Workshop Service Manual

Rubber Track Tractor

MT738
MT740
MT743

North America
4205 River Green Parkway, Duluth GA 30096 USA

August 2019
79037223B
English

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1 General

1.1 Safety information

1.1.1 A word to the technician

Read and understand the safety section in this service manual before operating or servicing the machine. Read and understand the safety sections in the manuals for all attachments before operating or servicing attachments. The technician has the key to safety. Good safety practices protect everyone.

Fig. 1

Study the safety information in this service manual. Make the safety information a working part of the safety program. The safety information in this service manual applies specifically to this type of machine. Always do all other usual and customary safe working precautions. Remember - The technician has the responsibility for safety. Good safety practices can prevent serious injury or death.

The safety section points out some basic safety situations that can occur during the operation and maintenance of the machine. The safety section also suggests possible ways to deal with these situations. The safety section does not replace safety practices in other parts of this service manual.

Practice good safety to help prevent injury or death.

Learn how to operate the machine and how to use the controls correctly.

Do not let other persons operate the machine without instruction and training.

Follow all safety precautions and instructions in the manuals and on safety signs affixed to the machine and all attachments.

Use only approved attachments and equipment.

Make sure the machine has the correct equipment needed by the local regulations.

WARNING:
An operator should not use alcohol or drugs which can affect their alertness or coordination. An operator on prescription or 'over the counter' drugs needs medical advice on whether or not they can properly operate machines. If any attachments used on this equipment have a separate Operator Manual, see that manual for other important safety information.

1.1.2 Service manual

WARNING:
Some pictures in the manual show the shields removed to permit a clearer view. Never operate the machine with any shields removed.

This service manual has been prepared with the latest service information available at publication. Read and understand the service manual carefully before doing any service on the machine.

Right-hand and left-hand, as used in this manual, are determined by facing the direction of machine travel when in use.

Photos, illustrations, and data used were current at the time of printing, due to possible production changes, the machine can vary slightly. The manufacturer reserves the right to redesign and change the machine as necessary without notification.

1.1.3 Safety symbol

The safety symbol tells you about a potentially hazardous area!

Look for the safety symbol in this manual and on the machine. The safety symbols tell you that there is important safety instructions in the manual.

Fig. 2

1.1.4 Safety messages

The words DANGER, WARNING or CAUTION are used with the safety symbol. Learn these safety messages and obey the recommended precautions and safety instructions.

DANGER:
If you do not obey the recommended precautions and safety instructions, DEATH OR INJURY will occur.

WARNING:
If you do not obey the recommended precautions and safety instructions, DEATH OR INJURY can occur.

CAUTION:
If you do not obey the recommended precautions and safety instructions, INJURY can possibly occur.

Fig. 3

1.1.5 Information messages

The words important and note are not related to personal safety, and are used to give information about the operation and servicing of the machine.

IMPORTANT: *Identifies special instructions or procedures which, if not followed, can cause damage to the machine, the process, or the area around the machine.*

NOTE: *Information to make procedures easier.*

1.1.6 Safety signs

WARNING:
Do not remove the safety signs. Replace safety signs that you cannot read, are damaged, or are missing.

Clean the machine surface with a weak soap and water solution before you replace the safety signs. Replacement safety signs are available from your dealer.

Always make sure that safety signs are in the correct locations and that you can read the safety signs. Illustrations of safety sign locations are in this section.

Keep the safety signs clean. If necessary, use a weak soap and water solution.

1.1.7 Important safety information

IMPORTANT: *Any Modifications to the machine or systems not authorized by AGCO will void the AGCO Warranty. This includes, but is not limited to hitches.*

WARNING:
When replacement parts are required for this product, AGCO recommends using AGCO replacement parts or parts with equivalent specifications including, but not limited to, physical dimensions, type, strength and material. Failure to heed this warning can get untimely failures, product damage, personal injury or death.

Failure to obey basic safety rules and precautions can cause personal injuries during product operation, maintenance, or repair. Know dangerous situations before an injury occurs.

A person must be alert to possible dangers. This person must also have the necessary training, skills and tools to do these operations correctly.

Incorrect operation, lubrication, maintenance or repair of this product can be dangerous and can result in injury or death.

Read and understand all the information about the operation, lubrication, maintenance, and repair before operating on this machine.

The product and this manual give safety precautions and warnings. Bodily injury or death can occur to you or to other persons if all warnings are not heeded.

Not every possible circumstance that can involve a potential danger can be anticipated. The warnings in this publication and on the product are, thus, not all inclusive. If a tool or procedure, not recommended by AGCO, is used, make sure they are safe for everyone.

An operator must make sure the product will not be dangerous or damaged by the operation, lubrication, maintenance or repair procedures selected. Information, specifications, and illustrations in this publication come from information available at the time of publication production.

Specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can change the service that is given to the product. Get the complete and most current information before starting a job. AGCO dealers have the most current information available.

1.1.8 General safety instruction

CAUTION:
Carefully read the operator manual before operating the machine. See all instructions and safety rules when operating or doing maintenance.

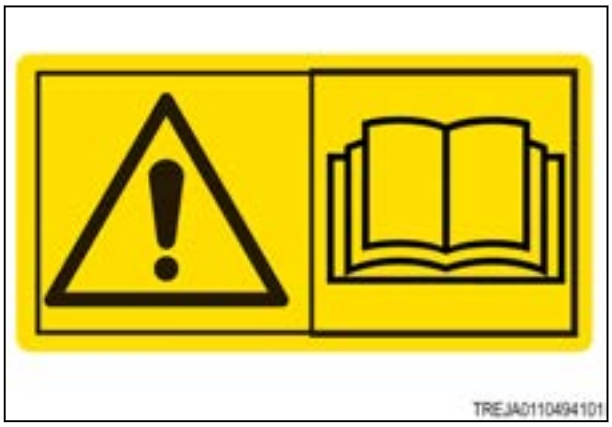

Fig. 4

Do not start the engine until the area is free of personnel. Honk the horn two times to tell others. This will help prevent personal injury because machine movement can occur.

Know the width of the equipment to keep the correct clearance when operating near fences or near boundary blockage.

Wear a hard hat, protective glasses, and other protective equipment, as necessary.

Do not wear loose clothing or jewelry that can catch on controls or on other parts of the machine.

Make sure that all protective guards and all covers are attached in position on the machine.

Fig. 5

Keep the machine free from unwanted material. Remove unwanted material, oil, tools, and other items from the deck, from walkways, and from steps.

Make sure lunch boxes, tools, and other loose items that are not a part of the machine are attached.

Know the applicable work location hand signals and the personnel that are approved to give the hand signals. Get hand signals from one person only.

Do not put maintenance fluids into glass containers. Drain all liquids into an approved container.

Discard all drained fluids and discard all filters. Refer to local regulations.

Use all cleaning solutions with precaution.

Record all necessary repairs.

Do not let untrained or not approved personnel on the machine.

Do not smoke when doing work an air conditioner. Also, if there is refrigerant gas around, do not smoke. Breathing the fumes that are released from a flame that touches air conditioner refrigerant can cause bodily injury or death.

Breathing gas from air conditioner refrigerant through a lighted cigarette can cause bodily injury or death.

Do the following before completing maintenance unless receiving other instructions:

- Parked the machine on level ground.
- Lower the implements to the ground.
- Park the machine.

- Stop the engine.
- Remove the switch key.
- Cool the machine.

Use other precautions if the conditions and environment make it necessary.

For operating this machine in forestry or loader operations:

This machine does not have a falling-object protective structure and must not be used in forestry or loader operations.

1.1.9 Pressurized air

Air under pressure can cause personal injury. When pressurized air is used for cleaning, wear a protective face shield, protective clothing and protective shoes.

The maximum air pressure for cleaning purposes must be below 205 kPa (30 psi).

1.1.10 Asbestos information

AGCO equipment and replacement parts are asbestos free. AGCO recommends the use of only correct AGCO replacement parts.

1.1.11 Electrical storm injury prevention

When lightning is striking in the vicinity of the machine, the operator should not attempt to dismount or mount the machine.

If you are in the operator's station during an electrical storm, stay in the operator's station. If you are on the ground during an electrical storm, stay away from the machine.

1.1.12 Mount and dismount the machine

Mount the machine and dismount the machine only at locations that have steps and/or hand holds. Before mounting the machine, clean the steps and the hand holds. Inspect the stairs and hand holds. Make any necessary repairs.

When dismounting the machine, descend the steps backwards, and maintain a three-point contact with the steps and hand holds. Three-point contact is two feet and one hand or one foot and two hands.

Never mount a moving machine. Never dismount a moving machine. Never jump off the machine except in an emergency.

Do not carry tools or supplies when you try to mount the machine or when you try to dismount the machine. Use a hand line to pull equipment onto the platform.

Do not use any controls as hand holds when you enter the operator compartment or when you exit the operator compartment.

1.1.13 Before you start the engine

Start the engine only from the operator compartment. Never short across the starter terminals or batteries. Shorting can damage electrical system or cause unexpected machine movement.

Adjust the seat so full pedal travel can be achieved with operator's back against seat back.

Make sure the machine is equipped with a lighting system sufficient for job conditions. Make sure all machine lights are working properly.

Before starting the engine or moving the machine, make sure no one is under, around or on machine. Make sure area is free of personnel.

To honk horn the key must be turned to “run” to enable the horn. As a warning honk horn twice, to alert others.

Fig. 6

1.1.14 Start the engine

Move all hydraulic controls to the hold position before you start the engine.

Make sure the machine is in park.

Press the clutch pedal before you turn the ignition key. The starter will not operate until the clutch has been pressed. To stop the starter, turn the key to off or release the clutch pedal.

Diesel engine exhaust contains material of combustion which can be dangerous. Always operate the engine in an open area. If in a closed in area, send the exhaust out.

WARNING:
If you turn the steering wheel with the transmission in the neutral position and the engine at idle speed, the machine will turn.

WARNING:
Do not use ether. Ether will cause engine damage and/or personal injury.

Do not start the engine until the area is free of personnel to prevent personal injury because of unexpected machine movement.

1.1.15 Before operation

Clear all personnel from around the machine and the area.

Clear all obstacles from machine's path. Be careful of dangers, (electrical power lines, ditches, etc).

Make sure all the windows are clean and attached in the closed position.

Adjust the rearview mirrors for best visibility near the machine. Make sure the horn, backup alarm (if equipped) and all other warning devices are working correctly.

On the drawbar-towed implements, fasten a transport chain of sufficient capacity between the machine drawbar support and implement. Give only enough slack in the chain to permit turning.

Only one instructor must be permitted to ride in the machine cab. Instructor must be seated in the instructor seat with the seat belt fastened.

1.1.16 Operating procedures

The machine will turn with the transmission control lever in the neutral position when the engine is operating and the steering wheel is turned.

Only operate the machine while in the operator's seat. Securely connect the seat belt while operating the machine. Only operate the controls while the engine is operating.

Do a check for the correct operation of all the controls and the protective devices.

As a warning operate the horn two times to tell others in the area to prevent personal injury because of machine movement.

During operation of the machine, record damage and make necessary repairs.

A rollover of the machine can occur when doing work on hills, banks, or slopes. A rollover of the machine can also occur when operating across ditches, ridges, or other unanticipated blockages.

Hold the implement approximately 40 cm (16 in) above the ground level while operating the machine. Do not operate the machine near an overhang, near the edge of a cliff, or near edge of an excavation.

If the machine starts to sideslip on a grade, immediately decrease the load and turn machine downhill.

Be careful to prevent ground conditions which will cause the machine to rollover.

Keep the machine in control. Do not overload the machine more than the capacity.

Make sure the towing devices are sufficient for the work.

Make sure the components on the 3-point linkage are sufficient for the work.

Connect the trailing equipment only to a drawbar or hitch.

Do not straddle a wire cable.

When maneuvering to connect equipment, make sure no personnel are between machine and trailing equipment. Hold up the hitch of trailing equipment to align equipment with drawbar.

Know the maximum dimensions of the machine.

When operating on icy or muddy roads, decrease the travel speed to prevent the loss of control of machine.

After operating in muddy conditions, let sufficient time for tracks to reject unwanted material and moisture before making high speed maneuvers. Belts that are wet and belts that are muddy can impede machine's steering.

Decrease travel speed if the stability of the machine is noticeably reduced.

Slow the machine to a speed that controls the machine when declining a hill.

