

# W50 - W60

# W70 - W80

## WHEEL LOADER

# 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.**

## PREFACE

The **Workshop Manual** has been written for the **repair specialist**. It provides important information on carrying out repair work expertly.

Please go carefully through the **Workshop Manual** as well as the Operation and Maintenance Instruction Manual for the **wheeled loader** before starting any repair work. Use the **Workshop Manual** as well as the **Operation and Maintenance Instruction Manual** and **Parts Catalog** as a reference book and source of information even if you are familiar with wheeled loader technology.

Using the Workshop Manual, the experience construction machine mechanic can carry out any necessary repairs expertly.

## HANDLING

The Workshop Manual is divided into main groups and subgroups, and covers the originally delivered version of the machine. Any additions or modifications undertaken at a later date are not described in this manual.

The required information can easily be found by referring to the table of contents.

For reasons of clarity, some of the illustrations are presented in simplified form. Differences from the actual version at the wheeled loader are therefore possible if this adds to the clarity of the information.

## REPAIR

Carry out any necessary repair work as soon as possible. This reduces repair costs and increases the availability of your wheeled loader.

When doing any work on the wheeled loader, always observe the instructions given in the Workshop Manual and in the Operation and Maintenance Instruction Manual.

Extensive works not described in the Workshop Manual will gladly be executed for you by the dealer.

Always use **original spare parts** only.

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**SECTION 0**

**SAFETY INSTRUCTIONS**

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## FUNDAMENTAL SAFETY INSTRUCTIONS

### WARNINGS AND SYMBOLS

The following signs are used in the Workshop Manual to designate exceptionally important information:

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

### RISKS RESULTING FROM FAILURE TO OBSERVE THE SAFETY INSTRUCTIONS

	<p><b>This wheeled loader has been built in accordance with state-of-the-art standards and recognized safety regulations.</b></p> <p><b>Nevertheless, its use may constitute a risk if it is still operated despite a suspected or obvious defect or if it is inexpertly repaired.</b></p> <p><b>There is then a potential</b></p> <ul style="list-style-type: none"> <li>- risk to life and limb</li> <li>- risk of the machine and other assets being damaged.</li> </ul> <p><b>The wheeled loader must be stopped immediately if suspected or obvious damage represents a risk to the safety of the operator, of other persons at the deployment site, or of other assets.</b></p> <p><b>All components are carefully coordinated. Original parts must be used to ensure smooth running and a long service life.</b></p>
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### ORGANIZATIONAL MEASURES

The Operation and Maintenance Instruction Manual must always be at hand at the deployment site of the machine, e.g. in the container provided.

In addition to the Operation and Maintenance Instruction Manual, observe and instruct the user in all other generally applicable statutory and other mandatory regulations relevant to accident prevention and environmental protection.

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

The Operation and Maintenance Instruction Manual must be supplemented by instructions covering the duties involved in supervising and notifying special organizational features, such as job organization, working sequences or deployed personnel.

The personnel assigned to work on the machine must have read the operating instructions and in particular the Safety Instructions section before starting 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 servicing.

Check at least occasionally whether the work is being carried out in compliance with the Operation and Maintenance Instruction Manual and with attention being paid to risks and safety factors.

Long hair must be tied back or otherwise secured, garments must be close-fitting, and no jewellery including rings may be worn. Injury may result from such items being caught up in the machinery or catching on moving parts.

Use personal 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 Operation and Maintenance Instruction Manual for routine checks and inspections.

For the execution of maintenance work, tools and workshop equipment equal 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

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

Deploy 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 / 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 only by skilled personnel 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.

## OPERATION, SAFETY INSTRUCTIONS

### Standard operation

Avoid any operational mode that might be prejudicial to safety.

Before starting 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 the public highway.

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, e.g. removable safety devices, emergency shut-off equipment, sound-proofing elements and extractors, 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 Operation and Maintenance Instruction Manual.

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 driving through underpasses or tunnels, over bridges or 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. Shut off the engine.

## MAINTENANCE, SAFETY INSTRUCTIONS

Observe the adjusting, maintenance and inspection activities and intervals set out in the Operation and Maintenance Instruction Manual, 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 Operation and Maintenance Instruction Manual 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 and
- 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 work. Never use aggressive detergents. Use lint-free cleaning rags.

Before cleaning the machine with water, steam jet (high-pressure cleaning) or detergents, cover or tape up all openings which have to be protected against water, steam or detergent penetration for safety and functional reasons. 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 fire-fighting systems do not come into contact with hot cleaning agents as this might activate the extinguishing 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 work. 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: life-threatening 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 and 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 de-energized with certainty.

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 fuel-operated 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 of 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 opened 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 Operation and Maintenance Instruction Manual.

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

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

The recommissioning procedure must be strictly in accordance with the Operation and Maintenance Instruction Manual.

**REPAIRS, SAFETY INSTRUCTIONS****OPERATION AND MAINTENANCE INSTRUCTION MANUAL**

Never start repair work without having read and understood the Operation and Maintenance Instruction Manual.

Pay special attention to: "Fundamental Safety Instructions",

"Inspection and Servicing, Safety Instructions"

and all warning and instruction signs attached to the machine.

The descriptions of operational sequences are designed for experienced personnel only.

Always keep the Operation and Maintenance Instruction Manual with the machine.

**REPAIR PERSONNEL**

Repair personnel must have know-how and experience relevant to the repair of this or comparable machines.

Inexperienced personnel must be thoroughly trained by experienced repair personnel.

**BLOCKING THE PIVOT JOINT**

When carrying out repair work in the pivot range, block the pivot joint. Remove the block on completing work.

