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GRADER

Workshop Manual

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THIS ALERT SYMBOL SIGNALS IMPORTANT MESSAGES INVOLVING YOUR SAFETY.

Read and heed carefully the safety instructions listed and follow the precautions recommended to avoid potential risks and to safeguard your health and your safety.

You will find this symbol in the text of this Manual referred to the following key words:

WARNING - Cautions directed to avoid improper repair interventions involving potential consequences for the safety of the personnel performing the repairs.

DANGER - These warnings qualify specifically potential dangers for the safety of the operator or other persons directly or indirectly involved.

IMPORTANT NOTICE

All maintenance and repair interventions explained in this Manual **must be performed exclusively by the Service Organisation of the Manufacturer**, observing strictly the instructions explained using, whenever necessary, the recommended specific tools.

Whoever performs the operations reported without following exactly the precautions is responsible on his own, for the damages that may result.

Neither the Factory nor any Organisations in its Distribution Network, including but not limited to national, regional or local distributors, are responsible for any liability arising from any damage resulting from defects caused by parts and/or components not approved by the Factory for use in maintaining and/or repairing products manufactured or merchandised by the Factory.

In any case, no warranty of any kind is made or shall be imposed with respect to products manufactured or merchandised by the Factory, when failures are caused by the use of parts and/or components not approved by the Factory.

AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the road, are caused by the failure of some individuals to follow simple and fundamental safety rules and precautions. For this reason **MOST ACCIDENTS CAN BE PREVENTED** by recognising the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering in the reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident. The complete observance of one simple rule would prevent many serious accidents.

The rule is simple: never attempt to clean, lubricate or maintain a machine while it is in motion.



WARNING

Prior to engaging in any maintenance, adjustment or repair operation on machines having hydraulically, mechanically, and/or cable controlled equipment (such as shovels, loaders, dozers, excavators etc.) be certain the equipment is lowered to the ground.

If it is necessary to have the equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the devices used for controlling the equipment.

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FOR THE READER

This Workshop Manual is written for the **Repair-Technician**. It provides important information on how to perform skilful repairs.

We recommend to consult the **Workshop Manual** and also the Motor-Grader Operation and Maintenance Instruction Manual before initiating any repair-work operation. Utilize the **Workshop Manual** as well as the **Operation and Maintenance Instruction Manual** and the **Parts Catalog** as a prompt-book and adviser, even if the Motor-Grader technique is become familiar.

By means of the Workshop Manual the expert technician will be able to carry out a skilful repair-work operation.

USE

The Workshop Manual refers to the initial Machine configuration. Structural changes or rebuilding operations are not described in this Handbook. In this Workshop Manual the following information can be found:

- Safety Instructions;
- Technical Data and Special Tools;
- Functional Description;
- Performance Testing;
- Troubleshooting and Failure Correction;
- Repair Instructions.

In the Section **Safety Instructions** the recommended procedures are described, so that through the relevant compliance with, a risk of accident for the User and for the personnel responsible of the maintenance operations on the machine can be avoided.

In the Section **Technical Data** the Service Data, the change tables and lists of the needed Special Tools and Maintenance materials are indicated.

In other Sections, for each mechanical group, when available can be found:

- a functional description with information concerning the operation of the essential devices and equipments;

- information for carrying out the performance tests on the machine;
- troubleshooting, information concerning the recognition and correction of failures on the machine,
- technical information necessary for carrying out the Service and Repair operations on the Machine, the equipment necessary for the maintenance operations, the information concerning the Standards to be applied in the Maintenance operations, the Procedures for the Removal and Installation operations as well as for Disassembly and Assembly operations.

By means of the index contents a desired information can be easily achieved.

For a better understanding the illustration of the part will be displayed.

Therefore differences in arrangement of the Grader are possible, whenever the latter involves the univocal capability of the information.

REPAIR OPERATIONS

Carry out the necessary repair works as soon as possible. This procedure will avoid the maintenance costs while increasing the availability of your Motor-Grader.

Pay always attention during all works to the Workshop Manual warnings and cautions and to the Operation and Maintenance Instruction Manual.

The Service Assistance will gladly carry out for you the works not described in the Workshop Manual.

Always utilize the **Original Spare Parts** only.

FURTHER INFORMATION MATERIAL

Please notice the supplementary information consulting the following Handbooks:

- **Operation and Maintenance Instruction Manual;**
- **Parts Catalog.**

NOTES:

SECTION 0

SAFETY INSTRUCTIONS



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FUNDAMENTAL SAFETY INSTRUCTIONS

WARNINGS AND SYMBOLS

The following signs are used in the manual to designate instructions of particular importance:

	Precautionary rules and measures designed to protect the machine operator and other persons from life-threatening danger or injuries and to prevent extensive damage.
	Information and precautionary measures designed to prevent damage to the machine or other property.

DESIGNATED USE

The machine has been built with state of the art technology and in accordance with the officially recognised safety regulations. Nevertheless, its use may constitute a risk to life and limb for the operator or third parties, or cause damage to the machine and other property.


The machine must be used only in technically perfect condition in accordance with its designated use and the instructions set out in the operating manual, and only by safety-conscious persons who are fully aware of the risks involved in operating the machine. Important notices are to be found at the beginning of the chapters. Functional disorders should be rectified immediately, especially those which could affect safety conditions.

The grader is intended mainly for:

- Creating fine-graded surfaces;
- Clearing away top soil;
- Tearing up old road surfaces and hard ground;
- Cutting slopes;
- Clearing away ice and snow;
- Gathering, spreading, mixing and compacting materials.

The grader can also be used with other working equipment for special purposes. The technical data offer clear instructions in this respect.

Designated use includes following the operating instructions and fulfilling the inspection and maintenance conditions.

	<p>Using the machine for purposes other than or extending beyond those stated above, e.g.:</p> <ul style="list-style-type: none"> - for the transportation of persons; - as a working platform; - for pulling or transporting loads without the working equipment being approved for such purposes is considered contrary to the designated use. <p>Improper use may involve a life-threatening risk for operators or other personnel or may cause injury or extensive damage.</p>
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The manufacturer/supplier cannot be held liable for any damage arising out of improper use. The risk involved in improper use lies entirely with the user.

Noise emission specification in accordance with the 3rd Ordinance of the Machine Safety Act (18/01/1991) and EC Machine Directive, 89/392/EEC.

If the earth-moving machine is operated in accordance with its designated use, the installation of driver's seats complying with ISO 7096 ensures that the considered vibration accelerations a_{zw} (measured as per ISO 2631, Part 1) fulfil the requirements of protecting the driver against wholebody vibration.

ORGANIZATIONAL MEASURES

The operating instructions must always be at hand at the place of use of the machine, e.g. by stowing them in the tool compartment or tool-box provided for such purpose.

In addition to the operating instructions, observe and instruct the user in all other generally applicable legal and other mandatory regulations relevant to accident prevention and environmental protection.

These compulsory regulations may also deal with the handling of hazardous substances, issuing and/or wearing of personal protective equipment or traffic regulations.

The operating instructions must be supplemented by instructions covering the duties involved in supervising and notifying special organizational features, such as job organization, working sequences or the personnel entrusted with the work.

Personnel entrusted with work on the machine must have read the operating instructions and in particular the chapter on safety before beginning work. Reading the instructions after work has begun is too late. This applies especially to persons working only occasionally on the machine, e.g. during setting up or maintenance.

