

# F156.6

# F156.6A

## GRADER

# Workshop Manual

Print No. 604.13.572 English  
III - 2005



**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.**

# SUMMARY

SAFETY INSTRUCTIONS .....	SECTION 0
TECHNICAL DATA .....	SECTION 1
ENGINE .....	SECTION 2
TRANSMISSION .....	SECTION 3
REAR AXLE .....	SECTION 4
FRONT AXLE.....	SECTION 5
ATTACHMENT .....	SECTION 6
HYDRAULIC SYSTEM.....	SECTION 7
BRAKE SYSTEM .....	SECTION 8
STEERING SYSTEM .....	SECTION 9
ELECTRICAL SYSTEM .....	SECTION 10
OPERATOR'S CAB .....	SECTION 11



## 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

## INDEX

SUBJECT	PAGE
FUNDAMENTAL SAFETY INSTRUCTIONS .....	0-1
Warnings and symbols.....	0-1
Designated use .....	0-1
Organizational measures .....	0-2
Selection and qualification of personnel	
Basic responsibilities.....	0-3
Safety instructions governing specific operational phases .....	0-4
Special work in conjunction with use of the machine	
Maintenance and repairs during operation	
Disposal of parts and consumables .....	0-5
Warning of special dangers .....	0-6
Transporting and towing	
Recommissioning.....	0-7
WARNING AND INSTRUCTION SIGNS .....	0-8
Left side .....	0-9
Right side .....	0-11
OPERATION.....	0-13
General instructions .....	0-13
Refuelling .....	0-15
Refuelling system (Option).....	0-16
Driving .....	0-17
Machine recovery / towing .....	0-19
Tow rod coupling.....	0-19
Transport .....	0-19
Crane loading.....	0-19
Working operation.....	0-20
Grader deployment .....	0-20
Working equipment.....	0-21
Securing the machine .....	0-22
INSPECTION AND SERVICING.....	0-23
General instructions .....	0-23
Fuel system.....	0-27
Electrical system .....	0-28
Powershift transmission .....	0-29
Hydraulic system.....	0-29
Brakes .....	0-30
Tyres and wheels.....	0-31
Air conditioner (Option) .....	0-33
Repair work.....	0-34



## FUNDAMENTAL SAFETY INSTRUCTIONS

### WARNINGS AND SYMBOLS

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

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

### 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><b>Using the machine for purposes other than or extending beyond those stated above, e.g.:</b></p> <ul style="list-style-type: none"> <li>- for the transportation of persons;</li> <li>- as a working platform;</li> <li>- for pulling or transporting loads without the working equipment being approved for such purposes is considered contrary to the designated use.</li> </ul> <p><b>Improper use may involve a life-threatening risk for operators or other personnel or may cause injury or extensive damage.</b></p>
---	---

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 3<sup>rd</sup> 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**

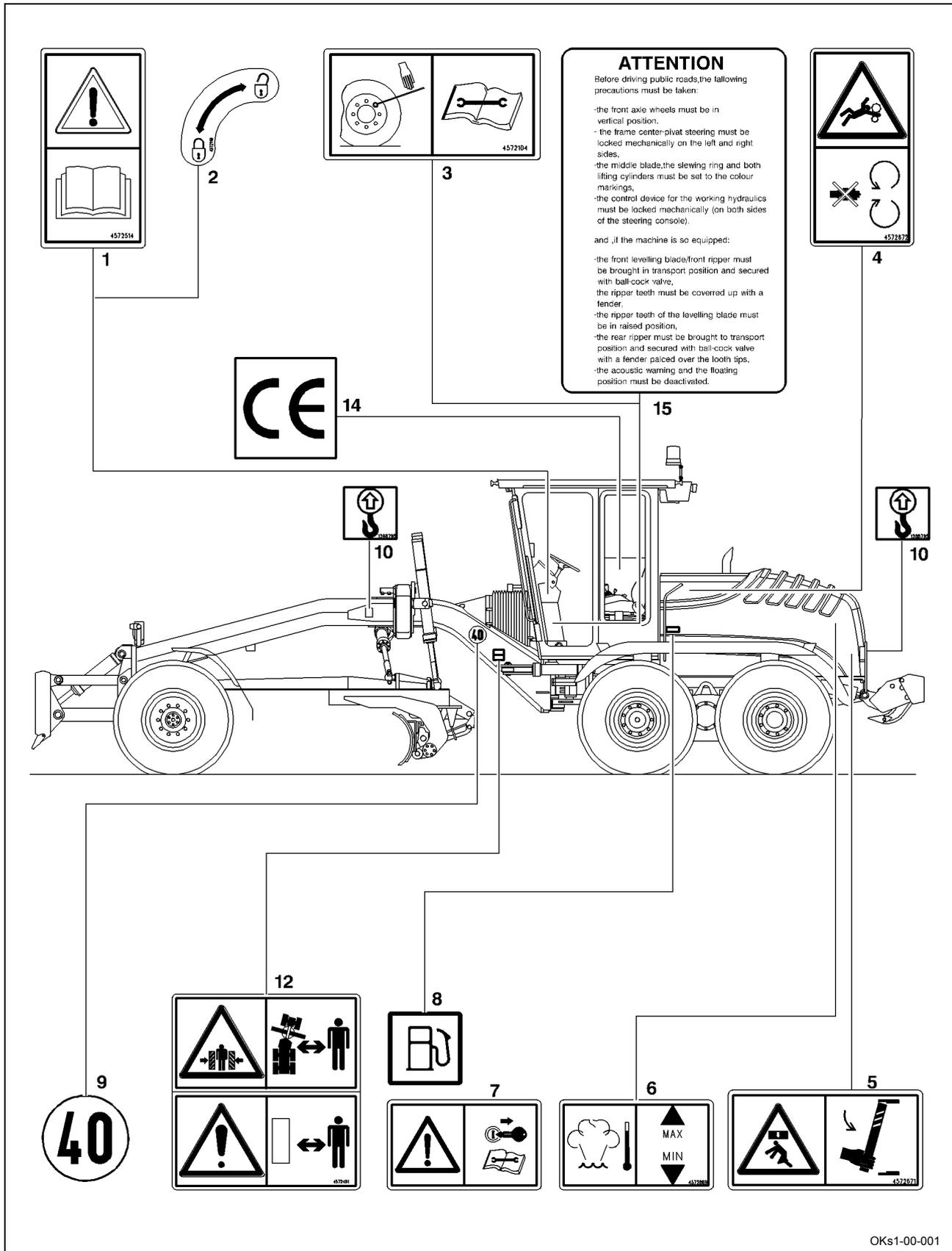
The machine must be towed, loaded and transported only in accordance with the operating instructions.