Use the service brakes if necessary, to control machine speed. Do not coast down a hill with transmission in neutral.

Do not steer machine when crossing ditches. Ditches that are wide and/or ditches that are deep can let the guide blocks sag below midwheels. This can cause the belt to come off.

Do not let passengers anywhere on the machine but on an approved passenger seat. Instructors must have the instructor seatbelt securely connected during all operation.

1.1.17 Parking

Make sure to park the machine on a solid, level surface. Move the drive lever to the neutral position. Wait a time for the park brake to automatically engage or press the park brake switch on the multifunction armrest. Lower all implements to the ground. Move the throttle control lever to low idle and wait a time to let the turbocharger cool. Stop the engine and take the key with you.

1.1.18 Operator station

Do not drill holes or weld on the cab rollover protective structure. (ROPS)

Any modifications to the inner operator station must not extend into the operator space.

Any item brought into the cab must not extend into defined operator space. Secure loose items. Objects must not pose an impact hazard in rough terrain or if there is a rollover.

1.1.19 Cut and crush prevention

Support the equipment correctly when performing work below the equipment. Do not rely on the hydraulic cylinders to hold up the equipment. An implement can fall if a control lever is moved or if a hydraulic line breaks.

Never start the machine engine by shorting across the starter solenoid terminals. Machine movement can occur causing runovers .

Never make adjustments while the machine is moving or while the engine is operating.

Whenever there are attachment control linkages, the clearance in the linkage area will change with movement of the attachment.

Stay clear of all rotating parts and all moving parts.

Keep objects away from moving fan blades. The fan blades will throw objects and the fan blades can cut.

Do not use a wire tow cable that is kinked or frayed. Wear gloves when touching wire cable.

When hitting a retainer pin, the retainer pin can fly out causing personal injury. Make sure that there are no people in the area when hitting a retainer pin. To prevent eye injury, wear protective glasses when hitting a retainer pin.

Chips or other debris can fly off objects when hitting the objects. Make sure that others are clear of the area before hitting any object.

1.1.20 Rollover protective structure

Do not make any modifications to the rollover protective structure (ROPS) as this will change protection provided. Do not change structure by welding, cutting, adding weight, or drilling holes into structure.

Any change not specifically authorized by AGCO invalidates AGCO certification for ROPS. The protection offered by ROPS will be impaired if ROPS has structural damage or alteration. Damage to structure can be caused by a turn over or by falling objects.

Do not mount items (fire extinguishers, first aid kits, work lights, etc.) by welding brackets or drilling holes in ROPS. See dealer for mounting guide lines.

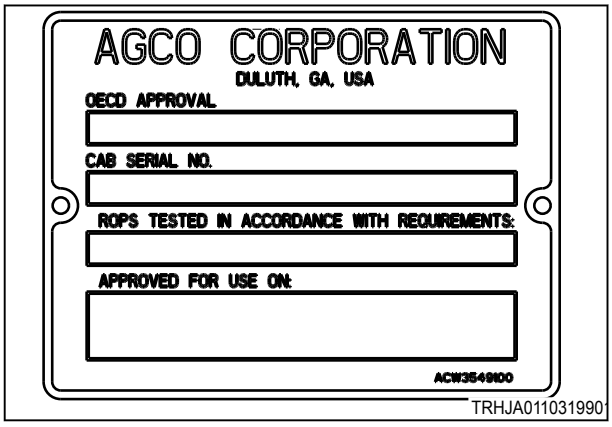

Fig. 7

1.1.21 Burn prevention

Do not touch any part of an operating engine. Other components such as the transmission, the axles and the oil reservoir can also be hot. Let the engine cool before performing any maintenance on the engine. Release all pressure in air, oil, lubrication, fuel and cooling systems before disconnecting any line fittings or related items.

Fig. 8

1.1.22 Coolant

When the engine is at operating temperature, the engine coolant is hot. The coolant is also under pressure. The radiator and all the lines to the heater or engine contain hot coolant.

Any contact with hot coolant or with the steam can cause severe burns. Allow the cooling system components to cool before the cooling system is drained.

Check the coolant level only after the engine has been stopped.

Make sure the filler cap is cool before removing. The filler cap must be cool enough to touch with a bare hand. Remove the filler cap slowly to relieve the pressure.

The cooling system conditioner contains alkali. Alkali can cause personal injury.

Do not allow alkali to contact skin, eyes or mouth.

Fig. 9

1.1.23 Oils

Pressurized hot oil and hot components can cause personal injury. Do not allow hot oil to contact skin. Do not allow hot components to contact skin.

Remove the hydraulic tank filler cap only after the engine has been stopped.

The filler cap must be cool enough to touch with a bare hand. Follow the standard procedure in this manual to remove the hydraulic tank and transmission filler caps.

1.1.24 High pressure lines

Do not bend or strike the high pressure lines. Do not install any lines that are bent or damaged.

Repair any loose or damaged lines. Leaks can cause fires. Consult your dealer for repair or for replacement parts.

DANGER:
Diesel fuel or hydraulic fluid under pressure can penetrate the skin or eyes. This can cause serious personal injury, blindness, or death.

1.1.25 Fluid penetration

Always use a board or cardboard when checking for a leak. Leaking fluid under pressure can penetrate the body tissue. Fluid penetration can cause serious injury and possible death. A pin hole leak can cause severe injury. If fluid is injected into the skin, get treatment immediately. Get treatment from a doctor familiar with this type of injury.

Check the lines, the tubes and the hoses carefully. Do not use your bare hand instead, use a board or cardboard to check for leaks. Tighten all connections to the recommended torque.

Replace the hose if any of the following conditions are present:

- End fittings are damaged or leaking.
- Outer coverings are rubbed or cut.
- Wires are showing.
- Outer coverings are ballooning.
- The flexible part of the hose has a kink.
- Outer coverings have embedded armoring.
- The end fittings are displaced.

IMPORTANT: *Take care to contain fluids during the performance of the inspection, the maintenance, the testing, the adjusting, and the repair of the machine. Have a suitable container large enough ready to collect the fluid before opening any compartment or disassembling any component containing fluids. See the local regulations and mandates when discarding fluids.*

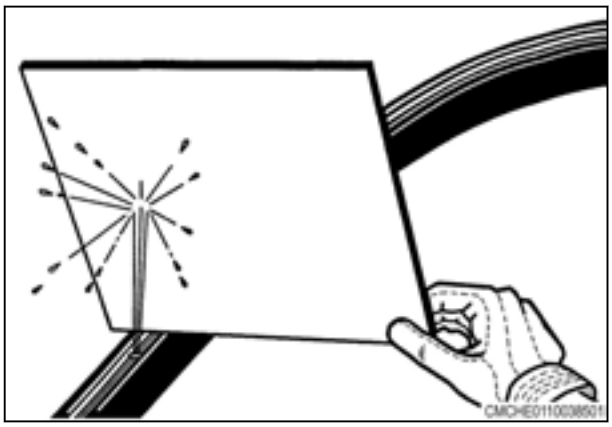

Fig. 10

1.1.26 Batteries

A lead acid battery generates flammable and explosive gases. Keep sparks and flames away from the battery.

WARNING: Sulfuric acid in battery electrolyte is poisonous.

The acid is strong enough to burn skin, eat holes in clothing and cause blindness if got into eyes.

If acid contacts skin or clothing, flush with water immediately. If acid contacts eyes get immediate medical aid.

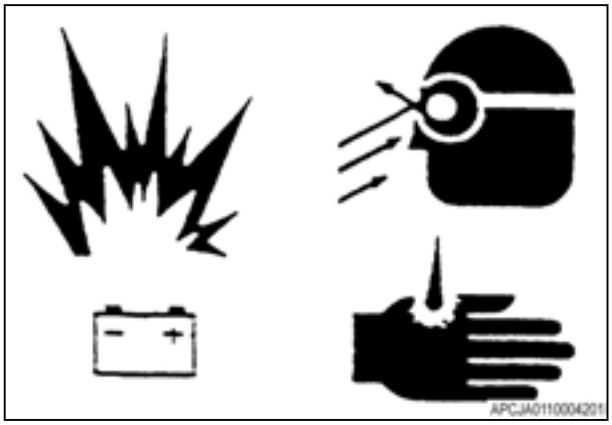

Fig. 11

Wash hands after touching batteries and connectors.

WARNING: Batteries contain electrolyte which is an acid that can cause personal injury.

Do not let the electrolyte contact the skin or eyes.

Always wear protective glasses for servicing batteries.

Fig. 12

Never check battery charge by placing a metal object across the terminal posts. Use a voltmeter or a hydrometer.

WARNING: Gases from a battery can explode.

Incorrect jumper cable connections can cause an explosion causing an injury.

Keep open flames or sparks away from the top of the battery. Do not smoke in the battery charging areas. To prevent an explosion, never charge a frozen battery.

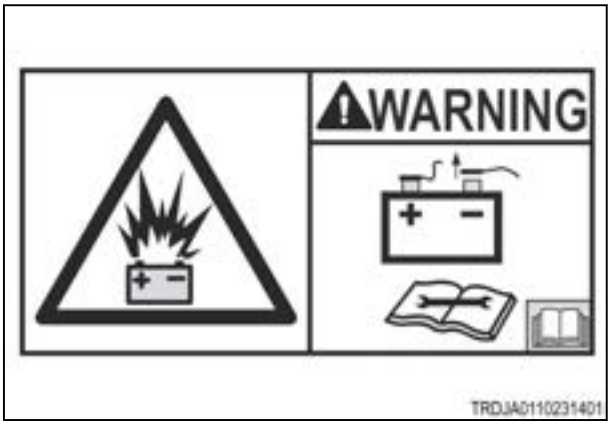

Fig. 13

1.1.27 Exhaust fumes

Always work in a correct ventilated area.

Engine exhaust fumes can cause sickness or death. If necessary to run engine in a closed area, use correct equipment to safely remove exhaust fumes from area.

Always open the doors and get outside air into area.

Fig. 14

1.1.28 Noise prevention

Wear proper hearing protective devices such as earmuffs or earplugs to prevent loss of hearing due to high noise levels.

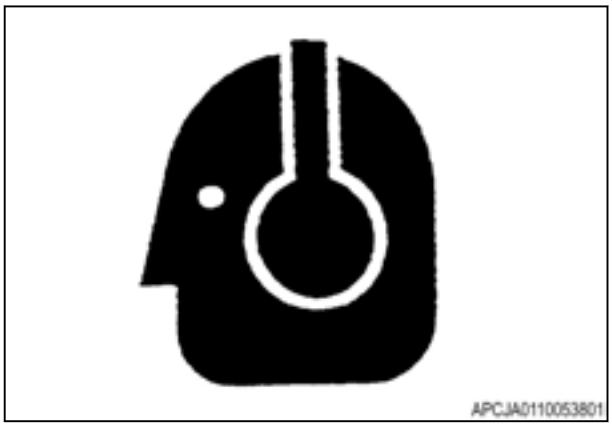

Fig. 15

1.1.29 Fire and explosion prevention

Use caution when refueling a machine. Do not smoke while refueling and do not refuel near open flames or sparks. Always stop engine before refueling. Fill fuel tank outdoors.

All fuels, most lubricants, and some coolant mixtures are flammable.

Flammable fluids leaking or spilled onto hot surfaces or electrical components can cause a fire.

Fire may cause personal injury and property damage.

Remove all flammable materials such as fuel, oil, and debris from machine.

Do not let any flammable materials to accumulate on machine.

Store fuels and lubricants in correctly identified containers away from not approved persons. Store rags with oil and any flammable materials in protective containers.

Do not smoke in areas used for storing flammable materials.

Do not operate machine near any flame.

Do not weld on lines or tanks that contain flammable fluids. Do not flame cut lines or tanks containing flammable fluid. Clean any such lines or tanks fully with a nonflammable solvent before welding or flame cutting.

Check all electrical wires daily. Repair any wires loose or frayed before operating machine. Clean and tighten all electrical connections.

Dust generated from repairing nonmetallic hoods or nonmetallic fenders can be flammable and/or

Fig. 16

explosive. Repair such components in a well ventilated area away from open flames or sparks.

Inspect all lines and hoses for wear or for deterioration and replace if necessary.

Route hoses correctly. Lines and hoses must have sufficient support and secure clamps. Tighten all connections to recommended torque.