Check - at least from time to time - whether the personnel is carrying out the work in compliance with the operating instructions and paying attention to risks and safety factors.

For reasons of security, long hair must be tied back or otherwise secured, garments must be close-fitting and no jewellery, such as rings, may be worn. Injury may result from being caught up in the machinery or from rings catching on moving parts.

Use protective equipment wherever required by the circumstances or by law.

Observe all safety instructions and warnings attached to the machine.

See to it that safety instructions and warnings attached to the machine are always complete and perfectly legible.

In the event of safety-relevant modifications or changes in the behaviour of the machine during operation, stop the machine immediately and report the malfunction to the competent authority/person.

Never make any modifications, additions or conversions which might affect safety without the supplier's approval. This also applies to the installation and adjustment of safety devices and valves as well as to welding work on load-bearing elements.

Spare parts must comply with the technical requirements specified by the manufacturer. Spare parts from original equipment manufacturers can be relied upon to do so.

Replace hydraulic hoses within stipulated and appropriate intervals, even if no safety-relevant defects have been detected.

Adhere to prescribed intervals or those specified in the operating instructions for routine checks and inspections.

For the execution of maintenance work, tools and workshop equipment adapted to the task on hand are absolutely indispensable.

The personnel must be familiar with the location and operation of fire extinguishers.

Observe all fire-warning and fire-fighting procedures.

SELECTION AND QUALIFICATION OF PERSONNEL

BASIC RESPONSIBILITIES

Any work on and with the machine must be executed by reliable personnel only. Statutory minimum age limits must be observed.

Employ only trained or instructed staff and set out clearly the individual responsibilities of the personnel for operation, set-up, maintenance and repair.

Make sure that only authorized personnel works on or with the machine.

Define the machine operator's responsibilities - also with regard to observing traffic regulations - giving the operator the authority to refuse instructions by third parties that are contrary to safety.

Do not allow persons to be trained or instructed or persons taking part in a general training course to work on or with the machine without being permanently supervised by an experienced person.

Work on the electrical system and equipment of the machine must be carried out only by a skilled electrician or by instructed persons under the supervision and guidance of a skilled electrician and in accordance with electrical engineering rules and regulations.

Work on chassis, brake and steering systems must be performed by skilled personnel only, which has been specially trained for such work.

Work on the hydraulic system must be carried out only by personnel with special knowledge and experience of hydraulic equipment.

SAFETY INSTRUCTIONS GOVERNING SPECIFIC OPERATIONAL PHASES

Standard operation

Avoid any operational mode that might be prejudicial to safety.

Before beginning work, familiarize yourself with the surroundings and circumstances of the site, such as obstacles in the working and travelling area, the soil bearing capacity and any barriers separating the construction site from public roads.

Take the necessary precautions to ensure that the machine is used only when in a safe and reliable state.

Operate the machine only if all protective and safety-oriented devices, such as removable safety devices, emergency shut-off equipment, soundproofing elements and exhausters, are in place and fully functional.

Check the machine at least once per working shift for obvious damage and defects. Report any changes (incl. changes in the machine's working behaviour) to the competent organization/person immediately. If necessary, stop the machine immediately and lock it.

In the event of malfunctions, stop the machine immediately and lock it. Have any defects rectified immediately.

Start the machine from the driver's seat only.

During start-up and shut-down procedures always watch the indicators in accordance with the operating instructions.

Before setting the machine in motion, make sure that nobody is at risk.

Before starting work or travelling with the machine, check that the braking, steering, signalling and lighting systems are fully functional.

Before setting the machine in motion always check that the accessories have been safely stowed away.

When travelling on public roads, ways and places always observe the valid traffic regulations and, if necessary, make sure beforehand that the machine is in a condition compatible with these regulations. In conditions of poor visibility and after dark always switch on the lighting system.

Persons accompanying the driver must be seated on the passenger seats provided for this purpose.

When crossing underpasses, bridges and tunnels or when passing under overhead lines always make sure that there is sufficient clearance.

Always keep at a distance from the edges of building pits and slopes.

Avoid any operation that might be a risk to machine stability.

Never travel across slopes; always keep the working equipment and the load close to the ground, especially when travelling downhill.

On sloping terrain always adapt your travelling speed to the prevailing ground conditions. Never change to a lower gear on a slope but always before reaching it.

Before leaving the driver's seat always secure the machine against inadvertent movement and unauthorized use. Stop the engine.

**SPECIAL WORK IN CONJUNCTION
WITH USE OF THE MACHINE
MAINTENANCE AND REPAIRS
DURING OPERATION
DISPOSAL OF PARTS AND CONSUMABLES**

Observe the adjusting, maintenance and inspection activities and intervals set out in the operating instructions, including information on the replacement of parts and equipment. These activities may be executed by skilled personnel only.

Brief operating personnel before beginning special operations and maintenance work, and appoint a person to supervise the activities.

In any work concerning the operation, conversion or adjustment of the machine and its safety-oriented devices or any work related to maintenance, inspection and repair, always observe the start-up and shut-down procedures set out in the operating instructions and the information on maintenance work.

Ensure that the maintenance area is adequately secured.

If the machine is completely shut down for maintenance and repair work, it must be secured against inadvertent starting by:

- removing the ignition key;
- attaching a warning sign.

Carry out maintenance and repair work only if the machine is positioned on stable and level ground and has been secured against inadvertent movement and buckling.

To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically perfect lifting gear and suspension systems with adequate lifting capacity. Never work or stand under suspended loads.

The fastening of loads and the instructing of crane operators should be entrusted to experienced persons only. The marshaller giving the instructions must be within sight or sound of the operator.

For carrying out overhead assembly work always use specially designed or otherwise safety-oriented ladders and working platforms. Never use machine parts as a climbing aid.

Wear a safety harness when carrying out maintenance work at greater heights.

Keep all handles, steps, handrails, platforms, landings and ladders free from dirt, snow and ice.

Clean the machine, especially connections and threaded unions, of any traces of oil, fuel or preservatives before carrying out maintenance/repair. Never use aggressive detergents. Use lintfree cleaning rags.

Before cleaning the machine with water, steam jet (high-pressure cleaning) or detergents, cover or tape up all openings which - for safety and functional reasons - must be protected against water, steam or detergent penetration. Special care must be taken with electric motors and switchgear cabinets.

Ensure during cleaning of the machine that the temperature sensors of the fire-warning and firefighting systems do not come into contact with hot cleaning agents as this might activate the fire-fighting system.

After cleaning, remove all covers and tapes applied for that purpose.

After cleaning, examine all fuel, lubricant, and hydraulic fluid lines for leaks, loose connections, chafe marks and damage. Any defects found must be rectified without delay.

Always tighten any screwed connections that have been loosened during maintenance and repair.

Any safety devices removed for set-up, maintenance or repair purposes must be refitted and checked immediately upon completion of the maintenance and repair work.

Ensure that all consumables and replaced parts are disposed of safely and with minimum environmental impact.

WARNING OF SPECIAL DANGERS

Electric energy

Use only original fuses with the specified current rating. Switch off the machine immediately if trouble occurs in the electrical system.

When working with the machine, maintain a safe distance from overhead electric lines. If work is to be carried out close to overhead lines, the working equipment must be kept well away from them. Caution, danger! Check out the prescribed safety distances.

If your machine comes into contact with a live wire:

- do not leave the machine;
- drive the machine out of the hazard zone;
- warn others against approaching and touching the machine;
- have the live wire de-energized;
- do not leave the machine until the damaged line has been safely de-energized.