**PRETENSIONED UNITS**

Never open damaged pretensioned units but replace them as complete units.

Open them only in exceptional cases where the system and the working sequence are exactly known and the necessary special tools are available.

The Operation and Maintenance Instruction Manual contains no relevant information.

**DISMANTLING COMPONENTS**

Never dismantle components while the machine is still at operating temperature.

Oils, greases, brake fluid or coolant may have a high temperature and thus result in burning or scalding.

Wait for the machine to cool down.

Depressurize pipelines and hoses, cylinders, radiator, hydraulic tank, compressed air reservoir and other systems or units before starting work.

Replace defective components in good time to prevent greater damage.

Clean the defective component carefully before dismantling it. Mark dismantled components in the correct sequence to facilitate installation.

When dismantling the component, close exposed hose and pipe connections, open boreholes and housings with care to prevent dirt from penetrating.

## ACCUMULATORS

### Safety Instructions



#### NEVER REMOVE LEAD SEALS

Never change the rated pressure of pressure-reducing valves without the explicit authorization of the Service department.

Never remove lead seals from pressure-reducing valves and accumulators.

#### AFTER REPAIR WORK

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

On completing the work, reassemble all protective devices, covers, and sound- and vibration-insulation material.

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

Check the repaired components and all machine functions with a trial run.

Never release the machine for re-commissioning until it is fully functioning.



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.

Therefore:

- Never handle accumulators mechanically, never weld or solder them.
- 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 eye protection and working gloves.
- Fill accumulators with nitrogen only, never with compressed air or oxygen.
- Report any defects or damage to the machine owner without delay.
- Prior to re-commissioning, an inspection by a specialist or expert is essential if the accumulator has been damaged or if the admissible operating temperature or operating pressure has been exceeded.

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

**ENGINE****Engine, repair instructions**

Before working on the engine, read and observe: "Repair, safety instructions" and the Operation and Maintenance Instruction Manual for the engine.

Risk of injury from rotating or hot engine components.

Shut off the engine and wait for it to cool down.

Do repair work only if the machine is secured as described under "Securing the machine" in Operation and Maintenance Instruction Manual.

Check and replace V-belts only when the engine is stationary.

Repair work on the engine demands extensive know-how and special tools.

If in doubt, have the repair work carried out by the Service Dept. or by your local dealer.

**Assisted starting (with jumper cables), safety instructions****EXPLOSION HAZARD**

Battery gases contain hydrogen and are highly flammable. Keep potential ignition sources such as unshielded lights or lighted cigarettes away from the batteries.

Risk of injury from acid splashes and battery gases.

Never lean over the batteries when starting the machine from another vehicle.

Wear goggles.

Never use assisted starting if the batteries are defective or frozen.

Never connect batteries (battery assemblies) unless they have the same voltage.

Use only tested jumper cables with insulated terminal clips and an adequate lead diameter.

Ensure that the bodies of the supplying and receiving machines are not in contact. Otherwise a current flow could result from connecting the positive poles. Risk of short-circuiting.

Never use assisted starting involving overvoltage, e.g. two or three batteries connected in series or auxiliary devices generating higher voltages than 12V.

Never use welding generators or welding transformers as a source of current.

Position the jumper cables in such a way that they cannot be caught by rotating engine components.

Read and observe: "Inspection and Servicing, Safety Instructions", paying special attention to the section "Handling batteries".

## WELDING OPERATIONS

### Welding Operations, safety instructions



**Never perform welding operations unless you are qualified to do so.**

**Observe the accident prevention regulations.**

**Any work on receptacles that contain or have contained substances:**

- which are combustible or which encourage combustion,
- which are susceptible to explosion, or
- which may develop health-hazardous gases, vapours, mist or dust during welding operations,

**must be carried out only under expert supervision and only by experienced persons authorized to do such work.**

**Should you have any problems or queries, apply to the Service department.**



**Prior to any welding operations on the machine:**

- Disconnect the battery, first at the negative terminal and then at the positive terminal.
- Disconnect the positive terminal at the alternator.
- Protect the disconnected terminals and plugs from short-circuiting and soiling by covering them with foil or adhesive tape.

**Apply the welding current terminals very close to the welding point.**

**The welding current must not flow via the ball bearing slewing rim, via pin couplings or link joints of hydraulic cylinders.**

**On completion of the welding operation, restore all electrical connections.**

**When connecting the battery, first connect the positive terminal and then the negative terminal.**

# SECTION 1

## SERVICE DATA

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## 1.1 FOREWORD

The Technical Handbook "Service Data" contains details which are important to the service staff. Data included in other parts of the general documentation have been left aside. The set of documents for an CNH construction machine includes:

- Operation and Maintenance Instruction Manual
- Parts Catalog
- Dimension Table or Dimension Sheet "Techn. Data".

Workshop Manual and "Service Information" bulletins (si) are, furthermore, to be considered as supplements to the general documentation.

Data regarding auxiliary units for operating ancillary or special systems, as well as data on machines produced only in small numbers, have not been included.

Filling quantities are only approximate figures intended to help in stockholding the various fluids and agents. Each unit has appropriate checking systems, e.g. dipstick or checking screws, with which the exact filling level can be checked.