1.1.30 Fire extinguisher

An optional (1) bracket can be installed on the right front frame rail. The bracket is holds a 4.5 kg fire extinguisher. Make sure that all clamps, guards, and heat shields are installed correctly. Correct installation prevents vibration, abrasions and too much heat during the machine operation.

Do not weld the bracket onto the cab ROPS frame to install the fire extinguisher. Do not drill holes in the cab ROPS frame to attach the fire extinguisher.

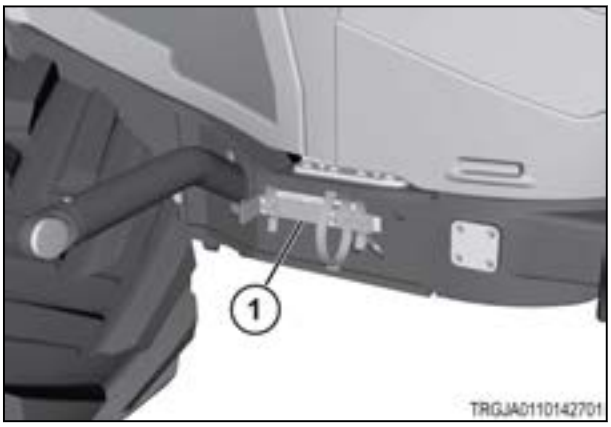

Fig. 17

Make sure that a fire extinguisher (1) is available and know the operation. Examine and service the fire extinguisher regularly. Obey the recommendations on the instruction plate.

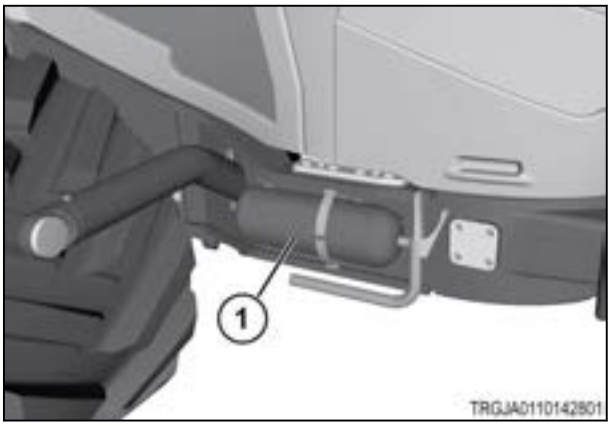

Fig. 18

1.1.31 Public road transportation

Always walk around and visually examine the machine before moving on a public road. As a warning to others in the area, honk the horn two times before starting engine. Do a check for damage and/or defective components that can make a dangerous condition. Make sure all machine systems operate correctly including (but not limited to):

- front road lamps
- tail and brake lamps
- amber hazard lights
- parking brake
- horn
- windshield wiper and washer
- rear view mirrors
- etc.

Repair or replace a component not in correct operating order.

Do not drive at a speed causing machine to lose control.

Obey all traffic rules. Operate the machine with hazard lights on, unless prevented by law. The operation of work lamps while driving on public roads is prohibited. Use of road lamps while moving on public roads is the operator's responsibility.

NOTE:
When the Speed Indication Symbol (SIS) is installed in the rear window, be sure to close the rear window when transporting the machine on the road.

1.2 Machine identification information

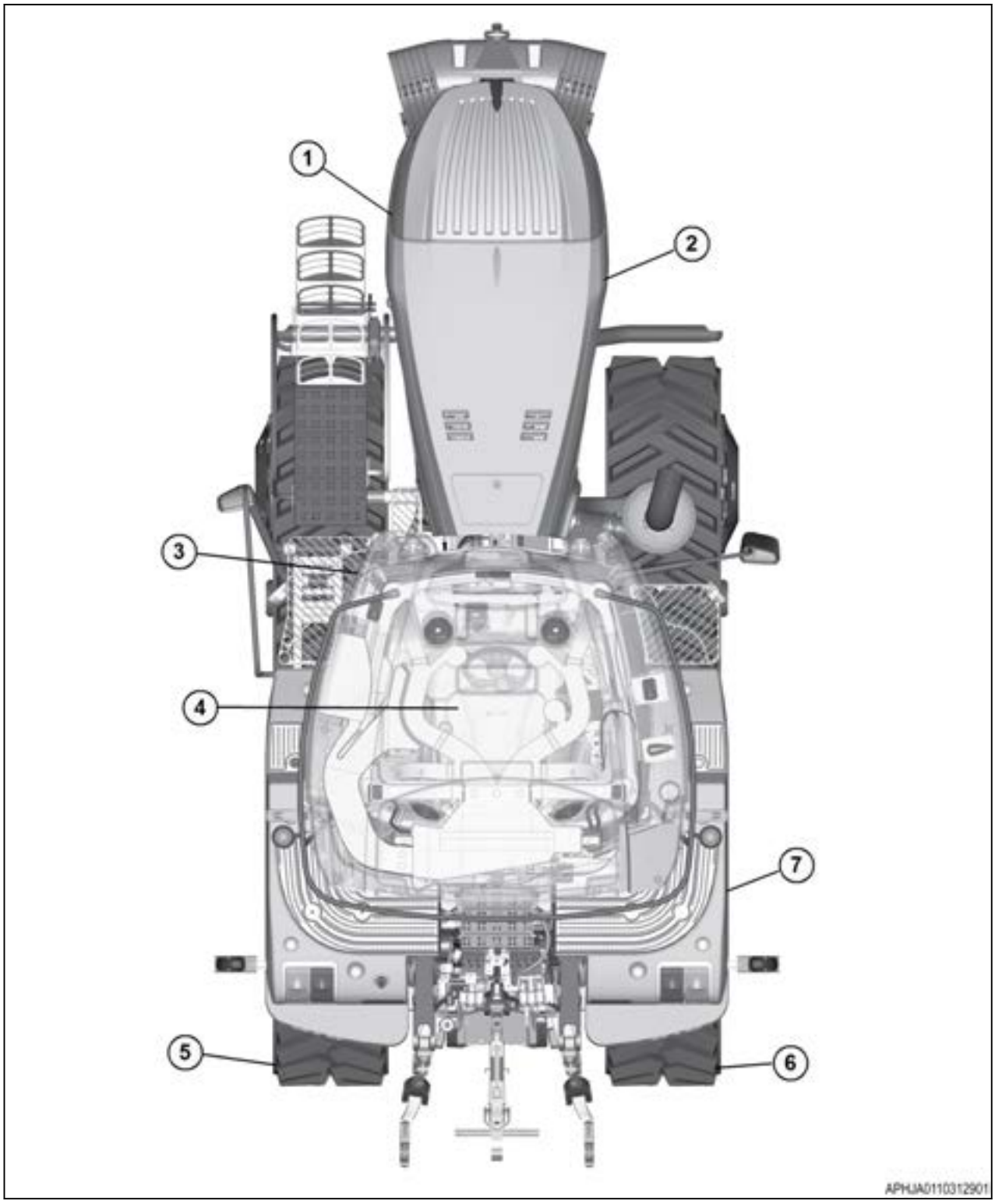

Fig. 19

Call out	Description	Serial Number
1	Emissions control information / Engine serial number	
2	Machine PIN plate	
3	Cab serial number (on front frame cross member)	
4	Operator seat serial number (on operator seat)	
5	Left track belt number	
6	Right track belt number	
7	Differential serial number	

1.2.1 Serial number definition

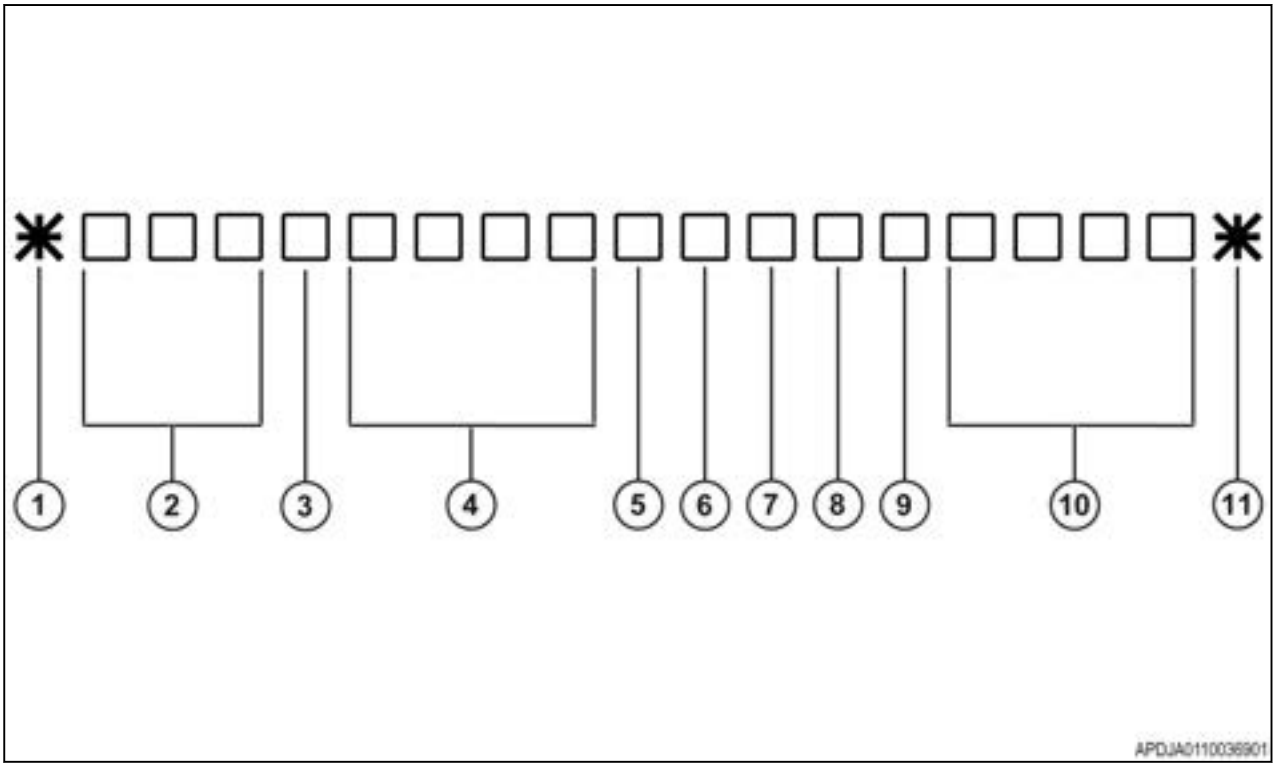

Fig. 20

Definition of the serial number.

1 Beginning Symbol
2 World Manufacturer Code
3 Brand Code
4 Model
5 Check Letter
6 Model Year Code
7 Location Built Code
8 Compliance Region
9 Option Code
10 Machine Sequence Number - sequence number will start over at the beginning of each model year. The first machine of each model year will start with sequence 1001.
11 Ending Symbol

NOTE: *For serial number breaks in this manual, only the information from the model year code and following will be given.*

1.3 Proper disposal of waste

Improper disposal of waste can pollute the environment and ecology. A few examples of potentially harmful equipment waste can include, but not limited to, items such as oil, fuel, coolant, brake fluid, filters, battery chemicals, tires, etc.

Use leak proof containers when draining fluids. Do not use food or beverage containers to collect waste fluids, as food or beverage container(s) may mislead someone into drinking from them.

Do not pour or spill waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire with local environmental or recycling center on the proper way to recycle or dispose waste.

1.4 Lubricant viscosities and refill capacities

1.4.1 Lubricant viscosities for ambient temperatures

Proper oil viscosity grade is determined by the minimum outside temperature while the machine is started and while operated.

To determine the proper oil viscosity grade, refer to the minimum column in the following table.

This information reflects the coldest ambient temperature condition for starting and for operating a cold machine.

Refer to the maximum column in the table to select the oil viscosity grade for operating the machine at the highest temperature anticipated.

Use the highest oil viscosity allowed for ambient temperature when starting the machine.

Machines operated continuously, should use oils having higher oil viscosity in final drives and in differentials.

Oils with higher oil viscosity will maintain the highest possible oil film thickness.

Consult a dealer if additional information is needed.

1.4.2 Lubricant viscosities

AGCO Genuine lubricants are the recommended products for this machine. The use of other lubricants may not provide the same level of necessary performance.