The electrical equipment of machines is to be inspected and checked at regular intervals.

Defects such as loose connections or scorched cables must be rectified immediately.

Gas, dust, steam and smoke

Operate internal combustion engines and fueloperated heating systems only on adequately ventilated premises. Before starting the machine on enclosed premises, make sure that there is sufficient ventilation.

Observe the regulations in force at the respective site.

Carry out welding, flame-cutting and grinding work on the machine only if this has been expressly authorized, as there may be a risk of explosion and fire.

Before carrying out welding, flame-cutting and grinding operations, clean the machine and its surroundings from dust and other inflammable substances and make sure that the premises are adequately ventilated (risk of explosion).

Hydraulic and pneumatic equipment

Check all lines, hoses and screwed connections regularly for leaks and obvious damage. Repair damage immediately. Splashed oil may cause injury and fire.

Depressurize all system sections and pressure pipes (hydraulic system, compressed-air system) to be removed in accordance with the specific instructions for the unit concerned before carrying out any repair work.

Hydraulic and compressed-air lines must be laid and fitted properly. Ensure that no connections are interchanged. The fittings, lengths and quality of the hoses must comply with the technical requirements.

Noise

During operation, all sound baffles of the machine must be closed.

Always wear the prescribed ear protectors.

Oil, grease and other chemical substances

When handling oil, grease and other chemical substances, observe the product-related safety regulations.

Be careful when handling hot consumables (risk of burning or scalding).

**TRANSPORTING AND TOWING
RECOMMISSIONING**

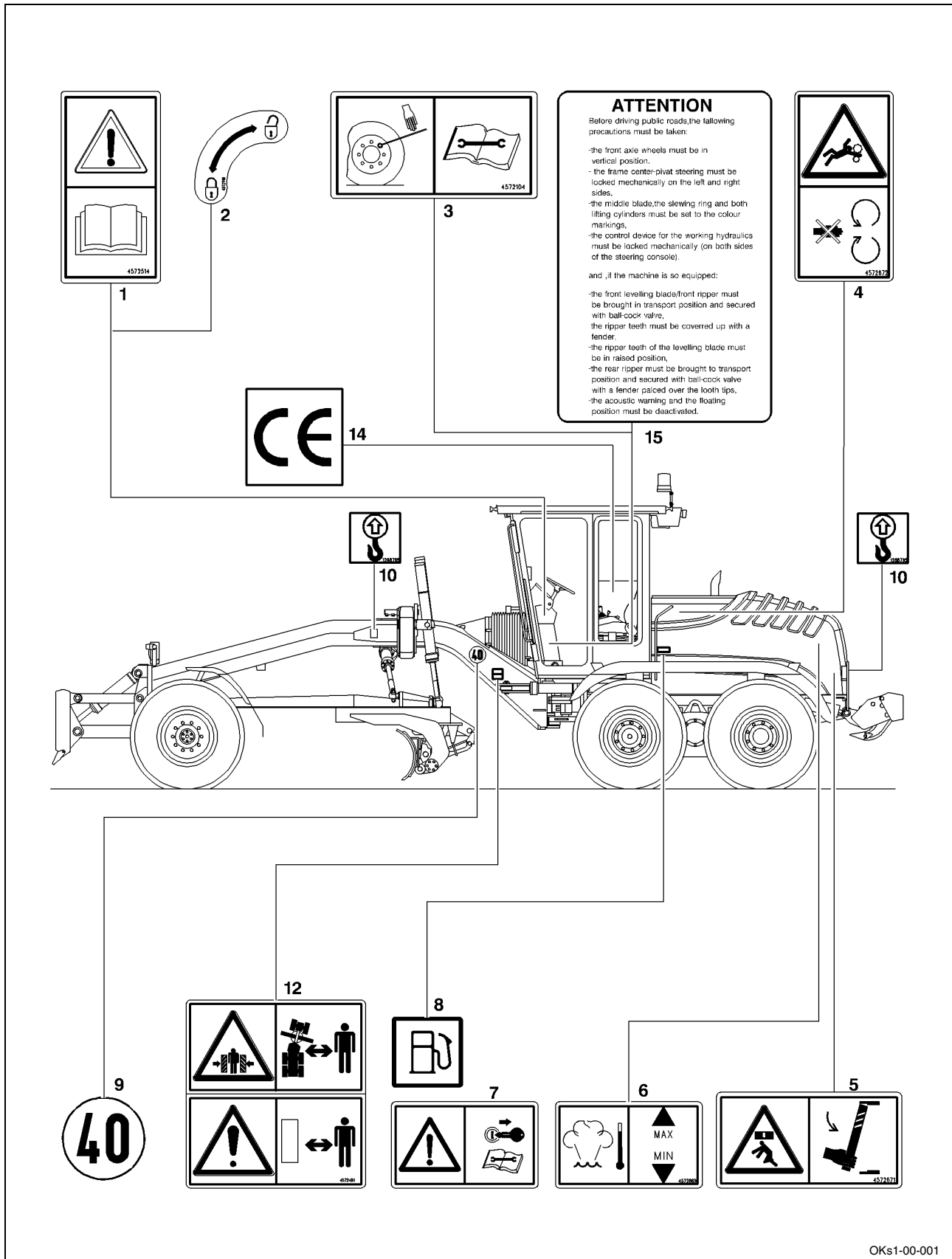
The machine must be towed, loaded and transported only in accordance with the operating instructions.

For towing the machine observe the prescribed transport position, admissible speed and itinerary.

Use only appropriate means of transport and lifting gear of adequate capacity.

The recommissioning procedure must be strictly in accordance with the operating instructions.

WARNING AND INSTRUCTION SIGNS



OKs1-00-001



Always observe the warning and instruction signs attached to the machine.