**The Part Nos. given in the sections are not to be used when ordering spare parts. They are only intended to identify the component being referred to. When ordering spare parts, use only the Part Nos. given in the Parts catalog or the internal microfilms.**



**Anyone involved with commissioning, operating, inspecting and servicing the CNH construction machine must read through and acquaint himself with the Operation and Maintenance Instructions Manual - and especially the Section SAFETY INSTRUCTIONS - before starting work.**

## 1.2 SI- AND ADDITIONAL UNITS

### 1.2.1 QUANTITIES OF SPACE AND MASS

Quantity	Symbol	Unit			Conversion		Explanation Remark
		old	new		For exact calculation	For rough calculation (appr. 2% inexact)	
			SI - Units	Selection of additional units			
Length	l	mm, cm, dm, m, km	m	mm, km			
Area	A	mm <sup>2</sup> , cm <sup>2</sup> , dm <sup>2</sup> , m <sup>2</sup>	m <sup>2</sup>	mm <sup>2</sup> , cm <sup>2</sup>			
Volume	V, Vn	mm <sup>3</sup> , cm <sup>3</sup> , dm <sup>3</sup> , m <sup>3</sup> , l	m <sup>3</sup>	mm <sup>3</sup> , cm <sup>3</sup> , dm <sup>3</sup> , l			
Mass	m	mg, g, kg, Mg=t, (kg <sub>f</sub> s <sup>2</sup> /m)	kg	mg, g, Mg, t			
Density	r	g/cm <sup>3</sup> , kg/dm <sup>3</sup> , (kg <sub>f</sub> s <sup>2</sup> /m <sup>4</sup> )	kg/m <sup>3</sup>	g/cm <sup>3</sup> , kg/dm <sup>3</sup>			
Inertia moment	J	kg m <sup>2</sup> (kg <sub>f</sub> m s <sup>2</sup> )	kg m <sup>2</sup>	Mg m <sup>2</sup>	1 kg <sub>f</sub> m s <sup>2</sup> = 9.81 kg m <sup>2</sup>	1 kg <sub>f</sub> m s <sup>2</sup> = 10 kg m <sup>2</sup>	
Specific volume	v	m <sup>3</sup> /kg, m <sup>3</sup> /t	m <sup>3</sup> /kg	m <sup>3</sup> /Mg			

## 1.2.2 TIME RELATED QUANTITIES

Quantity	Symbol	Unit			Conversion		Explanation Remark
		old	new		For exact calculation	For rough calculation (appr. 2% inexact)	
			SI - Units	Selection of additional units			
Time	t	s, min, h, d = day	s	ms, min, h, d			
Frequency	f	Hz	Hz				1 Hz = 1/s
Rate of revolutions	n	rev/min	1/s	1/min			s = min/60
Speed	v	m/s, km/h	m/s	km/h			
Acceleration	a	m/s <sup>2</sup>	m/s <sup>2</sup>				
Volume flow	V	m <sup>3</sup> /s, m <sup>3</sup> /min, m <sup>3</sup> /h	m <sup>3</sup> /s	m <sup>3</sup> /min, l/h			
Mass flow	m	kg/s, kg/min, kg/h	kg/s				
Heat flow	Φ	kcal/h	W	kW, MW	1 kcal/h = 1.163 W	1 kcal/h = 1.2 W	1 W = 1 J/s = 1 Nm/s
Specific fuel and oil consumption	b, b <sub>s</sub>	kg/CVh g/CVh	kg/J	g/kWh	1 g/CVh = 1.359 g/kWh	1 g/CVh = 1.36 g/kWh	

## 1.2.3 QUANTITIES OF FORCE, ENERGY AND POWER

Quantity	Symbol	Unit			Conversion		Explanation Remark
		old	new		For exact calculation	For rough calculation (appr. 2% inexact)	
			SI - Units	Selection of additional units			
Force	F	(dyne, gf)	N (Newton)	MN, kN, mN	1 kg <sub>f</sub> = 1 kg x 9.81 m/s <sup>2</sup> = 9.81 N	1 kg <sub>f</sub> = 10 N	1 N = 1 kg x 1 m/s <sup>2</sup> = 1 kg m/s <sup>2</sup>
Pressure (of Fluids)	P, Pi, P <sub>e</sub> , P <sub>ü</sub> , P <sub>u</sub>	(kg <sub>f</sub> /cm <sup>2</sup> , at, atm) (mWS, Torr) (mmHg)	N/m <sup>2</sup> Pa (Pascal)	bar, mbar	1 kg <sub>f</sub> /cm <sup>2</sup> = 0.981 bar 1 atm = 1.013 bar 1 mWS = 0.098 bar	1 kg <sub>f</sub> /cm <sup>2</sup> = 1 bar 1 mWS = 0.1 bar	1 N/m <sup>2</sup> = 1 Pa 1 Pa = 10 <sup>-5</sup> bar 1 bar = 10 <sup>5</sup> N/m <sup>2</sup>
Mechanical stress	s, t	(kg <sub>f</sub> /cm <sup>2</sup> ) (kg <sub>f</sub> /mm <sup>2</sup> )	N/m <sup>2</sup> , Pa	N/mm <sup>2</sup>	1 kg <sub>f</sub> /mm <sup>2</sup> = 9.81 N/mm <sup>2</sup> 1 kg <sub>f</sub> /cm <sup>2</sup> = 9.81 N/cm <sup>2</sup>	1 kg <sub>f</sub> /mm <sup>2</sup> = 10 N/mm <sup>2</sup> 1 kg <sub>f</sub> /cm <sup>2</sup> = 10 N/cm <sup>2</sup>	1 N/m <sup>2</sup> = 1Pa
Energy	W	(kg <sub>f</sub> m)	J (Joule)	MJ, kJ, kW h	1 kg <sub>f</sub> m = 9.81 J	1 kg <sub>f</sub> m = 10 J	3.6 MJ = 1 kWh 1 J = 1 Nm = 1 Ws
Heat capacity	Q	(cal, erg)	J (Joule)	MJ, kJ, kW h	1 kcal = 4.19 kJ		3.6 MJ = 1 kWh 1J = 1 Nm = 1 Ws
Power	P	(CV), W	W	kW, MW	1 CV = 0.735499 kW 1 kW = 1.359622 CV	1 CV = 0.74 kW 1 kW = 1.36 CV	1 W = 1J/s = 1 Nm/s
Torque, bending moment	M	(kg <sub>f</sub> m)	Nm	Ncm	1 kg <sub>f</sub> m = 9.81 Nm	1 kg <sub>f</sub> m = 10 Nm	

