system, l	21,5
Engine oil system, l	12
Gearbox case, l	6
Rear axle housing, l	8
Power steering system, l	1,3
Shock absorbers (each), cm ³	137,5
Clutch hydraulic drive system, l	0,2
Lubricant for front wheel hubs (both), g	400±30
Lubricant for rear wheel hubs (both), g	40
Windscreen washer tank, l	4

Supplement 2

10.2. ELECTRIC BULBS USED

Purpose and location	Type	Quantity
Head lamps:		
low beam	H7	2
high beam	H1	2
clearance light	W5W	2
turn indicator	PY21W	2
Turn indicator repeater	PY21W	2
Front marker lights	A12-5	2
Side clearance lamps	W3W	4
Tail lights:		
turn indicator	A12-21-3	2
stop-light	A12-21-3	2
clearance light	A12-10	2
backing light	A12-21-3	2
fog light	A12-21-3	2
Side clearance marker light	A12-10	2
Instrument cluster		
pilot lamps	A12-1,2-1	24
instrument illumination bulbs	A12-2,3-1	4
Pressure gauge (manometer)	AMH12-3-1	2
Cab dome lamp	A12-5-1	3
	A12-3-1	1
Glove box dome lamp	A12-5-1	1
Hood light	A12-10	1
Licence plate light	A12-5	4

Purpose and location	Type	Quantity
Cab dome lamp for vehicles with two-bank cab	KJIY9/TBIQ-1	1
Control unit of head lamp aiming device	A12-1,2-1	1
Instrument illumination control	ACMH12-0,55	1
Heating and ventilation unit control desk	A12-1,2	4
Cigar lighter socket lighting	A12-1,2	1
Alarm switch pilot lamp	A12-1,1	1
Main light switch	A12-1,2	2

Supplement 3

10.3. ROLLING BEARINGS USED IN THE VEHICLE

Type of bearing	Bearing No.	Quantity	Location
Engine			
Single seal ball bearing	1160305	2	Water pump
Taper roller bearing	7204A	2	Fuel pump
Thrust ball bearing	8110	1	Fuel pump governor
Thrust ball bearing	8202	1	
Single-row radial ball bearing	205K	2	Power steering pump drive
Single-row radial ball bearing	6-203 or 6-203AK	2	Vacuum pump
Single-row radial ball bearing	207	2	Compressor
Transmission			
Radial ball bearing	1280114C23	1	Clutch release sleeve
Single-row radial ball bearing	6-311AKY	1	Gearbox output shaft, rear
Single-row radial ball bearing	60205K	1	Gearbox input shaft, front
Single-row radial ball bearing	B6-213AKYIII	1	Gearbox input shaft, rear
Radial roller bearing without races	64706	1	Gearbox reverse pinion shaft
Ball Б 11,112-200	306203-II	3	Transmission shifter shaft lock
Ball 10-100	296870	4	Transmission shifter shaft lock plunger
Single-row taper roller bearing	7207A	2	Intermediate shaft
Radial roller bearing without races	264706	1	Gearbox output shaft, front
Double-row needle radial roller bearing without races	664910E	5	Gearbox output shaft pinions
Needle roller bearing with one outer race	804805K1	12	Propeller shaft pivot joints
Single-row radial ball bearing	6-114	1	Propeller shaft bearing
Single-row taper roller bearing	27709Y4III2	1	Rear axle drive pinion, center
Single-row taper roller bearing	27308AKY	1	Rear axle drive pinion, front
Single-row taper roller bearing	Y-807813A	2	Rear axle differential
Single-row radial roller bearing	20-102605M	1	Rear axle drive pinion, rear

Type of bearing	Bearing No.	Quantity	Location
Steering gear			
Radial ball bearing	6-930904FT1C17	2	Steering column
Needle roller bearing with one outer race	904700YC17	10	Steering gear shaft pivot joints
Running gear			
Single-row taper roller bearing	4-807813A	2	Outer support of rear wheel hub
Single-row taper roller bearing	6-7515A	2	Inner support of rear wheel hub
Single-row taper roller bearing	7610A	2	Front wheel hub, inner
Single-row taper roller bearing	7607AY	2	Front wheel hub, outer
Electrical equipment			
Single-row radial ball bearing	6-180502K1C9	1	Alternator
	6-180603KC9	1	