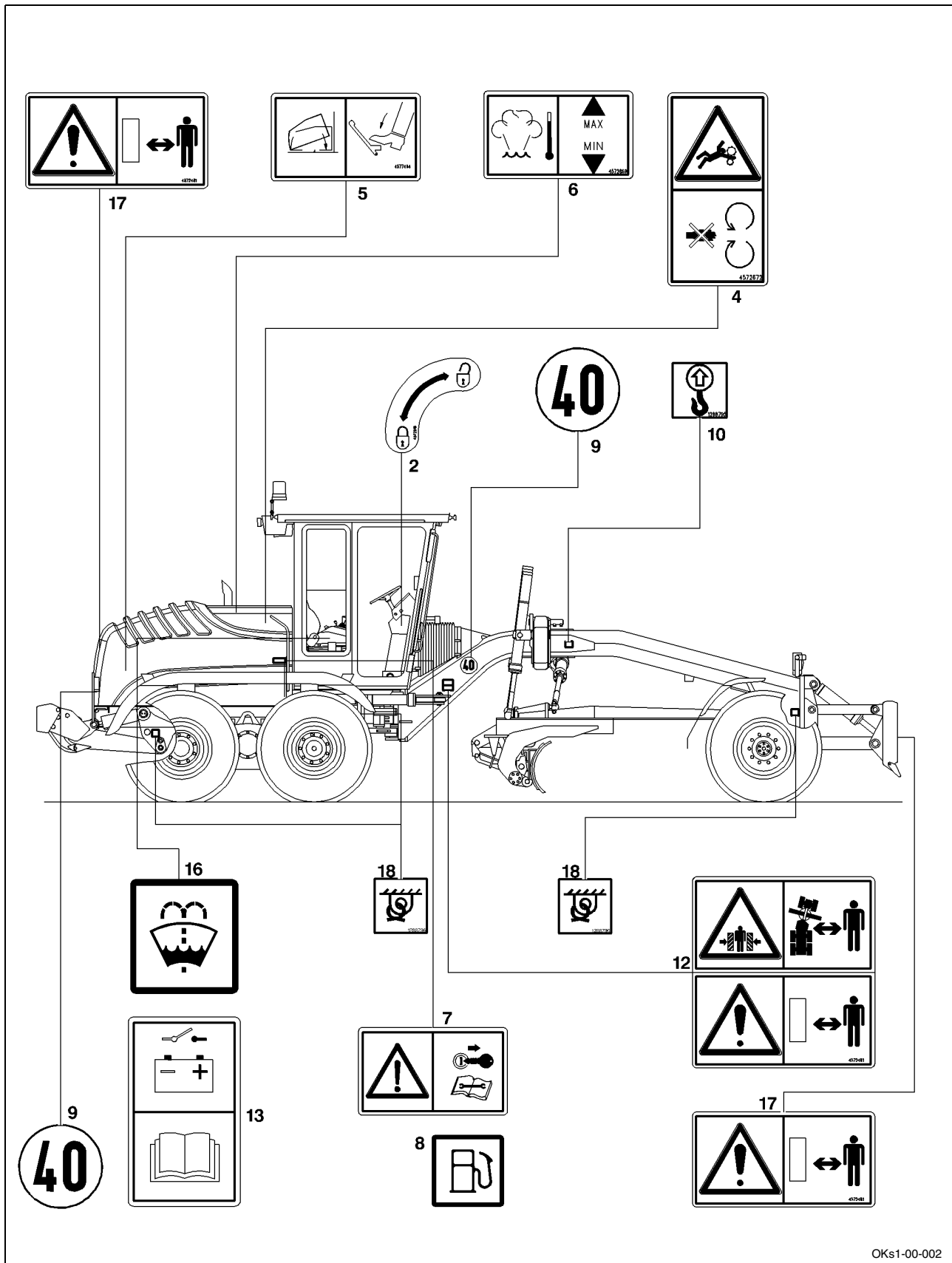
Keep signs clean and legible.

Replace signs immediately if they have become illegible.

New warning and instruction signs can be ordered from the Spare-Parts Service. The Part nos. required for orders can be found in the Parts Catalog of your machine.

LEFT SIDE

1. The machine must not be started up unless the Operation and Maintenance Instructions Manual have been read and understood
2. The equipment can be secured at this point against inadvertent activation
3. Check wheel nuts at regular intervals; see Operation and Maintenance Instructions Manual
4. **Risk of injury** through hot or rotating components in the engine compartment. Never open engine hood until engine is stationary
5. **Risk of injury** through engine hood slamming closed.
Open engine hood until the safety rod engages in the lock position.
Read Operation and Maintenance Instructions Manual before carrying out any repair / servicing work
6. **Risk of injury** through hot coolant. Open cap on radiator only after the radiator has cooled down - Coolant level indicators
7. **Risk of injury** by unauthorized starting of the machine. Before undertaking any work on the machine shut off the engine and withdraw the key
8. Fuel tank, fill in diesel only
9. This sign indicates the admissible maximum speed for driving on public roads
10. Fixing points for fastening chains and ropes for machine transport
12. **Risk of injury** through crushing. Never start up the machine without ensuring that nobody is standing within the range of the center-pivot joint
Risk of injury through crushing. Never start up the machine without ensuring that nobody is standing in the area between the machine and a nearby obstacle
14. The CE sign indicates that this machine has been built in conformity with the European prescriptions for the safety of machines. L_{WA} is the level of noise emissions specified in dB_A (in acc. with standard 2000/14/EC)
15. **Driving on public roads.** This sign specifies measure to be taken before driving on public roads.



Carefully read personal and machine SAFETY INSTRUCTIONS (at the beginning of this manual)



Always observe the warning and instruction signs attached to the machine.

Keep signs clean and legible.

Replace signs immediately if they have become illegible.

New warning and instruction signs can be ordered from the Spare-Parts Service. The Part nos. required for orders can be found in the Parts Catalog of your machine.

RIGHT SIDE

2. The equipment can be secured at this point against inadvertent activation
4. **Risk of injury** through hot or rotating components in the engine compartment. Never open engine hood until engine is stationary
5. **Risk of injury** through engine hood slamming closed. Close engine hood by disengaging the safety bar with your foot. Read Operation and Maintenance Instructions Manual before carrying out any repair / servicing work
6. **Risk of injury** through hot coolant. Open cap on radiator only after the radiator has cooled down - Coolant level indicators
7. **Risk of injury** by unauthorized starting of the machine. Before undertaking any work on the machine shut off the engine and withdraw the key
8. Fuel tank, fill in diesel only
9. This sign indicates the admissible maximum speed for driving on public roads
10. Fixing points for fastening chains and ropes for machine transport
12. **Risk of injury** through crushing. Never start up the machine without ensuring that nobody is standing within the range of the center-pivot joint
Risk of injury through crushing. Never start up the machine without ensuring that nobody is standing in the area between the machine and a nearby obstacle
13. **Damage** to the alternator, regulator and electronic modules may result from the battery being disconnected while the engine is running. Always stop the engine before disconnecting and removing batteries
16. Screen washer. Filler opening of screen-washer reservoir. Top up with water
17. **Risk of injury** through crushing. Never start up the machine without ensuring that nobody is standing in the area between the machine and a nearby obstacle
18. Fixing points for fastening chains and ropes for machine transport.

NOTES:

OPERATION

GENERAL INSTRUCTIONS



Never operate the machine before having read and understood the operating instructions.

Pay special attention to:

"Fundamental Safety Instructions" and all warnings and safety instructions attached to the machine.

Familiarize yourself with the layout, the functioning and the activating devices of the control elements prior to starting up the machine.

Activate the control elements from the driver's seat only.

Keep the operating instructions with the machine at all times.

OPERATING PERSONNEL

The operating personnel must be fully informed of the operation and application of this or comparable machines.

The necessary know-how can be acquired in several days' instruction, e.g. by a CNH mechanic or by attending a CNH operators' training course.

PERSONAL PROTECTIVE WEAR AND WORKING CLOTHING

Wear a safety helmet and working footwear with non-slip soles. Smooth soles may slip from steps and pedals, resulting in injury or incorrect operation.

Wear closely fitting working clothing when operating the machine. Loose, wide garments may result in the control lever being inadvertently activated.



SAFETY BELT

For machines with a safety belt for operating personnel:

Check safety belt attached to driver's seat. In the event of damage or after an accident, have it replaced immediately.

Apply safety belt before starting work.

STATE OF THE MACHINE

Operate the machine only in a safe state and only in accordance with its designated use. Always observe the safety instructions.

Always have inspection and maintenance work carried out on schedule.

Operate the machine only with the equipment and component combinations approved by the Manufacturer. Clearcut data are given in the technical specifications.

Never install and commission other equipment and component combinations without the Manufacturer having first inspected and approved the project.

Before starting work or travelling with the machine, check that the braking, steering, signalling and lighting systems are fully functional.

Poor visibility may result in accidents. Always clean the windows and the glass covers of all lights before starting up the machine.

Check that all warnings and safety instructions attached to the machine are present and legible.