### 1.3 CONVERSIONS TABLES

#### 1.3.1 CONVERSION FOR UNITS OF LEGTH

Length	in	ft	yd	mi	UK n mile	cm	m
1 inch	1	0.0833	0.0278			2.54	0.0254
1 foot	12	1	0.3333	0.00019	0.00016	30.48	0.3048
1 yard	36	3	1	0.00057	0.00049	91.44	0.9144
1 statute mile	63360	5280	1760	1	0.86842		1609.3
1 UK nautic mile	72960	6080	2026.7	1.15151	1		1853.2
1 cm	0.3937	0.0328	0.0109			1	0.01
1 m	39.370	3.2808	1.0936	0.00062	0.00054	100	1

Length



25.4 mm = 1 in

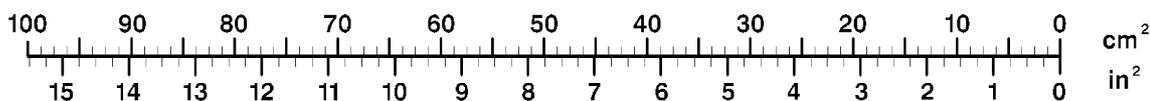
600030

#### 1.3.2 CONVERSION FOR UNITS OF AREA

Area	sq in	sq ft	sq yd	sq mi	acre	cm <sup>2</sup>	m <sup>2</sup>	km <sup>2</sup>
1 square inch	1	0.0069				6.4516		
1 square foot	144	1	0.1111			929.03	0.0929	
1 square yard	1296	9	1		0.00021	8361.3	0.8361	
1 square mile				1	640			2.58999
1 acre		43560	4840	0.00156	1		4046.9	0.004047
1 cm <sup>2</sup>	0.1550					1	0.0001	
1 m <sup>2</sup>	1550.0	10.764	1.1960			10000	1	
1 km <sup>2</sup>				0.3861	247.105			

Area

6.452 cm<sup>2</sup> = 1 in<sup>2</sup>



600031

### 1.3.3 CONVERSION FROM FOOT AND INCH TO METRIC MESURES

1 in = 25.4 mm (exact)	1 ft = 12 in = 304.8 mm	Example: 4ft 2in = 1.27m
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ft	in											
	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11
	m	m	m	m	m	m	m	m	m	m	m	m
0		0.0254	0.0508	0.0762	0.1016	0.1270	0.1524	0.1778	0.2032	0.2286	0.2540	0.2794
1	0.3048	0.3302	0.3556	0.3810	0.4064	0.4318	0.4572	0.4826	0.5080	0.5334	0.5588	0.5842
2	0.6096	0.6350	0.6604	0.6858	0.7112	0.7366	0.7620	0.7874	0.8128	0.8382	0.8636	0.8890
3	0.9144	0.9398	0.9652	0.9906	1.0160	1.0414	1.0668	1.0922	1.1176	1.1430	1.1684	1.1938
4	1.2192	1.2446	1.2700	1.2954	1.3208	1.3462	1.3716	1.3970	1.4224	1.4478	1.4732	1.4986
5	1.5240	1.5494	1.5748	1.6002	1.6256	1.6510	1.6764	1.7018	1.7272	1.7526	1.7780	1.8034
6	1.8288	1.8542	1.8796	1.9050	1.9304	1.9558	1.9812	2.0066	2.0320	2.0574	2.0828	2.1082
7	2.1336	2.1590	2.1844	2.2098	2.2352	2.2606	2.2860	2.3114	2.3368	2.3622	2.3876	2.4130
8	2.4384	2.4638	2.4892	2.5146	2.5400	2.5654	2.5908	2.6162	2.6416	2.6670	2.6924	2.7178
9	2.7432	2.7686	2.7940	2.8194	2.8448	2.8702	2.8956	2.9210	2.9464	2.9718	2.9972	3.0226
10	3.0480	3.0734	3.0988	3.1242	3.1496	3.1750	3.2004	3.2258	3.2512	3.2766	3.3020	3.3274
11	3.3528	3.3782	3.4036	3.4290	3.4544	3.4798	3.5052	3.5306	3.5560	3.5814	3.6068	3.6322
12	3.6576	3.6830	3.7000	3.7338	3.7592	3.7846	3.8100	3.8354	3.8608	3.8862	3.9116	3.9370