Lubricant viscosities						
Compartment or system	Oil type and classification	Oil viscosity	Celcius		Fahrenheit	
			Min	Max	Min	Max
Engine crankcase	AGCO® Multiguard® Engine Oil	SAE 5W-30	-35	30	-31	104
		SAE 5W-40	-35	40+	-31	86
		SAE 10W-30	-25	30	-13	86
		SAE 10W-40	-25	40+	-13	104
		SAE 15W-40	-20	40+	-4	104
		SAE 20W-20	-15	15	5	59
		SAE 20W-40	-15	40+	5	104
		SAE 30	0	30	32	86
Front idler hub Midwheel hub Drive wheel hub	AGCO® Gear Lubricant Full Synthetic	SAE 50	-30	50	-22	122
Hydraulic system Transmission	AGCO® Permatran® 821XL Plus	SAE 15W-40	-20	40	-4	104
Final drive	AGCO® Gear Lubricant	SAE 85W-140	-12	41	10	105
Fan drive	AGCO® Permatran® 821XL	SAE 10W-30	-25	30	-13	86
Implement hydraulics	AGCO® Permatran® 821XL	SAE 10W-30	-25	30	-13	86

1.4.3 Fluids and capacities

IMPORTANT: *The fill capacities given are approximate. Do a check of the fluid levels after filling.*

AGCO Genuine lubricants are the recommended products for this machine. The use of other lubricants may not provide the same level of necessary performance.

Fluids and fill capacities			
Compartment or system			**Approximate fill capacity**
Engine coolant		AGCO® Antifreeze and Coolant (50/50 premix water and ethylene/glycol)	42.2 L
Diesel fuel	Fuel tank - left fender	Meets EN590-2009 or ASTM D975 Grade No. 1-D S15 B5 blend	251.8 L
	Fuel tank - right fender		248.9 L
	Fuel tank - main		179.5 L
	Mid capacity		131.0 L
	High capacity		290.2 L
Engine crankcase and filter		AGCO® Multiguard® SAE 10W-40	34.8 L
DEF (Diesel exhaust fluid) tank			71.0 L
Windscreen washer reservoir			4.0 L
Refrigerant		R134A	1.3 kg
Final drives hydraulic system (standard, wide)	Final drive - left	AGCO® Gear Lubricant SAE 85W-140	18.0 L
	Final drive - right		18.0 L
Front idler hub		AGCO® Permatran® 821XL SAE 50 synthetic	590 mL each
Midwheel hub		AGCO® Permatran® 821XL SAE 50 synthetic	160 mL each
Drive wheel hub		AGCO® Permatran® 821XL SAE 50 synthetic	1.4 L
Grease fittings		AGCO® Grease Hi Temperature Moly-Lithium Base	As necessary
Implement hydraulic system		AGCO® Permatran® 821XL	150 L
Transmission / differential		AGCO® Permatran® 821XL Plus SAE 15W-40	110.0 L
Fan drive system		AGCO® Permatran® 821XL SAE 10W-30	18.3 L

1.5 Service intervals

IMPORTANT: *Always stop the engine before starting service work*
Things to examine during the service interval checks:

- *Cab recirculation filter - clean/inspect/replace*
- *Cab air filter - clean/replace*
- *Check the HVAC drain lines and clean as needed*
- *Batteries - replace*
- *Alternator belt - replace*
- *Air conditioner belt - replace*
- *Cooling cores - clean*
- *Drawbar wearplates and swing stops - replace*
- *Drive wheel hub oil level - check*
- *Primary engine air cleaner filter - inspect/replace*
- *Fuel tank water and sediment - drain*
- *Fuses, circuit breakers, and relays - replace/reset*
- *Idler hubs oil level - check*
- *Midwheel hub oil level - check*
- *Undercarriage belt - remove/replace*
- *Undercarriage belt alignment - check/adjust*
- *Fuel system water separator - drain*
- *Window washer reservoir - fill*
- *Window wipers - inspect/replace*
- *Windows - clean*

1.5.1 Maintenance schedule

Initial checks: Make sure that all hose clamps on the engine are tight at 10 hours and again at 50 hours. If it is necessary, tighten and torque the hose clamps . Do the checks again when a hose is replaced.

Every 10 hours or daily	Every 50 hours	Every 250 hours	Every 500 hours	Every 1000 hours	Other	Service Item
x						*Fill the fuel system*
x						*Check the power train oil level*
x						*Check the hydraulic system oil level*
x						*Check the final drives oil level*
x						*Check / drain the fuel water separator*
x						*Check the undercarriage system*
x						*Examine the engine air filter restriction indicator*
x						*Check the reversing fan drive tank oil level*
x						*Drain water from the air tank (if equipped)*

Every 10 hours or daily	Every 50 hours	Every 250 hours	Every 500 hours	Every 1000 hours	Other	Service Item
	x[1]			x[2]	Every 1000 hours [3]	*Replace the power train oil pressure filter*
		x				*Lubricate the 3-point linkage*
		x				*Examine the batteries*
		x				*Get a sample of the power train system oil for analysis*
			x			*Replace the drive wheel hub oil*
			x[4]		Every 2000 hours	*Replace the rear axle final drive oil*
			x [5]			*Clean / replace the fuel cap filter*
				x		*Clean / replace the fuel cap*
				x		*Replace the primary engine air filter*
					Every third primary filter replacement	*Replace the safety (secondary) engine air filter*
				x[6]		*Replace the idler and midwheel hub oil*
				x		*Examine the ROPS*
				x		*Examine the seat belt*
1200 hours or annually, that which occurs first.						*Replace the DEF pump - main filter*
1200 hours or annually, that which occurs first.						*Replace the DEF tank breather*
2000 hours						*Replace the power train system oil and suction filters*
2000 hours						*Replace the auxiliary hydraulic system oil, filters, and breather*
2000 hours						*Replace the reversing fan drive hydraulic oil, filter and tank breather*
2000 hours						*Replace the implement case drain filter (if equipped)*
2000 hours						*Replace air dryer cartridge (if equipped)*
Every 2 years or at 3000 hours						*Replace the refrigerant accumulator*

[1] Initial occurrence, then at given intervals
[2] or as indicated by a multiple display signal

[3] or once a year, that which occurs first. Regular service interval.
[4] Initial occurrence, then at given intervals
[5] Earlier in dusty conditions
[6] If operated in wet/muddy or extremely dusty conditions, replace every 500 hours

1.6 Engine service information

1.6.1 Maintenance chart

Maintenance chart for tractors and forest machines with 84 - 98 engines.

Maintenance work	Service interval / running hours				
	10	100	400	800	4500
Check engine oil level	x[1]				
Check coolant level	x[1]				
Check for oil, fuel or coolant leakages	x[1]				
Clean cooling system (from outside)		x			
Check the condition of the belt		x			
Change engine oil and oil filter			x[2]		
Change fuel filters				x[3]	
Do a check for a possible engine software update[4]			x		
Adjust valves[5, 6]	See Valve adjustment intervals table.				
Turbocharger and intercooler inspection in a repair workshop					x
Change the SCR supply module main filter	Once a year. [7, 8]				
Change the SCR supply module inlet filter	Once a year. [7] [8]				
Change coolant	Every two years.				
Change the vibration damper (98 engines)	Every five years. [9]				

[1] or once a day.
[2] or once a year (in the autumn).
[3] or once a year (at the end of the season) or earlier if the engine control system notifies by specific service code.
[4] Always do an engine software update, if there is an update available.
[5] The 98 engines have hydraulic lash adjusters from the engine serial number B52904. Do not adjust the valves.
[6] In the spring 2016, AGCO Power started to install hydraulic lash adjusters gradually to different 84 AWF engines. See for information, how to recognize an engine with hydraulic lash adjusters. Do not adjust the valves of an engine, which has hydraulic lash adjusters!
[7] or after 1200 running hours.
[8] In North America: Every two years or after 1600 running hours.
[9] or after 8000 running hours.

Valve adjustment intervals[1, 2]				
1st	2nd	3rd	4th	5th
400	2000	4000	6000	8000

[1] The 98 engines have hydraulic lash adjusters from the engine serial number B52904. Do not adjust the valves.
[2] In the spring 2016, AGCO Power started to install hydraulic lash adjusters gradually to different 84 AWF engines. See for information, how to recognize an engine with hydraulic lash adjusters. Do not adjust the valves of an engine, which has hydraulic lash adjusters!

1.6.2 Maintenance to be made daily or at 10 hours intervals

1.6.2.1 Do a check for the engine oil level

Procedure

1. Stop the engine.

2. Wait for approximately 15 minutes.

3. Do a check for the oil level.

The oil level must be between the MAX and MIN lines on the oil dipstick.

4. Add oil, if necessary.

a) Clean the oil filler plug and the surroundings.

b) Top up to the MAX line.

NOTE: *Overfill causes excessive oil splash in the crankcase, which results in increased oil consumption and malfunction in crankcase ventilation system (CCV). Major engine damage can occur.*

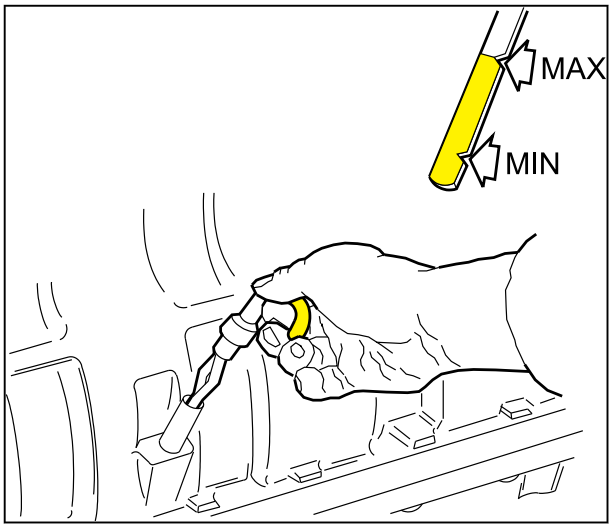

Fig. 21

1.6.2.2 Check coolant level

The coolant level should be slightly above the radiator core.

The coolant level should be between the MAX and MIN lines if the system is provided with an expansion tank.

Check the freezing point of the coolant before the cold season.

NOTE:
Use only coolant that is a mixture of 40-60% water and antifreeze. Refer to the engine specification for the machine, for the specified ratio and the quantities necessary. Do not use water only for the coolant.

NOTE: *The hot engine can be damaged if you pour cold coolant into it!*

WARNING: Hot pressurized coolant. It is dangerous to open the cap of the pressurized hot radiator.

Injury from the release of hot pressurized coolant.

Carefully open the radiator cap slowly.

1.6.2.3 Check for leakages

Find any leakage points (fuel, oil, coolant) and eliminate them as soon as possible.

The coolant pump is provided with a telltale hole on the left side. This hole must not be blocked. If coolant drops out of the hole, the coolant pump must immediately be repaired.

There may be a slight leakage on a new pump before it has been run in.

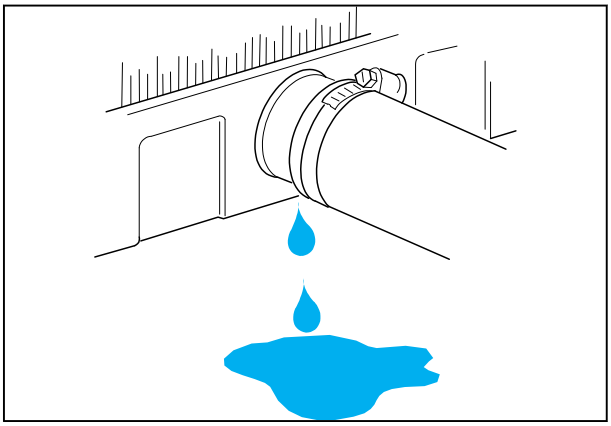

Fig. 22

1.6.3 Maintenance to be made weekly or at 100 hours interval

1.6.3.1 Clean cooling system (from outside)

See also the instructions of the machine manufacturer.

Procedure

1. Check and clean the outside of the radiator from time to time.
2. Use compressed air or water spray to remove dirt and impurities.
   - Avoid too high a pressure.
   - The direction of the air or water spray must be against normal air flow.

1.6.3.2 Examine the condition of the belts

The engine has a spring loaded belt tensioner and the belt is of V-ribbed type. The tensioner tightens the belt automatically during the operation.

See also the instructions of the machine manufacturer.

DANGER: The engine has parts that move.

Injury to persons.