**ENTERING AND LEAVING THE MACHINE**

Use only the steps, platforms and handrails provided when entering and leaving the machine.

Always keep steps, platforms, handles and handrails in a non-slip, safe state and remove any oil, grease, soil, clay, snow, ice and other foreign matter immediately.

Always face the machine when entering and leaving.

HAZARD RANGE

The hazard range is that zone around the machine in which persons are within reach of falling loads or falling attachments due to operational movements by the machine, to its equipment and attachments or to swinging loads.

PERSONS WITHIN THE HAZARD ZONE

Always use the horn to warn persons in the immediate vicinity of the machine before starting up the machine.

Ensure that no one sets foot in the hazard zone of the machine. Interrupt work until such persons have left the hazard zone.

**MARSHALLERS**

The marshall must keep outside the hazard zone.

Have a marshall to assist you:

- when you have no clear overview over the hazard zone of the machine;
- when reversing;
- when shunting.

Use only those communication signals which you and the marshall understand, or use aids for communication (e.g. walkie-talkie / camera).

Calls cannot be understood by the marshall because of the noise made by the machine during operation.

Keep in constant contact with the marshall.

Stop the machine immediately if you lose contact with the marshall.

SECURING THE MACHINE

Secure the machine as described in the chapter "Securing the Machine" before:

- mounting or dismantling the attachment;
- parking the machine after daily operation;
- carrying out any servicing or repair work.

REFUELLING

**EXPLOSION HAZARD**

Fuels and fuel vapours are highly flammable and likely to explode. Therefore, avoid the formation of sparks and do not use open flames such as lighters or matches for illumination purposes.

POSSIBLE HEALTH HAZARD

Diesel fuel and the fuel vapours are a health hazard.

Fuels must not be swallowed.

Avoid prolonged contact with the skin.

Do not inhale the fumes.

Wear protective gloves or use a barrier cream.

Do not eat, drink or smoke during refuelling.

AVOID ENVIRONMENT POLLUTION

Avoid spilling fuel. Do not let fuel get into the ground, it pollutes the environment.

Soak up any overflowing fuel immediately with cleaning rags or binding agents and discard without polluting the environment.

Report fuel accidents immediately to the owner of the machine or to his representative.

SECURING THE MACHINE

Secure the machine against unauthorized starting during refuelling:

- park the machine on level and firm ground;
- lower the working equipment to the ground;
- switch off any fuel-operated auxiliary heaters and air conditioners;
- shut off the engine;
- apply the parking brake;
- withdraw the key from the keyswitch of the electrical system.

Refuelling must always be performed from the ground.

**FILLING IN FUEL**

Read and observe "Refuelling - safety instructions" before filling in fuel.

REFUELLING FROM CANS

If the machine is filled up frequently or regularly with fuel from cans or drums, there is an increased risk of dirt particles and water getting into the fuel system.

In this case:

- always fill in fuel through a finemeshed strainer;
- use only microfilter-equipped suction hoses;
- dewater the fuel filter more often than specified in the servicing plan;
- drain water and deposits from the tank bottom at shorter intervals;
- replace all fuel filters at shorter intervals.

**NEVER FILL IN "BIO-DIESEL"**

The injection system and the engine are at risk of being damaged if "Bio-diesel" is used.

Fill up the machine only with diesel fuel made from mineral oils acc. to the EN 590 standard.

For more information please contact your dealer service.

REFUELLING SYSTEM (Option)**RISK OF EXPLOSION**

Do not smoke and do not use naked flames. Fuels and fuel vapours are flammable. Risk of fire.

Switch off fuel-operated auxiliary heating systems and air conditioners.

HEALTH AND ENVIRONMENT PROTECTION

Fuel may damage the skin. Wear protective gloves or use a barrier cream.

Do not spill fuel. Do not let fuel seep into the ground. Fuel pollutes the environment.

Soak up any overflowing fuel immediately with cloths or binding agents. Then discard without polluting the environment.

Report any accidents involving fuels immediately to the owner of the machine or his authorized representative.

SECURING THE MACHINE

Secure the machine against unauthorized starting during refuelling:

- Lower the working equipment to the ground
- Shut off the engine
- Withdraw the key from the electrical system key-switch.

INCREASED RISK OF CONTAMINATION

If the machine is refilled frequently or regularly with fuel from cans or barrels, there is an increased risk of contamination for the fuel system.

In this case, the fuel prefilter must be drained and cleaned more often than specified in the servicing plans.

The fuel filter must be replaced at shorter intervals.

DRIVING

**BEFORE SETTING OFF**

Clean off any earth, mud, snow, ice, grease and oil adhering to your working footwear before operating the machine. There is otherwise a risk of slipping off the pedals and initiating inadvertent movements.

Adjust the driver's seat, steering column and mirrors and fasten the safety belt before setting off.

Do not let other persons accompany you on the machine.

Warn anyone in the vicinity with the horn before setting off.

DO NOT TOW TRAILERS

The machine is not suited for towing trailers or other vehicles. Risk of damage to gearboxes and axles. The tow-bar coupling is provided only for towing or recovering the machine out of hazard areas or for fastening of the machine on transport vehicles; see also "Machine recovery / towing".

DRIVING ON SLOPES

Make sure the wheels have sufficient grip; only then are the machine's full steering and braking capabilities available.

Do not drive across slopes.

Never turn on slopes.

Never steer with the pivot steering on slopes.

REVERSING

During reversing operations, your view of the hazard zone is restricted. Therefore, seek the assistance of experienced marshalls. Instruct the marshaller in order to ensure that you understand his signals correctly.

**PARKING THE MACHINE**

Machines parked on sloping terrain may start moving inadvertently.

Park the machine therefore on a level surface and lower the working equipment to the ground.

DRIVING LONG DISTANCES

The blade must not interfere with the steering range of the front wheels or with the steering linkage.

Do not start the machine when the central warning lamp is flashing; locate the cause of the fault beforehand and rectify.

When driving on public roads:

- Observe the requirements of the machine's general operating permit.
- Close the cab door.
- The first-aid kit, the warning triangle and the warning lamp must be on board.
- Check that the contents of the first-aid kit is complete, replacing missing or old parts.

Check when the engine is running:

- When making short left / right turns the steering wheel must move easily and the steering must react.
- After driving a short distance, the braking effect of the service brake must be tested.

Never idle the machine with the gear lever in neutral position, e.g. when driving downhill.

When driving with the door open, it must be locked in its limit position.



Bring the machine to operating temperature as described in the "Operation and Maintenance Instruction Manual - Warming up the machine" before setting off.

Never demand full performance from the engine unless the machine is at operating temperature.

**SEAT BELT**

Always belt up before driving.

Never run belt over rigid or fragile objects such as bunches of keys or spectacles. This may result in injury.

The belt must always be flat and firm against the body and must not be jammed.

The buckle opening must not be locked, e. g. with paper, as the buckle can then not engage.

Damaged seat belts and those stretched in an accident must be replaced.

ADJUSTING THE STEERING COLUMN

Do not adjust the steering column while driving. Concentrate on the road to avoid accidents.

Before adjusting the steering column:

- Stop the machine;
- Set the gearshift lever to neutral position;
- Apply the parking brake.

MACHINE RECOVERY / TOWING

Tow the machine with a tow-rod or towing cable only.

The tow rod or cable must be undamaged.

They must be dimensioned in such a way that the calculated breaking load is equal to three times the tractive power of the towing machine.