**1.3.4 CONVERSION FROM NEWTONMETER (NM) INTO FOOT POUNDS (FT LB)**

Nm	0	1	2	3	4	5	6	7	8	9
10	7.376	8.113	8.851	9.588	10.326	11.063	11.801	12.539	13.276	14.014
20	14.751	15.489	16.226	16.964	17.701	18.439	19.177	19.914	20.652	21.389
30	22.127	22.864	23.602	24.339	25.077	25.815	26.552	27.290	28.027	28.765
40	29.502	30.240	30.978	31.715	32.453	33.190	33.928	34.665	35.403	36.140
50	36.878	37.616	38.353	39.091	39.828	40.566	41.303	42.041	42.778	43.516
60	44.254	44.991	45.729	46.466	47.204	47.941	48.679	49.417	50.154	50.892
70	51.629	52.367	53.104	53.842	54.579	55.317	56.055	56.792	57.530	58.267
80	59.005	59.742	60.480	61.217	61.955	62.693	63.430	64.168	64.905	65.643
90	66.380	67.118	67.856	68.593	69.331	70.068	70.806	71.543	72.281	73.018
100	73.756	74.494	75.231	75.969	76.706	77.444	78.181	78.919	79.656	80.394
110	81.132	81.869	82.607	83.344	84.082	84.819	85.557	86.295	87.032	87.770
120	88.507	89.245	89.982	90.720	91.457	92.195	92.933	93.670	94.408	95.145
130	95.883	96.620	97.358	98.095	98.833	99.571	100.308	101.046	101.783	102.521
140	103.258	103.996	104.734	105.471	106.209	106.946	107.684	108.421	109.159	109.896
150	110.634	111.372	112.109	112.847	113.584	114.322	115.059	115.797	116.534	117.272
160	118.010	118.747	119.485	120.222	120.960	121.697	122.435	123.173	123.910	124.648
170	125.385	126.123	126.860	127.598	128.335	129.073	129.811	130.548	131.286	132.023
180	132.761	133.498	134.236	134.973	135.711	136.449	137.186	137.924	138.661	139.399
190	140.136	140.874	141.612	142.349	143.087	143.824	144.562	145.299	146.037	146.774
200	147.512	148.250	148.987	149.725	150.462	151.200	151.937	152.675	153.412	154.150
210	154.888	155.625	156.363	157.100	157.838	158.575	159.313	160.051	160.788	161.526
220	162.263	163.001	163.738	164.476	165.213	165.951	166.689	167.426	168.164	168.901
230	169.639	170.376	171.114	171.851	172.589	173.327	174.064	174.802	175.539	176.277
240	177.014	177.752	178.490	179.227	179.965	180.702	181.440	182.177	182.915	183.652
250	184.390	185.128	185.865	186.603	187.340	188.078	188.815	189.553	190.290	191.028
260	191.766	192.503	193.241	193.978	194.716	195.453	196.191	196.929	197.666	198.404
270	199.141	199.879	200.616	201.354	202.091	202.829	203.567	204.304	205.042	205.779
280	206.517	207.254	207.992	208.729	209.467	210.205	210.942	211.680	212.417	213.155
290	213.892	214.630	215.368	216.105	216.843	217.580	218.318	219.055	219.793	220.530
300	221.268	222.006	222.743	223.481	224.218	224.956	225.693	226.431	227.168	227.906
310	228.644	229.381	230.119	230.856	231.594	232.331	233.069	233.807	234.544	235.282
320	236.019	236.757	237.494	238.232	238.969	239.707	240.445	241.182	241.920	242.657
330	243.395	244.132	244.870	245.607	246.345	247.083	247.820	248.558	249.295	250.033
340	250.770	251.508	252.245	252.983	253.721	254.458	255.196	255.933	256.671	257.408
350	258.146	258.884	259.621	260.359	261.096	261.834	262.571	263.309	264.046	264.784
360	265.521	266.259	266.997	267.734	268.472	269.209	269.947	270.684	271.422	272.159
370	272.897	273.635	274.372	275.110	275.847	276.585	277.323	278.060	278.798	279.535
380	280.273	281.010	281.748	282.485	283.223	283.960	284.698	285.436	286.173	286.911
390	287.648	288.386	289.123	289.861	290.598	291.336	292.074	292.811	293.549	294.286
400	295.024	295.761	296.499	297.237	297.974	298.712	299.449	300.187	300.924	301.662
410	302.399	303.137	303.875	304.612	305.350	306.087	306.825	307.562	308.300	309.038
420	309.775	310.513	311.250	311.988	312.725	313.463	314.200	314.938	315.676	316.413
430	317.151	317.888	318.626	319.363	320.101	320.838	321.576	322.313	323.051	323.789
440	324.526	325.264	326.001	326.739	327.477	328.214	328.952	329.689	330.427	331.164
450	331.902	332.639	333.377	334.115	334.852	335.590	336.327	337.065	337.802	338.540
460	339.278	340.015	340.753	341.490	342.228	342.965	343.703	344.440	345.178	345.916
470	346.653	347.391	348.128	348.866	349.603	350.341	351.078	351.816	352.553	353.291
480	354.029	354.766	355.504	356.241	356.979	357.717	358.454	359.192	359.929	360.667
490	361.404	362.142	362.879	363.617	364.354	365.092	365.830	366.567	367.305	368.042
500	368.780	369.517	370.255	370.992	371.730	372.468	373.205	373.943	374.680	375.418
510	376.156	376.893	377.631	378.368	379.106	379.843	380.581	381.318	382.056	382.793
520	383.531	384.269	385.006	385.744	386.481	387.219	387.957	388.694	389.432	390.169
530	390.907	391.644	392.382	393.119	393.857	394.594	395.332	396.070	396.807	397.545
540	398.282	399.020	399.757	400.495	401.232	401.970	402.708	403.445	404.183	404.920
550	405.658	406.396	407.133	407.871	408.608	409.346	410.083	410.821	411.558	412.296
560	413.033	413.771	414.509	415.246	415.984	416.721	417.459	418.196	418.934	419.671
570	420.409	421.147	421.884	422.622	423.359	424.097	424.834	425.572	426.310	427.047
580	427.785	428.522	429.260	429.997	430.735	431.472	432.210	432.948	433.685	434.423
590	435.160	435.898	436.635	437.373	438.111	438.848	439.586	440.323	441.061	441.798
600	442.536	443.273	444.011	444.749	445.486	446.224	446.961	447.699	448.436	449.174
610	449.911	450.649	451.386	452.124	452.862	453.599	454.337	455.074	455.812	456.550
620	457.287	458.025	458.762	459.500	460.237	460.975	461.712	462.450	463.187	463.925
630	464.663	465.400	466.138	466.875	467.613	468.350	469.088	469.826	470.563	471.301
640	472.038	472.776	473.513	474.251	474.989	475.726	476.464	477.201	477.939	478.676
650	479.414	480.151	480.889	481.626	482.364	483.102	483.839	484.577	485.314	486.052
660	486.790	487.527	488.265	489.002	489.740	490.477	491.215	491.952	492.690	493.427
670	494.165	494.903	495.640	496.378	497.115	497.853	498.590	499.328	500.065	500.803
680	501.541	502.278	503.016	503.753	504.491	505.229	505.966	506.704	507.441	508.179
690	508.916	509.654	510.391	511.129	511.866	512.604	513.342	514.079	514.817	515.554
700	516.292	517.030	517.767	518.505	519.242	519.980	520.717	521.455	522.192	522.930