Make sure that the engine cannot start during a belt replacement. Before you start, disconnect the battery.

Procedure

1. Examine the belts visually. Change a worn, oily, or damaged belt.
2. Replace a belt if necessary.
3. Before you remove a belt, examine the routing to make sure the new belt routing is the same.
4. Use a 1/2 inch breaker bar and put into the square hole of the belt tensioner.
5. Turn the breaker bar counterclockwise to loosen the belt or other accessories.
6. Be careful of the free rotation of the belt tensioner roller and the toque of the fixing screw 55 Nm.
7. Install the new belt and other loosened parts.

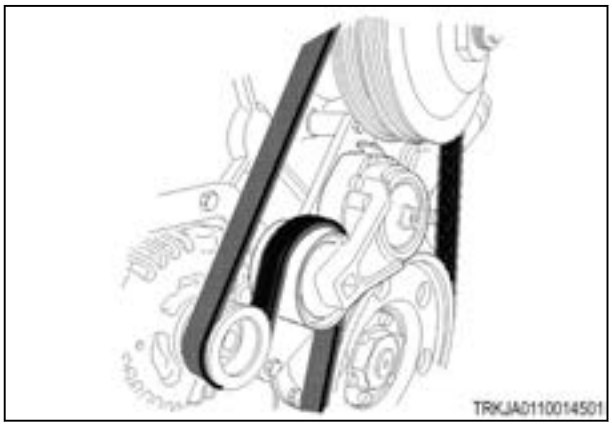

Fig. 23

1.6.4 Maintenance to be made at 400 - 800 hours intervals

1.6.4.1 Change engine oil

See the instructions of the machine manufacturer.

Regarding oil grade, see **Lubricating oil quality requirements**.

Procedure

1. Run the engine until it is warm.
2. Stop the engine.
3. Remove the draining plug and drain the oil into a suitable container.

   The engine may be equipped with an oil draining pump (e.g. marine engines), in that case use the pump to drain the oil.
4. When the oil sump is empty, refit the plug with a new washer.
5. Clean the oil filler plug and the surroundings.
6. Fill new oil to the prescribed level (upper mark line on dipstick) through the filler hole. Note the capacity of the oil filter.
7. Take used oil to a proper disposal point.

Related Links

Lubricating oil quality requirements page 1-44

1.6.4.2 Change oil filter

NOTE:
Make sure that you obey all the requirements of the engine warranty. You must obey the maintenance schedule recommended by the manufacturer. Use only the filters that have approval by the manufacturer or those of equivalent quality.

Procedure

1. Before removing the oil filter clean the surroundings of it.
2. Use the loop tool to remove the used oil filter.

3. Lubricate slightly the rubber gasket of the new oil filter with clean motor oil and clean the sealing faces.

4. Rotate the new oil filter carefully until the gasket touches the opposite surface.

5. Tighten the oil filter ¾ rounds (or one (1) full round, if the height of the oil filter used is 260 mm). Use an appropriate tool for tightening if necessary.

6. Wipe off any oil run onto the chassis.

7. Do a check for the quantity of oil in the engine.

8. If it is necessary, add oil.

9. Start the engine. Do not race.

10. Make sure that no oil is leaking from the oil filter.

11. Take the used oil filter to a proper disposal point.

1.6.4.3 Update the engine software

Engine software updates bring new features to the engine controller that improve the performance of the engine, update diagnostic features and help to protect the engine and its emission components over the engine lifetime.

Procedure

1. Use the EDT and examine, if new software is available for the machine.

2. Update the engine software, if possible.

1.6.4.4 How to recognize an engine with hydraulic lash adjusters

IMPORTANT: *Do not adjust the valves of an engine, which has hydraulic lash adjusters!*

An engine with hydraulic lash adjusters has a cylinder block, which has drillings for oil ways for each hydraulic lash adjuster. If the cylinder block has oil ways, there are screw plugs on the oil ways in the cylinder block.

The screw plugs are in the same locations, where the hydraulic lash adjusters or valve tappets are. For example, one location is above the engine plate.

(1) Screw plug

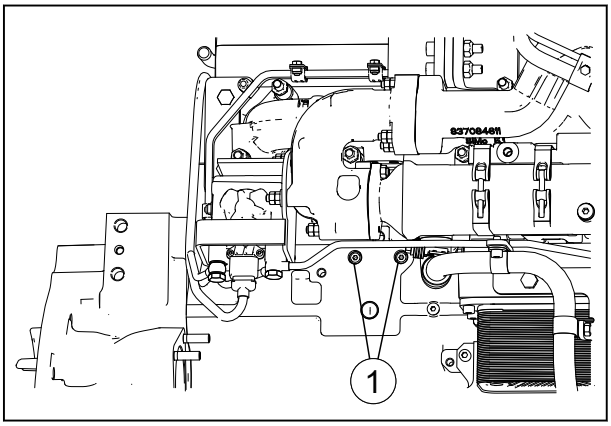

Fig. 24

NOTE: *The same cylinder block is used in some engines, which do not have the hydraulic lash adjusters.*

Procedure

1. Examine the cylinder block for screw plugs on oil ways.

Result

If the cylinder block has no screw plugs, the engine does not have hydraulic lash adjusters.

2. If the cylinder block has screw plugs, examine the screw head of the screw plug.

Result

If the screw head of the screw plug has two levels, the engine does not have hydraulic lash adjusters.

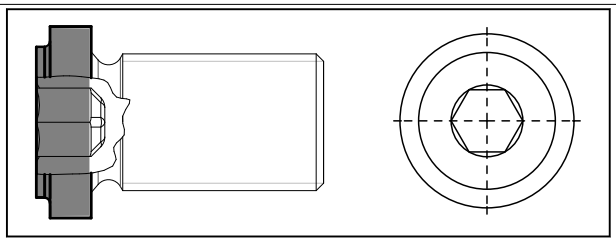

Fig. 25 The screw head has two levels.

If the screw head of the screw plug is flat, the engine has hydraulic lash adjusters.

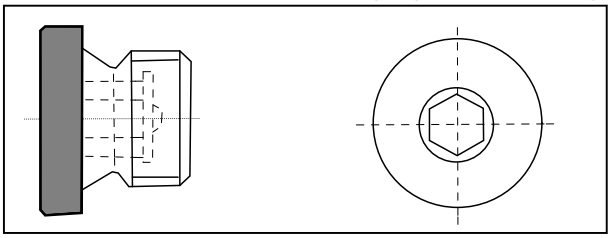

Fig. 26 The screw head is flat.

1.6.5 Change fuel filters

Absolute cleanliness is required when servicing fuel system.

NOTE:
Pre-filter and main-filter elements are delivered as a filter set. Single filter elements are not available as replacement parts. Set includes pre-filter water detector gasket. During year 2019 a disposable fuel filter wrench is included in the fuel filter set.

NOTE:
Refer to the local regulations, for the discard of used components, used liquids (includes used oils) and used materials.

NOTE:
Make sure that you obey all the requirements of the engine warranty. You must obey the maintenance schedule recommended by the manufacturer. Use only the filters that have approval by the manufacturer or those of equivalent quality.

CAUTION: Diesel fuel.

Diesel fuel can cause irritation if you touch or breathe it.

Use protective gloves, when you do work with fuel equipment.

CAUTION: Contamination.

Dirt and contamination can cause system malfunction.

Clean the maintenance components and adjacent area carefully, before the maintenance work starts.

Procedure

1. Clean the fuel filters and surrounding area.
2. Disconnect the pre-filter water detector connector.
3. Use the fuel filter wrench V837079717 to open the pre-filter element and remove the pre-filter element from its mounting bracket.
4. Collect the fuel into a suitable container.
5. Detach the water detector from the pre-filter bottom end.
6. Remove the main filter in a similar way.
7. Attach the water detector to the new pre-filter bottom end.

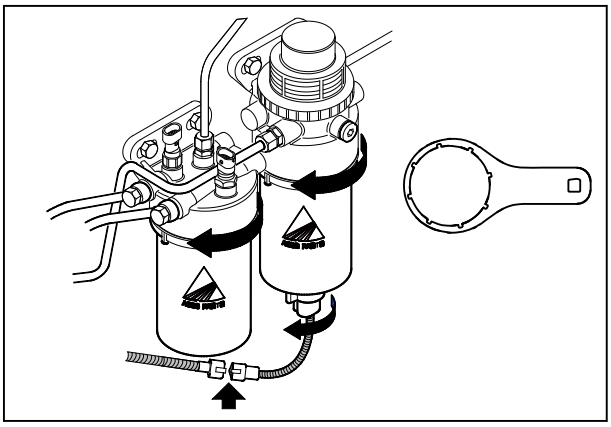

Fig. 27

8. Lubricate the filter element o-ring seal with clean fuel.
9. Fill the outer shell of the filter element with clean fuel.
10. Use the fuel filter wrench V837079717 and turn the filter element to its mounting bracket until the plastic flange contacts the bracket.
11. Connect the water detector connector.
12. Install the main filter in a similar way.
13. Bleed the fuel system.

    See information for bleeding the fuel system.
14. Start the engine and make sure that there are no leaks.

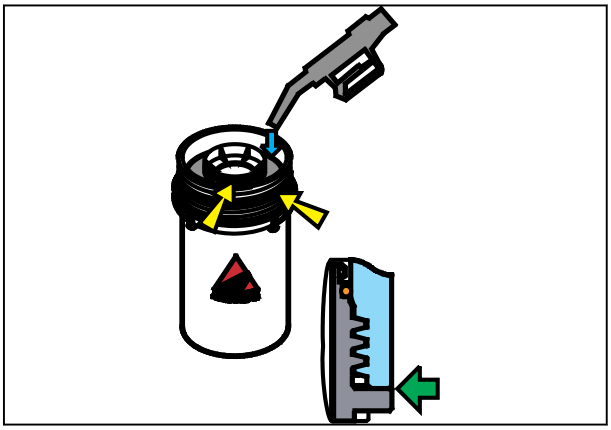

Fig. 28

1.6.6 Bleed the fuel system

WARNING: High pressure fuel during and after engine operation.

If a high pressure jet of fuel gets through your skin it can cause injury, get medical aid immediately.

Do not do work on the high pressure side of the fuel system when the engine is in operation. Do not start work for more than 30 seconds after you stop the engine. Loosen the high pressure components slowly, this decreases the pressure in the high pressure side of the fuel system.

CAUTION: Diesel fuel.

Diesel fuel can cause irritation if you touch or breathe it.

Use protective gloves, when you do work with fuel equipment.

CAUTION: Contamination.

Dirt and contamination can cause system malfunction.

Clean the maintenance components and adjacent area carefully, before the maintenance work starts.

NOTE: *Use eye protection, safety clothing and safety gloves during the work.*

Procedure

1. Open the bleeding plug on the pre-filter bracket.
2. Put a transparent hose in the plug hole and lead it into a suitable container.
3. Pump fuel with the hand pump on top of the pre-filter.
4. Pump with the hand pump until there are no air bubbles in the fuel stream.
5. Remove the hose and turn in the bleeding plug.
6. Clean the engine of eventual overspill fuel.

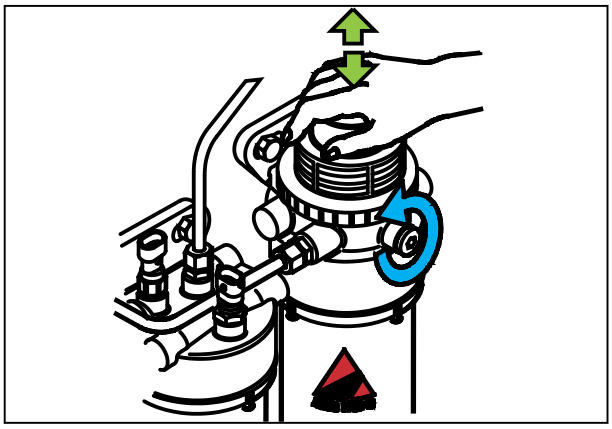

Fig. 29

7. Start the engine. The fuel system removes automatically the air left in the system.

   NOTE: *Do not use the hand pump when the engine is running. Do not use any tools or excessive force on the pre-filter hand pump.*

   NOTE: *The fuel system is equipped with a pressure sensor that alarms before interference has developed. Reasons can be for instance:*

   - *Empty fuel tank.*
   - *Clogged fuel filters.*
   - *Suction piping clogged or leaking air.*
   - *Unsuitable fuel (e.g. summer fuel in the winter).*

   NOTE: *Use of spirits as antifreeze is not useful or recommended at all. It makes the fuel solidify and weakens the lubricating qualities of the fuel and increases the possibility of corrosion.*

1.6.7 Maintenance to be made at 4000 hours intervals

1.6.7.1 Check turbocharger play and check that the intercooler cell is clean

The turbocharger and the intercooler cell service must be entrusted to an expert technician at AGCO Power Service.