The towing vehicle must have adequate tractive power. Drive slowly and carefully.

All persons must keep clear of the tow rod or cable.

Tow only if the brakes and steering of the machine are functioning properly and if the machine cannot be transported in another way.

Tow defective machines only as far as is needed to recover the machine from hazard zones.

After being recovered, the machine must be secured against inadvertent movement and unauthorized starting.

Repair the machine before transporting it over longer distances, or load it onto a transport vehicle.



The towing speed must not exceed 10 km/h. Tow the machine only out of the hazard zone or transport it on a low loader.

Excessive trailing may damage the transmission.

TOW ROD COUPLING

The tow rod couplings must not be used to tow trailers.

TRANSPORT

The machine may be loaded and transported only if all safety regulations are complied with.

Entrust loading and transporting of the machine to a company experienced in the transport of heavy equipment.

The responsibility for loading and transporting lies with the transport company or their representative.

Remove oil, grease, soil, mud, snow, ice and other materials from the machine's wheels and from ramps and loading platforms of the transport vehicle to minimize slipping.

Use only tying equipment of sufficient strength (the weights of the machine are set out in the Section "Technical Data").

CRANE LOADING

Block the pivot joint if the machine is to be lifted by a crane for loading.

WORKING OPERATION



Read the chapters "Fundamental safety instructions" and "Operation - General instructions" carefully and observe the instructions given in these sections.

Inspect the site for underground gas, power and water lines before starting work. Any damage to such lines is a life-threatening risk.

Clean off any earth, mud, snow, ice, grease and oil adhering to your working footwear before operating the machine. There is otherwise a risk of slipping off the pedals and initiating inadvertent movements.

When driving with the door open, it must be locked in its limit position.

Sound the hooter to warn persons in the immediate vicinity of the machine before starting work.

Never drive across slopes.

Never turn on slopes.

Never steer with the pivot steering on slopes.

Stop work if anyone is in the hazard range of the machine. Continue working only after such persons have left the hazard range.

Always use and operate the machine in such a way as to guarantee its stability.

Trenches and building pits may cave in. Keep well clear of them.

GRADER DEPLOYMENT

The versatility of the graders and the wide range of materials handled allow many different applications and working methods.

We therefore recommend initial operator instruction by the Manufacturer.



Read and observe: "Operation and Maintenance Instruction Manual - Warming up the machine".

Never exceed the admissible transverse and longitudinal inclination of the machine. This affects or interrupts the engine lubrication.

The admissible engine inclinations are:

Transverse: left / right
35° 35°

Longitudinal: deep / high
35° 35°

Lower the working equipment immediately and shut off the engine if the warning lights for engine temperature, engine oil pressure or alternator light up.

WORKING EQUIPMENT**PERSONNEL**

Assembly work may be performed only by operating or repair personnel possessing the necessary know-how.

In the case of insufficient knowhow, meticulous instruction must be given by experienced personnel, e.g. by the Manufacturer.

The personnel must have read and understood the operating instructions, especially the chapter "Fundamental safety instructions".

These people only may operate the machine during installation, in order to make corrections to the working equipment.

Misuse or improper operation of the machine or its working equipment can be highly dangerous.

PERSONAL PROTECTIVE EQUIPMENT AND WORKING CLOTHES

Wear closely fitting working clothes when working on the machine. Loose, wide working clothes can catch in machine parts and cause injury.

Wear a safety helmet, protective working boots and gloves.

**TOOLS AND AUXILIARIES**

Tools, lifting equipment, slings, chocks and other equipment must be in safe operating and working condition.

Metal splinters can cause injury when accessory bolts are being driven in and out. Therefore, a brass or copper mandrel should be used and protective goggles must be worn.

When entering and leaving the cab, use only the intended steps, platforms and handrails.

Keep steps, platforms and handles in safe condition for footholds and handholds. Remove any oil, grease, earth, clay, snow, ice other substances immediately.

SECURING WORKING EQUIPMENT

Set all working equipment down on the ground, so that no movements can occur if mechanical or hydraulic connections become detached.

When working in jointed areas lock the pivot joints. Remove the locks when work is finished.

Secure any equipment or components which are to be attached or detached or whose position is to be altered, with hoists or suitable slinging/supporting devices to prevent them from moving, slipping or falling.



SECURING THE MACHINE

Work on the working equipment should only be carried out if the machine has been secured as described in the chapter "Securing the machine".

SELECTING THE WORKING EQUIPMENT

The machine can be fitted with a variety of working equipment. The working equipment components are assembled with hydraulic cylinders and connectors. The components can be combined in a variety of ways so that the working equipment can be best adapted to the specific task.

Operate the machine only with equipment and component combinations approved by the Manufacturer for this machine.

Install and commission equipment and component combinations only after the Manufacturer has checked the proposal and given its approval in writing.

Attachments from other manufacturers subject to the EC Machine Directive 89/392 EEC may be mounted and put into operation only if:

- the manufacturer's declaration of conformity,
- the declaration of compatibility from CNH are at hand.

SECURING THE MACHINE



RISK OF INJURY

The machine must not be started by unauthorised persons.
Therefore, secure the machine.

Secure the machine as described below:

- Before carrying out any servicing or repair work on the machine.
- Before fitting or changing the working equipment.
- Park the machine on level, firm ground.
- Set working equipment down on the ground.
- Apply parking brake.



Never shut off the engine out of full load, but continue running for ca. three minutes at idling speed to cool down.

- Turn off engine.
- Remove key from the key switch in the electrical system.
- Depressurize the hydraulic system.
- Lock the pivot joint.
- Secure open hood.
- Secure the machine from rolling away by placing chocks under the wheels.
- Switch off battery main switch and remove switching lever.
- Disconnect batteries before work on the electrical system or before welding work.
- When doing welding jobs on the machine, observe "Repair work - Welding operations".

INSPECTION AND SERVICING

GENERAL INSTRUCTIONS



WORKSHOP MANUAL

No inspection and servicing work must be carried out until the Service Manual has been read and understood.

Pay special attention to the:

"Fundamental Safety Instructions" and all warnings and safety instructions attached to the machine.

The Workshop Manual contains the necessary information in order to perform all repair and maintenance jobs.

However working on the machine must be carried out only by specialised personnel specially trained for this activity.

INSPECTION AND SERVICING PERSONNEL

Inspection and servicing personnel must have the necessary knowhow on the inspection and servicing of this or comparable machines.

The necessary know-how can be acquired in several days' instruction, e.g. by a CNH mechanic or by attending a CNH training course.

PERSONAL PROTECTIVE EQUIPMENT AND WORKING CLOTHING

Wear closely fitting working clothing when working on the machine.

Loose, wide garments may catch on machine parts and result in injury.

Wear a safety helmet, safety footwear, gloves and, in the event of high noise levels, ear protectors.



SECURING WORKING EQUIPMENT

Stand working equipment on the ground in such a way that no movements can be made if mechanical or hydraulic connections become detached.

When working in jointed areas, block off the joints. Remove the blocks on finishing work.

If the machine has to be jacked up, the front axle must first be wedged in place to prevent it from moving.

Secure any equipment or component which is to be mounted or dismantled, or whose position is to be changed, with hoists or appropriate slinging/supporting devices to prevent them from moving, slipping or falling inadvertently.

SECURING THE MACHINE

Carry out servicing work only if the machine is secured as described in the chapter "Securing the Machine".