Nm	0	1	2	3	4	5	6	7	8	9
710	523.667	524.405	525.143	525.880	526.618	527.355	528.093	528.830	529.568	530.305
720	531.043	531.781	532.518	533.256	533.993	534.731	535.469	536.206	536.944	537.681
730	538.419	539.156	539.894	540.631	541.369	542.106	542.844	543.582	544.319	545.057
740	545.794	546.532	547.269	548.007	548.744	549.482	550.220	550.957	551.695	552.432
750	553.170	553.907	554.645	555.383	556.120	556.858	557.595	558.333	559.070	559.808
760	560.545	561.283	562.021	562.758	563.496	564.233	564.971	565.708	566.446	567.184
770	567.921	568.659	569.396	570.134	570.871	571.609	572.346	573.084	573.822	574.559
780	575.297	576.034	576.772	577.509	578.247	578.984	579.722	580.459	581.197	581.935
790	582.672	583.410	584.147	584.885	585.623	586.360	587.098	587.835	588.573	589.310
800	590.048	590.785	591.523	592.260	592.998	593.736	594.473	595.211	595.948	596.686
810	597.423	598.161	598.899	599.636	600.374	601.111	601.849	602.586	603.324	604.062
820	604.799	605.537	606.274	607.012	607.749	608.487	609.224	609.962	610.699	611.437
830	612.175	612.912	613.650	614.387	615.125	615.863	616.600	617.338	618.075	618.813
840	619.550	620.288	621.025	621.763	622.500	623.238	623.976	624.713	625.451	626.188
850	626.926	627.663	628.401	629.138	629.876	630.614	631.351	632.089	632.826	633.564
860	634.302	635.039	635.777	636.514	637.252	637.989	638.727	639.464	640.202	640.939
870	641.677	642.415	643.152	643.890	644.627	645.365	646.102	646.840	647.578	648.315
880	649.053	649.790	650.528	651.265	652.003	652.740	653.478	654.216	654.953	655.691
890	656.428	657.166	657.903	658.641	659.378	660.116	660.854	661.591	662.329	663.066
900	663.804	664.542	665.279	666.017	666.754	667.492	668.229	668.967	669.704	670.442
910	671.179	671.917	672.655	673.392	674.130	674.867	675.605	676.342	677.080	677.817
920	678.555	679.293	680.030	680.768	681.505	682.243	682.980	683.718	684.456	685.193
930	685.931	686.668	687.406	688.143	688.881	689.618	690.356	691.094	691.831	692.569
940	693.306	694.044	694.781	695.519	696.257	696.994	697.732	698.469	699.207	699.944
950	700.682	701.419	702.157	702.895	703.632	704.370	705.107	705.845	706.582	707.320
960	708.057	708.795	709.532	710.270	711.008	711.745	712.483	713.220	713.958	714.696
970	715.433	716.171	716.908	717.646	718.383	719.121	719.858	720.596	721.333	722.071
980	722.809	723.546	724.284	725.021	725.759	726.496	727.234	727.972	728.709	729.447
990	730.184	730.922	731.659	732.397	733.135	733.872	734.610	735.347	736.085	736.822
1000	737.560	738.297	739.035	739.772	740.510	741.248	741.985	742.723	743.460	744.198
1010	744.936	745.673	746.411	747.148	747.886	748.623	749.361	750.098	750.836	751.573
1020	752.311	753.049	753.786	754.524	755.261	755.999	756.736	757.474	758.211	758.949
1030	759.687	760.424	761.162	761.899	762.637	763.375	764.112	764.850	765.587	766.325
1040	767.062	767.800	768.537	769.275	770.012	770.750	771.488	772.225	772.963	773.700
1050	774.438	775.175	775.913	776.651	777.388	778.126	778.863	779.601	780.338	781.076