It is essential to carry out regular engine services to keep the turbocharger in good condition. Special attention must be paid to the cleanliness of the air filter cartridge and to the engine oil and oil filter change at recommended intervals. Check regularly that the turbocharger is properly fitted to the exhaust manifold as well as the tightness of the inlet and exhaust manifold joints. Correct adjustment of the injection equipment is essential for the operation of the turbocharger.

When a new turbocharger is installed, pour about 0,1 ltr of pure engine oil into the bearing housing before attaching the pressure oil pipe. Ensure that no impurities are entering the turbocharger with the oil.

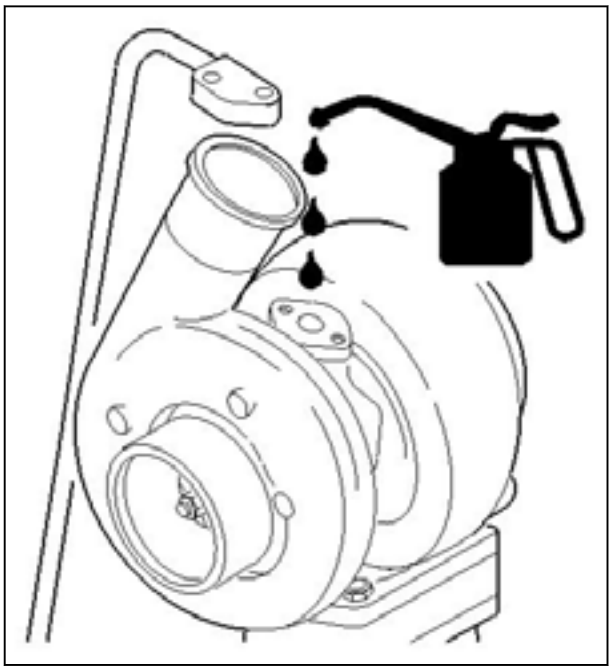

Fig. 30

1.6.8 Maintenance to be made once a year or 1200 hours

1.6.8.1 Selective Catalyst Reduction (SCR) system maintenance

The AGCO POWER Selective Catalyst Reduction (SCR) system makes sure that the engine is in compliance with emission regulations. In usual use only replacement of the main filter is necessary. The AGCO POWER Selective Catalyst Reduction (SCR) system has on-board diagnostics. The on-board diagnostics will tell the operator or limit the use of the machine if a problem occurs in the system (for example leaks or line blockages).

NOTE:
Engines with the aftertreatment system are in compliance with EU97/68/EC Stage IV and EPA 40 CFR 1039 Tier 4 final emission regulations.

When you do maintenance you must use replacement parts that are equivalent in performance and specification to AGCO Parts. The responsibility of AGCO POWER on the correct compliance of the emission specification is removed when:

- You do not use AGCO Parts
- The maintenance is incorrect or not done on time.

CAUTION: Make sure that you use Diesel Exhaust Fluid (DEF) (DIN 70070 or ISO 22241 certified) in the Selective Catalyst Reduction (SCR) system.

The engine is not in compliance with emission regulations.

Do not mix the Diesel Exhaust Fluid (DEF) with other materials, this can cause damage to the Selective Catalyst Reduction (SCR) system.

CAUTION: Decreased engine power because of a fault in the Selective Catalyst Reduction (SCR) system.

When the Diesel Exhaust Fluid (DEF) quality sensor identifies a problem with the Diesel Exhaust Fluid (DEF) quality, it send a CAN signal to the ECU. The ECU decreases the engine power output.

Make sure that Diesel Exhaust Fluid (DEF) (DIN 70070 or ISO 22241 certified) is used in the Selective Catalyst Reduction (SCR) system.

CAUTION: The diesel fuel can cause damage to the gaskets of the Selective Catalyst Reduction (SCR) system.

The engine is not in compliance with emission regulations. The Selective Catalyst Reduction (SCR) system does not operate correctly.

Do not put diesel fuel in Diesel Exhaust Fluid (DEF) tank.

CAUTION: Decreased performance.

Engine is not in compliance with emission regulations.

Make sure that the Diesel Exhaust Fluid (DEF) in storage is at a temperature of less than 30°C, and away from sunlight.

1.6.8.2 Replace the main filter and the inlet filter of the supply module

The main filter is on the supply module below the filter cover. No special tools are necessary for the replacement of the main filter and the inlet filter.

The inlet filter is in the Diesel Exhaust Fluid (DEF) connector. The inlet filter is only available with the Diesel Exhaust Fluid (DEF) connector.

(1) Main filter
(2) Diesel Exhaust Fluid (DEF) connector with inlet filter

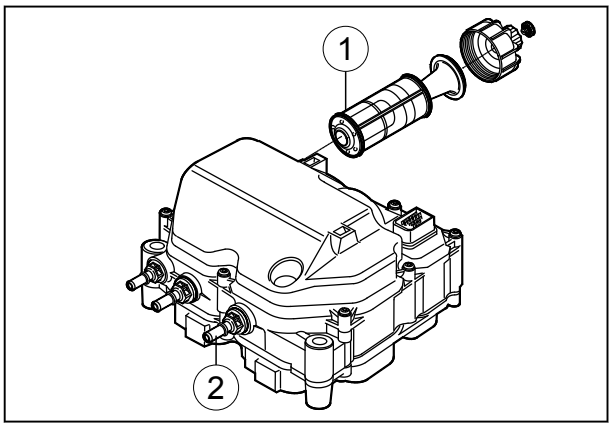

Fig. 31

CAUTION: Contamination of the Selective Catalyst Reduction (SCR) system.

The engine is not in compliance with emission regulations. The Selective Catalyst Reduction (SCR) system does not operate correctly.

Make sure that all seal surfaces are fully clean and that there is no damage when you install the components.

CAUTION: Contamination of the Selective Catalyst Reduction (SCR) system.

It is possible that engine damage or Selective Catalyst Reduction (SCR) system damage is caused by unsatisfactory filtered Diesel Exhaust Fluid (DEF).

Do not install a used or a wet main filter, or a used equalizer.

CAUTION: Teflon layer damage on the seals.

Unsatisfactory operation and leaks can occur.

Do not use mineral or silicone lubricating oils and grease on the filter seals.

Procedure

1. Make sure that the supply module is fully clean.

2. Make sure that there are no cracks in the supply module.
a) If there are cracks in the supply module, replace it.

3. Make sure that there are no cracks in the filter cover of the main filter.
a) If there are cracks in the filter cover, replace it.

4. Turn the filter cover counterclockwise with a 27 mm spanner and remove the filter cover.

5. Pull out the equalizer.

6. Pull out the main filter with an applicable tool.

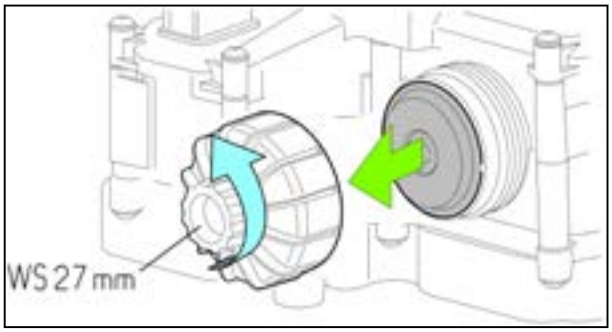

Fig. 32

7. NOTE:
Make sure that the area is fully clean before you install the new main filter.

Install a new main filter and a new equalizer.

8. Install the filter cover and tighten to a torque of 22.5 Nm ± 2.5 Nm with a 27 mm spanner.

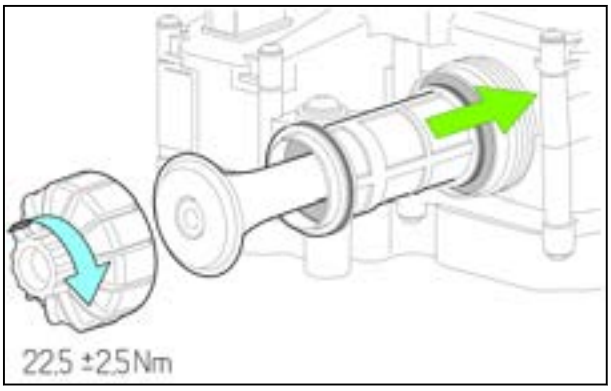

Fig. 33

9. IMPORTANT:
Dirt in the inlet connector can cause a failure of the DENOX2.2-system.

Make sure that the surface around the DEF connector is fully clean.

a) Use a vacuum cleaner to remove all particles around the DEF connector.
b) Examine the parts for solid DEF particles.
c) If necessary, clean the parts carefully with warm and clean water.
d) Dry the parts carefully.

Do not use compressed air!

10. NOTE:
Do not let dirt go into the DEF line or the connector on the supply module.

Remove the DEF line and remove the DEF connector.

11. Install the new DEF connector.

a) Install a new O-ring.
b) Lubricate the O-ring with a glycerin type lubricant.

Do not use oil!

c) Tighten to a torque of 4 Nm - 5 Nm.

12. Dispose of the parts you removed. Refer to your local regulations for correct disposal.

1.6.9 Maintenance to be made every two years

1.6.9.1 Change coolant

(1) Drain plug on radiator
(2) Drain plug on cylinder block
(3) Drain plug on oil cooler
(4) Bleed plug

Change the coolant every two years. This ensures that the anti-corrosive is always active. See information for coolant quality requirements.

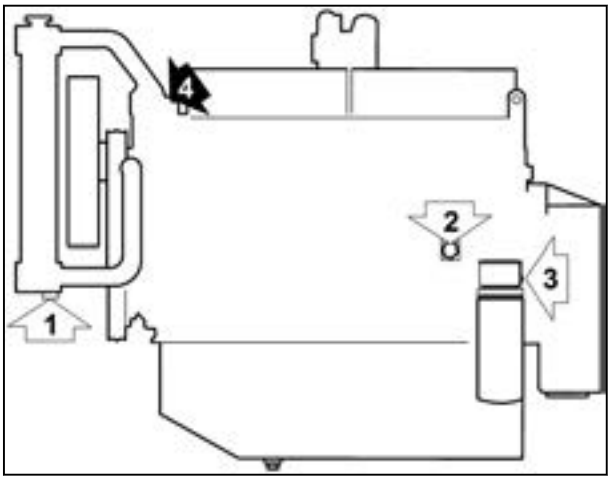

Fig. 34

Procedure

1. Drain the cooling system.
   a) Remove the filler cap.
   b) Remove the draining plugs on the radiator and on the left side of the cylinder block.
   c) Remove the draining plugs on the oil cooler.
   d) The engine assembly may also have other draining plugs (e.g. on the engine heater piping). Remove also these plugs.
   e) Drain the coolant.

   Make sure all coolant is drained out and no impurities are blocking the draining hole.

2. Examine the tightness and condition of the rubber hoses of the cooling system.

3. Replace damaged rubber hoses.

4. Fill cooling system.
   a) Fill the cooling system with a mixture of antifreeze and coolant until the coolant level comes above the radiator core.
   b) Bleed the cooling system by removing the air venting plug/temperature sensor on the thermostat housing.
   c) Pour coolant until the coolant level reaches the plug.
   d) Screw in the plug and fill rest of the system.

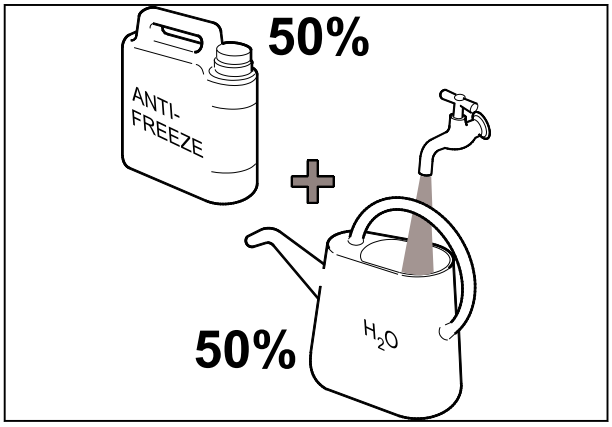

Fig. 35

NOTE:
Use only coolant that is a mixture of 40-60% water and antifreeze. Refer to the engine specification for the machine, for the specified ratio and the quantities necessary. Do not use water only for the coolant.