CLIMBING ONTO AND OFF THE MACHINE

Use only the steps, platforms and handrails provided when climbing onto or off the machine.

Always keep steps, platforms, handles and handrails in a non-slip, safe state and remove any oil, grease, soil, clay, snow, ice and other foreign matter immediately.

Always face the machine when climbing on and off.

CHECK STATE OF TOOLS

Use only fully functional, reliable tools.

Select the right tool for the job. Wrenches of the wrong size, for example, may slip and cause injury.



CLEANING JOBS

Clean the units within the working range before starting work. Select the cleaning agent according to the material constituting the parts to be cleaned.

Example: Never clean rubber or electrical parts with solvents or steam jets.

Use lint-free cleaning rags when working on the hydraulic system or the engine.

Cleaning agents and solvents may give off harmful, readily flammable vapours.

Never work with such agents except on well ventilated premises; never inhale the vapours and never smoke.

Prevent solvents and cleaning agents from coming into contact with the skin.

Wear solvent-resistant gloves.

Observe the instructions on the packaging.

HANDLING FLAMMABLE LIQUIDS

When handling flammable liquids:

- never smoke;
- keep away from unshielded light sources and naked flames.

Fuel and other consumables often have low flash points and are readily ignited.

Never attempt to extinguish burning liquids with water. Use:

- dry powder,
- carbon dioxide or
- foam extinguishers.

Water used for extinguishing purposes would vapourize instantaneously on contact with burning substances and spread burning oil, for example, over a wide area. Water generates short circuits in the electrical system, possibly producing new hazards.

Notify the fire brigade.



FASTENING AND SECURING ELEMENTS

Check fastening and securing elements, e.g. bolts, nuts, washers, before using them again.

Replace any damaged parts.

HANDLING OILS AND GREASES

Hot lubricant or hydraulic oil emerging uncontrolled from the system may result in severe burns.

Cool any burns immediately with running water and apply a dry dressing.

Never set foot within reach of the emerging oil jet.

Avoid contact with the skin. Wear gloves and firm protective clothing.

Used oil may be harmful to the skin.

Clean soiled skin thoroughly with warm soapy water and apply a barrier cream. Never use fuels or solvents for cleaning the skin.

If you have swallowed any oil, avoid vomiting but consult a doctor or a hospital immediately.

VISIBLE LOSS OF OIL

Have any visible leakage repaired immediately.

Escaping oil is an environmental hazard.

Soak up any oil that has escaped with a binding agent. Sweep up binding agent and dispose of it separately from other waste.



RELIEVING RESIDUAL PRESSURE IN THE HYDRAULIC SYSTEM

Only unpressurized hydraulic systems may be opened. Even when a machine is parked on a horizontal surface with its attachments supported on the ground and its driving motor switched off, there may still be substantial residual pressure in parts of the hydraulic system, e.g. primary pressure from the last hydraulic movements prior to stopping the machine.

Residual pressure is reduced only gradually. If an intervention into the hydraulic system is to be undertaken immediately after stopping, depressurize the system as described in the Section "Hydraulic System".

SCREWED CONNECTIONS, PIPING, HYDRAULIC HOSES

Repair any leakages in the piping and hose system immediately.

A fine, highly pressurized jet of hydraulic oil can penetrate the skin.

Never search for leakages with the fingers, but use a piece of cardboard and always wear goggles.

If oil has penetrated into the skin, consult a doctor immediately.

Never repair damaged piping; always replace it.

Replace hydraulic hoses immediately on detecting any damage or moist areas.

Tighten leaking screw plugs only when the system is depressurized.

Escaping oil is an environmental hazard.



ENVIRONMENTALLY COMPATIBLE DISPOSAL

Oils, greases, brake fluids, cleaning agents, solvents and oily components, e.g. filters, cleaning rags, replaced wear parts and unserviceable machine parts, must be disposed of separately in the interests of environmental protection.

Never dispose of such substances with standard household refuse.

Empty substances into the containers provided for this purpose.

Even biodegradable, "environmentally friendly" hydraulic oil has to be disposed of separately like any other oil.

Never allow oils and oily waste to get into the soil or into water: environmental hazard!

SEALING FACES

Clean sealing faces prior to assembly.

EXHAUST GASES

Exhaust gases are a health hazard: never inhale them.

When working on enclosed premises, draw off exhaust gases with a suction plant and ventilate the premises well.



HANDLING BATTERIES

Batteries give off explosive gases.
 Never handle batteries close to naked flames and unshielded light sources, never smoke.

Remove batteries if welding or grinding is to be done at close quarters and store them in a safe place.

Battery acid is toxic and corrosive.

Avoid any contact with the skin, mouth, eyes and clothing. Avoid spilling battery acid or inhaling the vapours.

Wear solvent-resistant gloves, firm protective clothing and goggles when handling batteries.

If acid splashes onto the skin, rinse off thoroughly with water, then seek medical advice at a medical practice or hospital.

If the eyes are splashed with acid, rinse thoroughly with running water, then seek medical advice immediately at an ophthalmological practice or a hospital.

Never wear metal necklaces, bracelets or watch-straps when working on the battery. The metal parts may induce a short circuit, resulting in burns.

Dispose of used batteries separately from other waste in the interests of environmental protection.

PRIOR TO WORK ON THE ELECTRICAL SYSTEM

Prior to any work on the electrical system involving tools, spares etc. coming into contact with electric cables or contacts, disconnect the battery.

Disconnect first the negative pole, then the positive pole.

After work:
 Connect first the positive pole, then the negative pole.
 Read and observe the chapter "Electrical system".



SELECTING OILS AND GREASES

Use the recommended qualities only, matching viscosities with the temperature level.

FILTERS

Replace all filter elements or filter cartridges within the specified periods.

All filters are coordinated carefully with the equipment. Original Parts must be used to ensure smooth running and a long service life of the engine and the hydraulic units.

SEALING ELEMENTS

When dismantling parts, pay attention to sealing elements.

Check sealing elements prior to installation and replace any that are even slightly damaged.

When assembling, ensure a perfect fit.

OIL-LEVEL CHECK AND OIL CHANGE

Position the machine horizontally.

Change the oil when the machine is at operating temperature. Warm oil flows better and carries suspended particles (carbon or abraded matter) better.

LUBRICATING

Clean the lubricating nipple, then lubricate as scheduled.



AFTER SERVICING

To prevent corrosion, coat all bright metal parts with a grease film.

On completing work, reinstall all protective devices.

Never start up the drive motor while work is being done on the machine.

Carry out a performance test with the machine.

FUEL SYSTEM**EXPLOSION HAZARD DUE TO VAPOURS**

Fuel vapours are easily flammable and likely to explode. Therefore, avoid the formation of sparks and do not use open flames such as lighters or matches for illumination purposes.

When you have to work on the fuel system:

- shut off the engine and the auxiliary heating;
- secure the machine;
- avoid open flames;
- do not eat, drink or smoke.

POSSIBLE HEALTH HAZARD

Diesel fuel and the water / fuel mixture drained off are a health hazard. These liquids must not be swallowed.

Avoid prolonged contact with the skin.

Do not inhale the fumes.

Wear protective gloves or use a barrier cream.

AVOID ENVIRONMENT POLLUTION

Collect escaping fuel and discard without polluting.

Fuel filter cartridges and fuelstained cleaning rags must be disposed of separately from other waste.

**NEVER FILL IN "BIO-DIESEL"**

The injection system and the engine are at risk of being damaged if "Bio-diesel" is used.