1060	781.813	782.551	783.289	784.026	784.764	785.501	786.239	786.976	787.714	788.451
1070	789.189	789.927	790.664	791.402	792.139	792.877	793.615	794.352	795.090	795.827
1080	796.565	797.302	798.040	798.777	799.515	800.252	800.990	801.728	802.465	803.203
1090	803.940	804.678	805.415	806.153	806.890	807.628	808.366	809.103	809.841	810.578
1100	811.316	812.053	812.791	813.529	814.266	815.004	815.741	816.479	817.216	817.954
1110	818.691	819.429	820.167	820.904	821.642	822.379	823.117	823.854	824.592	825.330
1120	826.067	826.805	827.542	828.280	829.017	829.755	830.492	831.230	831.968	832.705
1130	833.443	834.180	834.918	835.655	836.393	837.130	837.868	838.605	839.343	840.081
1140	840.818	841.556	842.293	843.031	843.769	844.506	845.244	845.981	846.719	847.456
1150	848.194	848.931	849.669	850.406	851.144	851.882	852.619	853.357	854.094	854.832
1160	855.569	856.307	857.045	857.782	858.520	859.257	859.995	860.732	861.470	862.208
1170	862.945	863.683	864.420	865.158	865.895	866.633	867.370	868.108	868.845	869.583
1180	870.321	871.058	871.796	872.533	873.271	874.009	874.746	875.484	876.221	876.959
1190	877.696	878.434	879.171	879.909	880.646	881.384	882.122	882.859	883.597	884.334
1200	885.072	885.809	886.547	887.284	888.022	888.760	889.497	890.235	890.972	891.710
1210	892.448	893.185	893.923	894.660	895.398	896.135	896.873	897.610	898.348	899.085
1220	899.823	900.561	901.298	902.036	902.773	903.511	904.248	904.986	905.724	906.461
1230	907.199	907.936	908.674	909.411	910.149	910.886	911.624	912.362	913.099	913.837
1240	914.574	915.312	916.049	916.787	917.524	918.262	919.000	919.737	920.475	921.212
1250	921.950	922.687	923.425	924.163	924.900	925.638	926.375	927.113	927.850	928.588
1260	929.325	930.063	930.801	931.538	932.276	933.013	933.751	934.488	935.226	935.963
1270	936.701	937.439	938.176	938.914	939.651	940.389	941.126	941.864	942.602	943.339
1280	944.077	944.814	945.552	946.289	947.027	947.764	948.502	949.240	949.977	950.715
1290	951.452	952.190	952.927	953.665	954.403	955.140	955.878	956.615	957.353	958.090
1300	958.828	959.565	960.303	961.041	961.778	962.516	963.253	963.991	964.728	965.466
1310	966.203	966.941	967.678	968.416	969.154	969.891	970.629	971.366	972.104	972.842
1320	973.579	974.317	975.054	975.792	976.529	977.267	978.004	978.742	979.479	980.217
1330	980.955	981.692	982.430	983.167	983.905	984.642	985.380	986.118	986.855	987.593
1340	988.330	989.068	989.805	990.543	991.281	992.018	992.756	993.493	994.231	994.968
1350	995.706	996.443	997.181	997.918	998.656	999.394	1000.131	1000.869	1001.606	1002.344
1360	1003.082	1003.819	1004.557	1005.294	1006.032	1006.769	1007.507	1008.244	1008.982	1009.719
1370	1010.457	1011.195	1011.932	1012.670	1013.407	1014.145	1014.882	1015.620	1016.357	1017.095
1380	1017.833	1018.570	1019.308	1020.045	1020.783	1021.521	1022.258	1022.996	1023.733	1024.471
1390	1025.208	1025.946	1026.683	1027.421	1028.158	1028.896	1029.634	1030.371	1031.109	1031.846
1400	1032.584	1033.321	1034.059	1034.797	1035.534	1036.272	1037.009	1037.747	1038.484	1039.222