Supplement 4

10.4. SEALS USED IN THE VEHICLE

Designation	No. of seal	Quantity per vehicle
Engine		
Engine crankshaft seal, rear	240-1002305	1
Engine crankshaft seal, front	240-1002055	1
Water pump seal	240-1307038-B	1
Transmission		
Gearbox output shaft flange seal	51-1701210-A	1
Rear axle drive pinion seal	51-2402052-B4	1
Input shaft bearing cap seal (42x62x10)	309827-II	1
Steering gear		
Seal 20x32x7	3302-3401022	1
Running gear		
Seal of front hub in assembly with spring	4301-3103038	2
Seal of rear hub in assembly with spring	51-3104038-132	2

10.5. TIGHTENING TORQUES OF MOST IMPORTANT JUNCTIONS

Junction description	Tightening torque, daN·m (kgf·m)
Tension bolts of:	
Cylinder head	19–21
Main bearing caps	20–22
Flywheel	18–20
Crankshaft balance weights	12–14
Crankshaft pulley	24–28
Injection nozzles	2–2.5
Cardan drive flanges	12–16
Transfer drive reduction gear and drive pinion bearings clutch	9–11
Starter	5–6.2
Retaining nuts of:	
Connecting-rod bearing bolts	18–20
Clutch case to cylinder block	4.4–6.2
Gearbox to clutch	7–10
Gearbox output shaft flange	28–36
Steering wheel	6.5–8
Spring U-bolts:	
front	12–15
rear	20–22
Wheels	36–44
Steering gear bracket to frame	8–10
Steering gear to bracket	25–32
Axle drive pinion flange	28–40
Drop arm	30.5–33

Note: Tightening torques are given for checking during repairing and maintenance.

Contents

	Page
Introduction	2
1. Vehicle Identification Data	3
2. Useful Hints	5
3. Safety Precaution Rules	6
4. Specifications	7
5. Controls and Instruments	11
6. Doors, Seats and Seat Belts	19
7. New Vehicle Running-in	22
8. Vehicle Operation	23
8.1. Engine Starting	23
8.2. Vehicle Driving	24
8.3. Braking and Parking	25
8.4. Heating and Ventilation of the Cab	26
8.5. Lighting and Light Signaling Devices	28
8.6. Fuses	30
8.7. Generator Set	31
8.8. Starter	32
8.9. Anti-lock Brake System	32
8.10. Towing Device	34
9. Vehicle Maintenance	34
9.1. Checking Engine Oil Level	34
9.2. Checking Oil Level in Gearbox and Rear Axle	34
9.3. Checking Coolant Level	35
9.4. Checking Brake Lining Wear Rate	35
9.5. Checking Brake Fluid Level in Clutch Master Cylinder Tank	36
9.6. Checking Storage Battery Electrolyte Level	37
9.7. Checking Oil Level in Power Steering Reservoir	38
9.8. Engine Accessories Drive Belt Tensioning	38
9.9. Wheels and Tires Care	39
9.10. Changing a Wheel	40
9.11. Cab Care	41
9.12. Types of Maintenance	42
9.13. Procedures carried out during Maintenance	43
9.13.1. Daily Maintenance (EO)	43
9.13.2. Periodic Maintenance (TO-1, TO-2, CO)	44
9.13.3. Vehicle Lubrication	44
9.13.4. Lubrication Chart	44
9.14. Equivalents of Fuels, Oils, Lubricants and Fluids	46
9.15. Parts to be Replaced on the Vehicle during Maintenance	47

10. Supplements	50
10.1. Filling Capacities	50
10.2. Electric Bulbs Used	50
10.3. Rolling Bearings Used on the Vehicle	51
10.4. Seals Used in the Vehicle	52
10.5. Tightening Torques of Most Important Junctions	53

Отпечатано в ООО «Печать НН», Е5.