1.6.10 Additional maintenance instructions

1.6.10.1 Before the cold season

Procedure

1. Drain the fuel tank of water.

2. Replace the fuel filter and pre-filter.

3. Ensure that the fuel in the tank is of winter quality.

4. Change the engine oil (winter quality).

5. Check the battery condition.

6. Check the function of the intake air heater.

7. Check the function of the coolant pre-heater.

1.6.10.2 Tightening torques

Object	Nm
Cylinder head bolts	80 Nm + 90° + 90°
Main bearing screws	200
Connecting rod screws, M12	40 Nm > 80 Nm + 90°
Connecting rod screws, M14	40 Nm > 80 Nm + 90° + 90°
Crankshaft nut	See the work instructions, how to tighten the crankshaft hub nut!
Crankshaft pulley screws, M14	200
Flywheel screws	200
Flywheel housing screws, M12	150
Flywheel housing screws, M10	80
Idler gear screws, M14	180
Idler gear screws, M8	32
Small idler gear screws (shaft, 2 pcs): M8	45
Small idler gear screws (thrust ring): M8	32
Camshaft gear nut	200
Rocker arm shaft bracket screw and nuts	45
Valve cover screws	25
Valve cover frame screws	25
Piston cooling valve	30
Oil pump retaining screws	50
Oil sump drain plug, M18	80
Oil cooler connecting piece	60
Coolant pump pulley screw, M10	50
Coolant pump pulley screw, M12	80
Coolant pump pulley nut, M16	120
Belt tightener screw	48
Exhaust manifold screws	50
Injector retaining screw	See the correct tightening procedure from the work instructions.
Injector wire nuts, M4	1,5
High pressure pump gear nut	80
Pre-filter water detector	6
Compressor gear nut (1 and 2 cylinder)	160 (LH thread)

Self carrying oil sump screws and engine bracket screws	
Thread	**Nm**
M8	35
M10	80
M12	140
M14	200
M16	300
M20	700
M22	700

General torque values

Always use the torque values listed in the following table when specific torque values are not available.

Thread	Strength class		
	8.8	**10.9**	**12.9**
M8	25 Nm	35 Nm	40 Nm
M10	50 Nm	75 Nm	85 Nm
M12	85 Nm	125 Nm	145 Nm
M14	135 Nm	200 Nm	235 Nm
M16	210 Nm	310 Nm	365 Nm

Use a washer with the aluminum parts.

1.6.10.3 Coolant quality requirements

AGCO Power Inc. recommends to use coolants that follow in all AGCO POWER engines:

- Arteco, Havoline XLC
- BASF, Glysantin G30

In addition, coolants under other brand names, which can be proved to use exactly the same inhibitor package as Arteco Havoline XLC or BASF Glysantin G30, are recommended to be used.

If Arteco Havoline XLC, BASF Glysantin G30 or coolant which uses the same inhibitor package is used, the coolant change interval can be extended from two years up to five years. If any other coolant is used, the coolant change interval is two years.

Requirements

The coolant used must meet the demands of standard ASTM D 3306 or BS 6580:1992.

- The cooling mixture must consist 40 - 60 % of ethylene/propylene-glycol based antifreeze and water. The best proportion is 50 % of antifreeze liquid and 50 % of water.
- The water used must be mechanically clean and not too acid (e.g. swamp water) or too hard (calciferous well water).
- Check periodically the proportion of antifreeze (the frost resistance) in the coolant.
- Do not mix ethylene- and propylene-glycol based antifreeze.
- Change the coolant every two years.

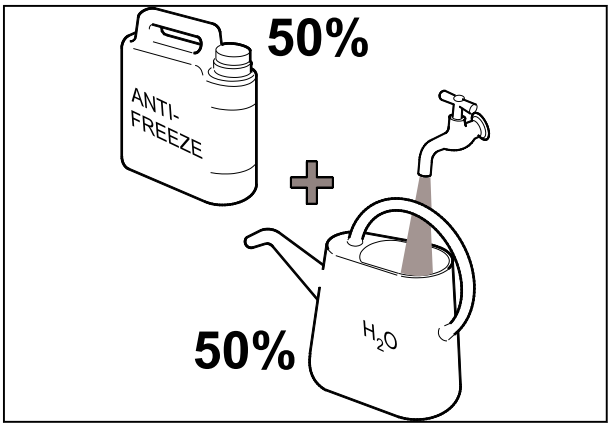

Fig. 36

NOTE:
Use only coolant that is a mixture of 40-60% water and antifreeze. Refer to the engine specification for the machine, for the specified ratio and the quantities necessary. Do not use water only for the coolant.

DANGER: Antifreeze is dangerous to health.

Injury to persons.

Do not let antifreeze touch the eyes and skin.

1.6.10.4 Fuel quality requirements

The use of fuels that are not permitted can cause faults in the engine and the exhaust gas aftertreatment system. These faults can cause:

- Damage to the engine components and decrease the engine life
- The engine to not be in compliance with the emission regulations.

AGCO POWER (and AGCO Corporation) is not responsible for failures or faults caused by the incorrect quality or storage of the fuel.

CAUTION: Risk of fuel system damage.

Diesel Exhaust Fluid (DEF) in the diesel fuel, will cause damage to the fuel system.

If you think that there is Diesel Exhaust Fluid (DEF) contamination in the diesel fuel tank, do not start the engine. Drain the fuel tank and clean the fuel tank before you start the engine.

Fuel standards

Fuel must be in compliance with the sulphur requirements, the biodiesel requirements and the standards that follow:

European standard	EN 590	2009 or newer
North American standard	ASTM D 975	10b or newer
Japanese standard	JIS K2204	2007 or newer
Chinese standard	GB 252 or GB 19147	≥2018

Use only ultra low sulphur (≤ 15 mg/kg) diesel fuels that are in compliance with:

- EN 590 (:2009 or newer)

- ASTM D 975 (-10b or newer)
- GB 19147 Stage V.

CAUTION: Engine and emission system damage.

The engine is not in compliance with emission regulations.

Do not use additives or admixtures.

IMPORTANT:
Fuels or mixtures that include ethanol, gasoline or kerosene are not permitted for use in AGCO POWER engines. These fuels decrease the life of the engine and cause system failure.

Permitted sulfur quantity

The permitted sulphur quantity is related to:

- Emission level
- Fuel system components and materials
- Aftertreatment components and materials.

For engines with a Selective Catalyst Reduction (SCR) system and engines with cooled external Exhaust Gas Recirculation (EGR) system, fuels with higher sulphur quantity are not permitted. Fuels with a high sulphur quantity will cause the engines not to be in compliance with particulate emission regulations.

Sulphur is also a catalyst poison, which can cause failure of the catalyst. Failure of the catalyst will cause a malfunction in the aftertreatment system.

IMPORTANT: *Use of high sulphur fuel in Selective Catalyst Reduction (SCR) engines and cooled external Exhaust Gas Recirculation (EGR) engines will cause damage to the aftertreatment system and cause the machine to loose performance. If you use high quantity sulphur fuels the warranty will be removed from the engine and aftertreatment system.*

Permitted sulphur quantities				
Emission level	**Fuel injection system**	**Aftertreatment system (Diesel Oxidation Catalyst (DOC), Selective Catalyst Reduction (SCR), Exhaust Gas Recirculation (EGR))**	**Diesel Particulate Filter (DPF)**	**Maximum permitted sulphur content**
Stage V	Common rail	Yes	Yes	10 mg/kg [1]
Tier 4 Final, Stage IV	Common rail	Yes	No	15 mg/kg
Tier 4 Interim, Stage IIIB	Common rail	Yes	No	15 mg/kg
Tier 3, Stage IIIA	Common rail	Yes	No	15 mg/kg or 500 mg/kg[2]
	Mechanical	Yes	No	
Tier 2, Stage II	Common rail	Yes	No	15 mg/kg or 500 mg/kg[2]
	Common rail	No	No	2000 mg/kg
	Mechanical	No	No	2000 mg/kg
Tier 0, Stage 0	Common rail	No	No	2000 mg/kg
	Mechanical			

[1] Within the European Union fuel with sulphur content not greater than 10 mg/kg (20 mg/kg at point of final distribution) shall be used.
[2] If the engine does not have a Selective Catalyst Reduction (SCR) system or a cooled external Exhaust Gas Recirculation (EGR) system, the maximum permitted sulphur quantity is 500 mg/kg.

Cetane number

The cetane number must be a minimum 43. We recommend a cetane number more than 47, specially for temperatures less than -20°C (-4°F) and elevations above 1500 m (5000 ft) from the sea level.

Biodiesel blends

1st generation biodiesel blends

It is not necessary to change the engine or its maintenance if you use 1st generation biodiesel. (less than 10% Fatty Acid Methyl Esters (FAME) / Fatty Acid Mono-Alkyl Esters (FAAE))

Permitted fuels	Maximum permitted 1st generation biodiesel quantity	Standard for biodiesel blend
EN 590 - Europe	0 - 10% Fatty Acid Methyl Esters (FAME) / Fatty Acid Mono-Alkyl Esters (FAAE)	EN 14214
ASTM D 975 - North America		ASTM D 6751
JIS K2204 - Japan		JIS K2390
GB 19147 St5 - China		-
EN 15940 EU BTL/HVO		EN 14214

It is necessary to change the engine and its maintenance if you use higher (10-20%) biodiesel quantities. The changes in the engine and its maintenance as follows:

- You must change the oil, oil filter and fuel filter more frequently than with less than 10% biodiesel.
- The engine must have 1 more fuel pre-filter or water separator in the fuel line between the fuel tank and the engine. It is necessary to do a frequent check of the water separator.
- The added fuel pre-filter (this includes the water separator) must have approval byAGCO POWER.

NOTE:
Do not use diesel fuel with higher proportions of biodiesel.

Risks of fuels with 1st generation biodiesel blends

If you use biodiesel blends from 10% to 20%, you must think about the risks.

- Possible power and fuel economy reduction up to 6%
- Decreased fuel flow in cold environments
- Possible decreased flow through the fuel filter(s) and risk that they become clogged
- Possible damage to the seals and hoses can cause fuel leaks
- Carbon can collect on the fuel injector nozzles
- Fuel can mix with the engine oil
- Possible high acid levels in the fuel system
- It is possible that it is not compatible with other materials (including copper, lead, zinc, tin, brass and bronze)
- Decrease in life of the engine and the exhaust system (Selective Catalyst Reduction (SCR) and Exhaust Gas Recirculation (EGR))
- Increase of engine emissions that can lead engine to de-rate on Selective Catalyst Reduction (SCR) engines.

All the above mentioned risks increase with higher than 20% biodiesel blends. Higher biodiesel blends cause other problems.

- Blockage of injector nozzles, causes a decrease of power and engine malfunction
- Oil soot in the crankcase, which decreases the oil and oil filter life

- Corrosion of the fuel system
- Failure of the engine or internal components of the fuel system.

2nd generation biodiesel

The use of the paraffinic diesel BTL/HVO (renewable diesel) equivalent to the standard EN 15940 Directive 98/70/EC is permitted in all AGCO POWER engines. Fuel filtration and maintenance intervals stay the same as usual.

Engine output depending on fuel quality

Different fuel qualities like temperature, density and viscosity affect the actual output of the engine. Our outputs are specified by fuel with a density of 0.84 kg/dm3 and specific heat rate of 42,7 Mj/kg at a fuel temperature of +15°C.

The correction in % caused by the change of fuel qualities is seen in the attached figures.

FIG. A. Engine output dependence on fuel temperature. +35°C is the reference temp (correction 0%). The fuel temperature is not only a function of ambient conditions but also varies according to the fuel system of the application (tank size and location, return flow etc.).

FIG. B. Engine output dependence on fuel density. Normal value is 0,84 kg/dm3 at +15°C.

FIG. C. Engine output dependence on fuel viscosity. Normal value is 3 cSt at +20°C.

Note figure B and C only if the fuel quality is changed.