Fill up the machine only with diesel fuel made from mineral oils acc. to the EN 590 standard.

For more information please contact your Dealer service.

REFUELLING FROM CANS

If the machine is filled up frequently or regularly with fuel from cans or drums, there is an increased risk of dirt particles and water getting into the fuel system.

In this case:

- always fill in fuel through a finemeshed strainer;
- dewater the fuel filter more often than specified in the servicing plan;
- drain water and deposits from the tank bottom at shorter intervals;
- replace all fuel filters at shorter intervals.

ELECTRICAL SYSTEM



Risk of injury from battery acid and gases.

Wear goggles, protective gloves and strong working clothes.

PRIOR TO WORKING ON THE ELECTRICAL SYSTEM

Shut off the engine.

Set 'Electrical System' key switch to 0 and withdraw key.

Set battery main switch to OFF and withdraw switching lever.

Disconnect control elements and control console from machine circuit.

Prior to working on the electrical system where tools, spare parts, etc. may come into contact with electrical cables or contacts, turn off the battery main switch or disconnect the battery.

Disconnect the negative pole first, then the positive pole.

After work:

Reconnect the positive pole first, then the negative pole.

Read and observe "Operating Instructions - Alternator, control elements and control console".

Read and observe "Inspection and servicing - General instructions".

Always use a meter for voltage and continuity testing.

Do not use any test lamp.

Do not "tap against ground".

This will cause a short circuit with consequent damage to the generator or to the PCS electronic system.



ALTERNATOR

Never disconnect electrical connections on the alternator, regulator and battery when the engine is running.

This would damage the alternator and regulator.

When connecting the batteries, never interchange the cables (pay attention to polarity).

Voltage and continuity tests must be done with a meter only.

Never use a test lamp.

Never check by touching ground with a bare wire.

The resulting short circuit damages the alternator and the regulator.

When starting up the engine, the alternator is controlled (pre-excited) by an electronic circuit. This ensures that the alternator can discharge power.

The circuit is an integral part of the central electronic system in the console.

A LED in the console (load control) shows that the alternator is functioning correctly. This LED must light up when the key-switch is switched on and go out when the engine is running.

If this is not the case, there is a fault in the alternator circuit or in the console.

To prevent further damage, the cause of the fault must be located and rectified as quickly as possible.

Consult your local Dealer.

POWERSHIFT TRANSMISSION

Read and observe: "Inspection and servicing - General instructions".

As the torque converter of the powershift transmission may be emptied into the transmission while the engine is stationary, the oil level must be checked while the engine is running.

It is vital therefore to respect the safety instructions set out in the following sections.

HYDRAULIC SYSTEM**RISK OF INJURY**

from hydraulic oil under high pressure.

from hydraulic fluid or hot parts of the engine.

Before working on the hydraulic system, make sure the system has been depressurized and that any residual pressure has also been released (see the section "Hydraulic system").

Shut off the engine and let the machine cool down.

Secure the machine as described in the chapter "Securing the machine".

Avoid skin contact with hydraulic oils. Skin contact with hydraulic oils is a health hazard.

Wear gloves and firm working clothing.

Read and observe: "Inspection and servicing - General instructions".

BRAKES**PERSONAL**

Do not carry out inspection and maintenance work on brakes unless you are qualified for working on brake systems.

If in doubt, have the work performed by our after-sales service.

Read and observe the instructions in the section: "Inspection and servicing - General instructions".

SECURING THE MACHINE

Inspection and maintenance work on brakes should only be carried out if the machine has been secured as described in the section "Securing the machine".

HEALTH PRECAUTIONS

Do not inhale abraded particles from brake linings. Wear a breathing mask.

**ACCUMULATORS**

Accumulators are installed in the hydraulic system. These accumulators contain nitrogen under high initial pressure.

Even when the hydraulic pressure in the system is reduced, the nitrogen remains in the accumulator.

The accumulators are completely safe in operation. If incorrectly handled, however, there is a risk of explosion.

So:

- Never handle accumulator mechanically, never weld or solder it.
- Testing and servicing work must be carried out by experts only.
- Prior to any testing and servicing work, depressurize the hydraulic part of the system.
- To dismantle the accumulator, always wear goggles and working gloves.
- Fill accumulator with nitrogen only, never with compressed air or oxygen.
- Report any defects or damage to the machine owner without delay.
- Prior to recommissioning, an inspection by a specialist or expert is essential if the accumulator was damaged or if the admissible operating temperature or operating pressure was exceeded.

Never remove or paint over warning and information plates, rating plates or type identification markings. Replace illegible or damaged plates immediately.

TYRES AND WHEELS**RISK OF INJURY**

Heat-induced combustion of gas inside the tyre may lead to explosions in air-inflated tyres.

This heat may be due, for instance, to frequent use of the brakes or to welding work carried out on the machine. A heat-induced tyre explosion is more violent than that occurring during normal bursting of tyres. Such an explosion can eject parts of the tyre and the rim over several hundreds of meters. Exploding and/or bursting tyres and ejected parts of tyres and rims may cause severe or sometimes even fatal injuries.

Therefore:

- If a tyre is suspected to be too hot, secure the machine and wait some distance away until the tyre has cooled down.
- Before inflating the tyre, check the tyre itself, the rims and rim components for damage, penetrated foreign objects and perfect fit.
- Have detected faults always rectified immediately by specialized workshops.
- If you are in doubt about the safe condition of the tyre, the rims or rim components, do nothing yourself but have the complete wheel removed by a special workshop. Changing of tyres, rims or rim components requires special tools and procedures and must therefore always be carried out by a workshop with special equipment for this kind of work.
- Never carry out works on rims and tyres unless you are qualified to do so.

**TYRE PRESSURE**

Bursting tyres and parts splintering away from the rims or from the tyre itself may cause severe injury.

The following instructions must therefore be strictly observed:

- Before inflating the tyre, check the tyres, rims and rim parts for damage, penetrated foreign objects and proper fitting.
- Have all damage detected repaired by a qualified workshop.
- Check the tyre inflation pressure only when the tyres are cold. After warming up, the pressures indicated are higher than usual.
- Use a tyre inflator with a long filling hose, snap-on valve and pressure gauge.
- Use only compressed ambient air for inflating the tyres. Never use flammable gases: risk of explosion.
- Keep away from the tyre during inflation and always stand besides the tyre tread.
- Watch the tyre and the gauge of the filling gear permanently during inflation and never exceed the specified tyre pressures.
- Place a safety cage around dismantled wheels.
- When pumping up, make sure all persons are well clear of the tyre.

Always inflate the tyres to the prescribed pressure:

- Excessive pressures result in poor off-road handling properties and tyres may burst;
- Insufficient tyre pressures lead to increased tyre wear and to inadequate stability of the machine.

WHEEL-NUTS

Always tighten the wheel-nuts with a torque wrench. Recheck with a torque wrench for tightness after several hours of operation.

**DRIVING ON ROADS**

When driving on the road check that the tyres have the prescribed minimum tread and the correct air pressure.

Always make sure that both axles are equipped with tyres of the same size and same degree of wear.

Tyres with different diameters may cause damage to the differentials.

To avoid excessive tyre wear:

- inflate to the correct air pressure;
- do not start or brake abruptly;
- take corners slowly.

Clean the tyres and the gaps between the tyres before driving on public roads. This helps to avoid putting other road users at risk from soiled traffic lanes or from lumps of soil or stones ejected from the wheels.

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