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.

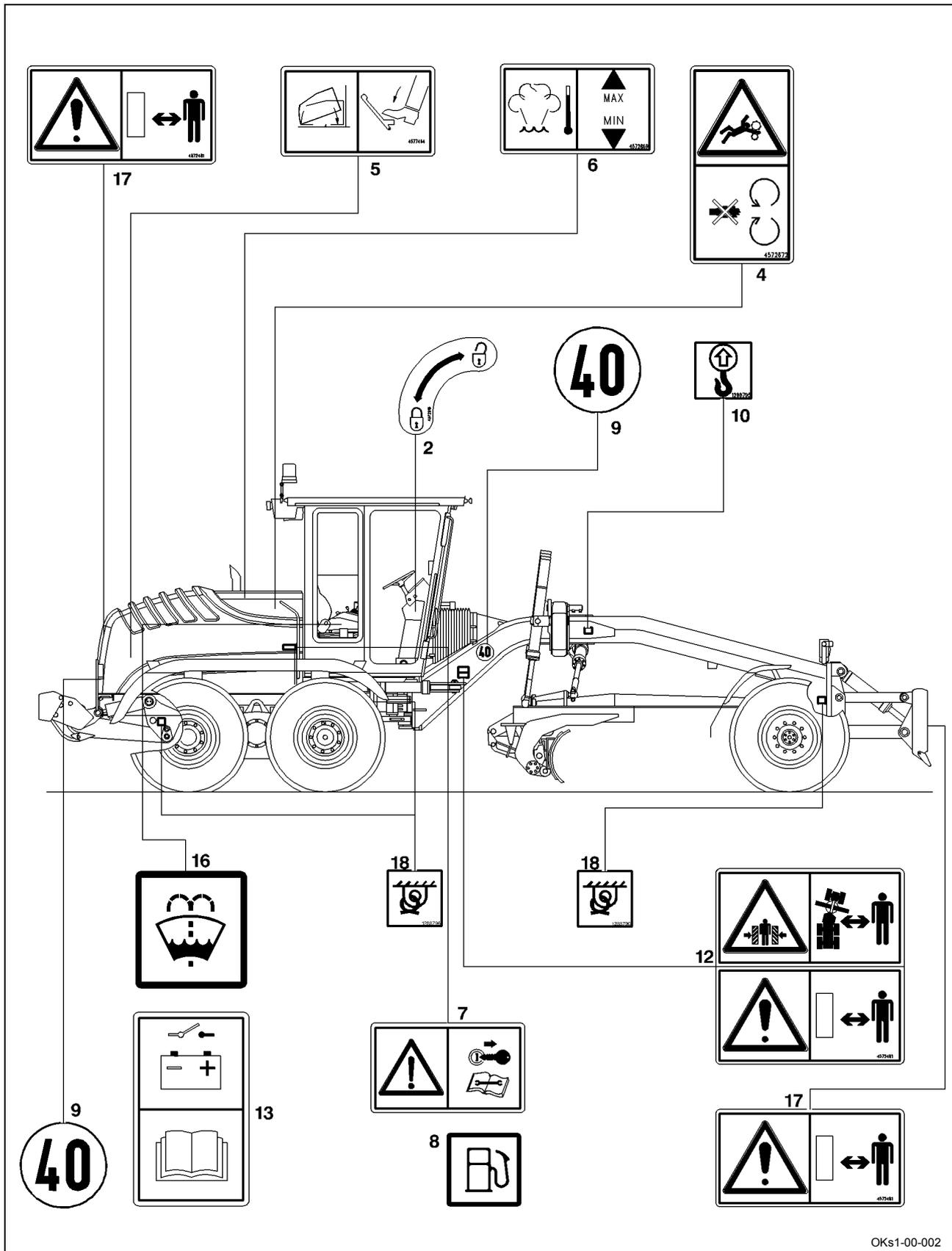
Keep signs clean and legible.

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.



OKs1-00-002

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.

**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".