In fig. A there are all the quality dependencies caused by the change of the temperature. The fuel density and viscosity can be seen in the produce declaration given by the manufacturer.

The output correction is made as follows: Correction percentages from figures A, B and C are summed up. The given rated power is then corrected with the resulting percentage.

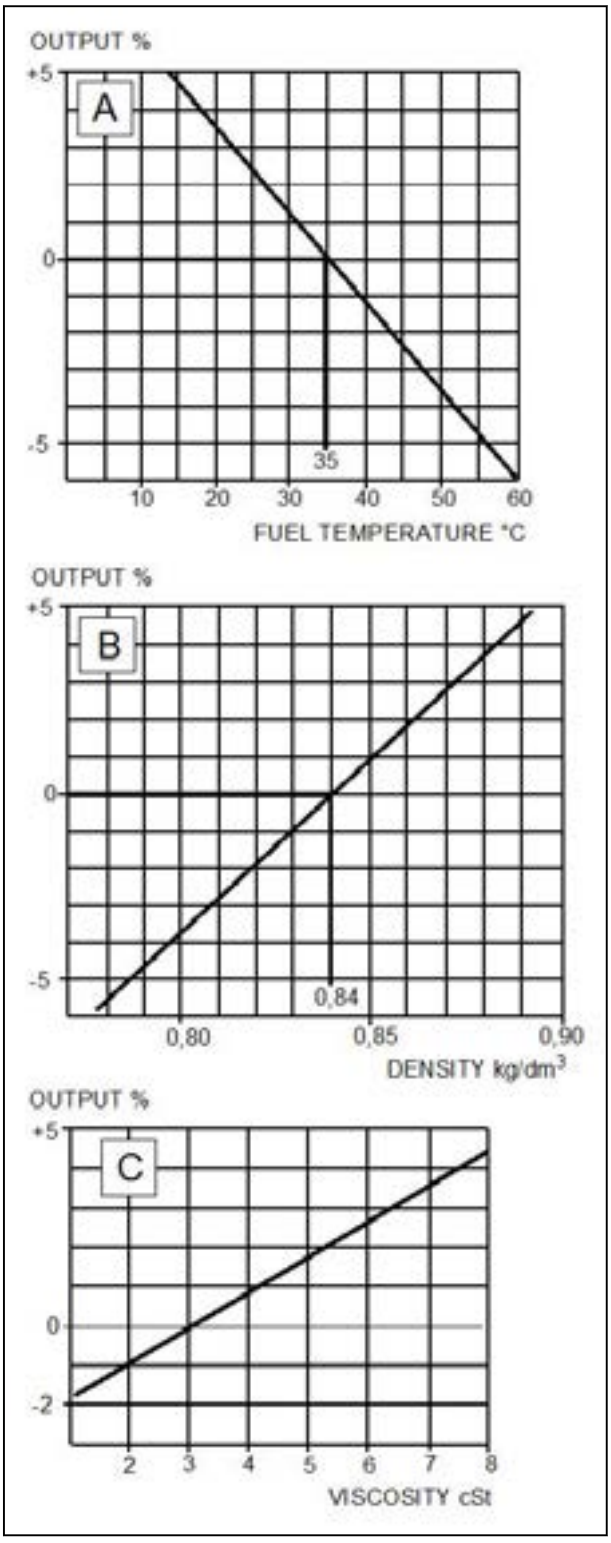

Fig. 37

1.6.10.5 Lubricating oil quality requirements

Engine type	API-grade	ACEA-grade	Viscosity	
AWF (Tier 4 final, with aftertreatment)	CJ-4	E9	5W - 40	Good for winter use
			10W - 40	Good for winter use and for summer use
			15W - 40	Good for summer use

NOTE:
Do not use E6 engine oil in AGCO POWER engines. Use of E6 engine oil can increase engine wear.

DANGER: Lubricating oil is dangerous to health.

Injury to persons.

Do not let the engine oil touch the skin, for long periods of time. Do not breathe in the spray of small particles of engine oil.

1.7 Technical data

1.7.1 Torque specifications

1.7.1.1 Torque specifications

CAUTION: Wrong parts

Mismatched or incorrect fasteners can cause damage or malfunction, or personal injury.

Take care to avoid mixing metric dimensioned fasteners and inch dimensioned fasteners.

Exceptions to these torques are in the service manual, if necessary.

Before installation of any hardware, make sure the components are in near new condition. Bolts and threads must not be worn or damaged. Threads must not have burrs or nicks. Hardware must be free of rust and corrosion. Clean hardware with a non corrosive cleaner.

Do not lubricate the fastener threads except for rust preventive. Rust preventive should be applied by supplier of that component for purposes of shipping and storage. Other applications for lubricating components may also be specified in service manual.

1.7.1.2 Constant torque hose clamps

Because of extreme temperature changes, hose will heat set. Heat setting can cause hose clamps to loosen. Loose hose clamps can cause leaks and cause component failures. Constant torque hose clamp will help prevent these failures.

Constant torque hose clamp is installed correctly under the following conditions:

- Screw tip (1) extends 6.35 mm (.25 in) (A) beyond housing.
- Belleville springs are collapsed nearly flat after screw (2) is tightened to a torque of 11 Nm (8.1 lbf ft) .

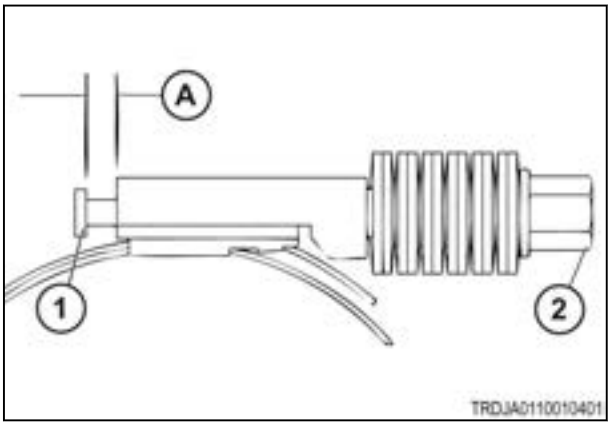

Fig. 38

1.7.1.3 Metric fasteners

This chart shows the assembly torque values for metric fasteners.

Standard			High		Low	
Thread Size	**Pound Feet lbf ft**	**Newton Meters Nm**	**Pound Feet lbf ft**	**Newton Meters Nm**	**Pound Feet lbf ft**	**Newton Meters Nm**
M6 x 1	8 to 10	9 to 15	9 to 11	10 to 16	3.5 to 4.5	5 to 7
M8 x 1.25	19 to 23	21 to 35	20 to 24	23 to 37	10 to 12	12 to 18
M10 x 1.5	37 to 45	45 to 65	40 to 48	48 to 72	20 to 24	23 to 37
M12 x 1.75	67 to 83	80 to 120	72 to 88	85 to 125	31 to 39	40 to 60
M14 x 2	108 to 132	130 to 190	120 to 140	145 to 205	55 to 65	65 to 95
M16 x 2	160 to 190	200 to 280	180 to 220	230 to 310	80 to 100	105 to 145
M20 x 2.5	305 to 375	400 to 520	350 to 430	460 to 600	165 to 205	210 to 290

Standard			High		Low	
Thread Size	Pound Feet lbf ft	Newton Meters Nm	Pound Feet lbf ft	Newton Meters Nm	Pound Feet lbf ft	Newton Meters Nm
M24 x 3	530 to 640	700 to 900	600 to 730	800 to 1000	285 to 345	375 to 475
M30 x 3.5	1060 to 1300	1400 to 1800	1200 to 1460	1600 to 2000	565 to 685	750 to 950
M36 x 4	1800 to 2200	2400 to 3000	2055 to 2515	2750 to 3450	990 to 1210	1300 to 1700

Standard taperlock studs

Thread Size	Pound Feet lbf ft	Newton Meters Nm
M6	6	8
M8	13	17
M10	26	35
M12	48	65
M16	80	110
M20	125	170
M24	300	400
M30	550	750
M36	880	1200

Metric bolt and cap screws

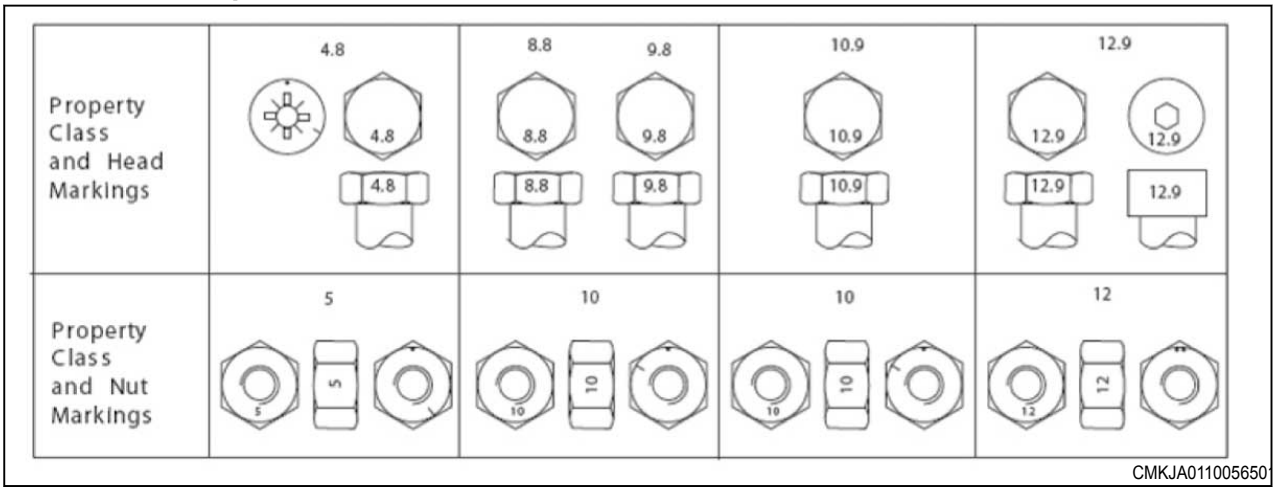

Fig. 39

Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
-	Lubricated		Dry		Lubricated		Dry		Lubricated		Dry		Lubricated		Dry	
	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190

Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
-	Lubricated		Dry		Lubricated		Dry		Lubricated		Dry		Lubricated		Dry	
	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft	Nm	lbf ft
M16	100	73	125	92	190	140	240	175	275	200	350	225	320	240	400	300
M18	135	100	175	125	360	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

1.7.1.4 Inch fasteners

This chart shows the assembly torque values for inch fasteners.

Standard			High		Low	
Thread Size	Pound Feet lbf ft	Newton Meters Nm	Pound Feet lbf ft	Newton Meters Nm	Pound Feet lbf ft	Newton Meters Nm
1/4 - 20	8 to 10	9 to 15	9 to 11	10 to 16	3.5 to 4.5	5 to 7
5/16 - 18	16 to 20	21 to 31	18 to 22	21 to 35	9 to 11	10 to 16
3/8 - 16	31 to 39	38 to 56	36 to 44	40 to 60	16 to 20	19 to 31
7/16 - 14	45 to 55	65 to 85	54 to 66	65 to 95	27 to 33	32 to 48
1/2 - 13	67 to 83	85 to 125	81 to 99	100 to 140	40 to 50	48 to 72
9/16 - 12	110 to 130	130 to 190	117 to 143	145 to 205	55 to 65	70 to 100
5/8 - 11	145 to 175	175 to 255	160 to 190	200 to 280	75 to 95	95 to 135
3/4 - 10	245 to 305	320 to 420	290 to 350	370 to 490	135 to 165	160 to 240
7/8 - 9	410 to 510	540 to 700	470 to 570	610 to 790	215 to 265	285 to 365
1 - 8	590 to 730	800 to 1000	700 to 850	900 to 1200	335 to 405	435 to 565
1 1/8 - 7	860 to 1060	1150 to 1450	965 to 1175	1300 to 1600	465 to 565	610 to 790
1 1/4 - 7	1190 to 1450	1600 to 2000	1395 to 1705	1850 to 2350	880 to 1070	875 to 1125
1 3/8 - 6	1600 to 1960	2100 to 2700	1790 to 2190	2400 to 3000	1185 to 1445	1850 to 1150
1 1/2 - 5	2050 to 2510	2750 to 3450	2385 to 2915	3200 to 4000	1515 to 1845	1500 to 1900