Nm	0	1	2	3	4	5	6	7	8	9
1410	1039.959	1040.697	1041.435	1042.172	1042.910	1043.647	1044.385	1045.122	1045.860	1046.597
1420	1047.335	1048.073	1048.810	1049.548	1050.285	1051.023	1051.760	1052.498	1053.236	1053.973
1430	1054.711	1055.448	1056.186	1056.923	1057.661	1058.398	1059.136	1059.874	1060.611	1061.349
1440	1062.086	1062.824	1063.561	1064.299	1065.036	1065.774	1066.512	1067.249	1067.987	1068.724
1450	1069.462	1070.199	1070.937	1071.675	1072.412	1073.150	1073.887	1074.625	1075.362	1076.100
1460	1076.837	1077.575	1078.312	1079.050	1079.788	1080.525	1081.263	1082.000	1082.738	1083.476
1470	1084.213	1084.951	1085.688	1086.426	1087.163	1087.901	1088.638	1089.376	1090.114	1090.851
1480	1091.589	1092.326	1093.064	1093.801	1094.539	1095.276	1096.014	1096.751	1097.489	1098.227
1490	1098.964	1099.702	1100.439	1101.177	1101.915	1102.652	1103.390	1104.127	1104.865	1105.602
1500	1106.340	1107.077	1107.815	1108.552	1109.290	1110.028	1110.765	1111.503	1112.240	1112.978
1510	1113.715	1114.453	1115.191	1115.928	1116.666	1117.403	1118.141	1118.878	1119.616	1120.354
1520	1121.091	1121.829	1122.566	1123.304	1124.041	1124.779	1125.516	1126.254	1126.991	1127.729
1530	1128.467	1129.204	1129.942	1130.679	1131.417	1132.155	1132.892	1133.630	1134.367	1135.105
1540	1135.842	1136.580	1137.317	1138.055	1138.792	1139.530	1140.268	1141.005	1141.743	1142.480
1550	1143.218	1143.955	1144.693	1145.430	1146.168	1146.906	1147.643	1148.381	1149.118	1149.856
1560	1150.594	1151.331	1152.069	1152.806	1153.544	1154.281	1155.019	1155.756	1156.494	1157.231
1570	1157.969	1158.707	1159.444	1160.182	1160.919	1161.657	1162.394	1163.132	1163.870	1164.607
1580	1165.345	1166.082	1166.820	1167.557	1168.295	1169.032	1169.770	1170.508	1171.245	1171.983
1590	1172.720	1173.458	1174.195	1174.933	1175.670	1176.408	1177.146	1177.883	1178.621	1179.358
1600	1180.096	1180.833	1181.571	1182.309	1183.046	1183.784	1184.521	1185.259	1185.996	1186.734
1610	1187.471	1188.209	1188.947	1189.684	1190.422	1191.159	1191.897	1192.634	1193.372	1194.109
1620	1194.847	1195.585	1196.322	1197.060	1197.797	1198.535	1199.272	1200.010	1200.748	1201.485
1630	1202.223	1202.960	1203.698	1204.435	1205.173	1205.910	1206.648	1207.385	1208.123	1208.861
1640	1209.598	1210.336	1211.073	1211.811	1212.549	1213.286	1214.024	1214.761	1215.499	1216.236
1650	1216.974	1217.711	1218.449	1219.187	1219.924	1220.662	1221.399	1222.137	1222.874	1223.612
1660	1224.349	1225.087	1225.824	1226.562	1227.300	1228.037	1228.775	1229.512	1230.250	1230.988
1670	1231.725	1232.463	1233.200	1233.938	1234.675	1235.413	1236.150	1236.888	1237.625	1238.363
1680	1239.101	1239.838	1240.576	1241.313	1242.051	1242.788	1243.526	1244.264	1245.001	1245.739
1690	1246.476	1247.214	1247.951	1248.689	1249.427	1250.164	1250.902	1251.639	1252.377	1253.114
1700	1253.852	1254.589	1255.327	1256.064	1256.802	1257.540	1258.277	1259.015	1259.752	1260.490
1710	1261.228	1261.965	1262.703	1263.440	1264.178	1264.915	1265.653	1266.390	1267.128	1267.865
1720	1268.603	1269.341	1270.078	1270.816	1271.553	1272.291	1273.028	1273.766	1274.503	1275.241
1730	1275.979	1276.716	1277.454	1278.191	1278.929	1279.667	1280.404	1281.142	1281.879	1282.617
1740	1283.354	1284.092	1284.829	1285.567	1286.304	1287.042	1287.780	1288.517	1289.255	1289.992
1750	1290.730	1291.467	1292.205	1292.943	1293.680	1294.418	1295.155	1295.893	1296.630	1297.368
1760	1298.105	1298.843	1299.581	1300.318	1301.056	1301.793	1302.531	1303.268	1304.006	1304.743
1770	1305.481	1306.219	1306.956	1307.694	1308.431	1309.169	1309.906	1310.644	1311.382	1312.119
1780	1312.857	1313.594	1314.332	1315.069	1315.807	1316.544	1317.282	1318.020	1318.757	1319.495
1790	1320.232	1320.970	1321.707	1322.445	1323.182	1323.920	1324.657	1325.395	1326.133	1326.870
1800	1327.608	1328.345	1329.083	1329.821	1330.558	1331.296	1332.033	1332.771	1333.508	1334.246
1810	1334.983	1335.721	1336.458	1337.196	1337.934	1338.671	1339.409	1340.146	1340.884	1341.622
1820	1342.359	1343.097	1343.834	1344.572	1345.309	1346.047	1346.784	1347.522	1348.260	1348.997
1830	1349.735	1350.472	1351.210	1351.947	1352.685	1353.422	1354.160	1354.897	1355.635	1356.373
1840	1357.110	1357.848	1358.585	1359.323	1360.061	1360.798	1361.536	1362.273	1363.011	1363.748
1850	1364.486	1365.223	1365.961	1366.698	1367.436	1368.174	1368.911	1369.649	1370.386	1371.124
1860	1371.861	1372.599	1373.337	1374.074	1374.812	1375.549	1376.287	1377.024	1377.762	1378.500
1870	1379.237	1379.975	1380.712	1381.450	1382.187	1382.925	1383.662	1384.400	1385.137	1385.875
1880	1386.613	1387.350	1388.088	1388.825	1389.563	1390.301	1391.038	1391.776	1392.513	1393.251
1890	1393.988	1394.726	1395.463	1396.201	1396.938	1397.676	1398.414	1399.151	1399.889	1400.626
1900	1401.364	1402.101	1402.839	1403.576	1404.314	1405.052	1405.789	1406.527	1407.264	1408.002
1910	1408.740	1409.477	1410.215	1410.952	1411.690	1412.427	1413.165	1413.902	1414.640	1415.377
1920	1416.115	1416.853	1417.590	1418.328	1419.065	1419.803	1420.540	1421.278	1422.016	1422.753
1930	1423.491	1424.228	1424.966	1425.703	1426.441	1427.178	1427.916	1428.654	1429.391	1430.129
1940	1430.866	1431.604	1432.341	1433.079	1433.816	1434.554	1435.292	1436.029	1436.767	1437.504
1950	1438.242	1438.979	1439.717	1440.455	1441.192	1441.930	1442.667	1443.405	1444.142	1444.880
1960	1445.617	1446.355	1447.093	1447.830	1448.568	1449.305	1450.043	1450.780	1451.518	1452.255
1970	1452.993	1453.730	1454.468	1455.206	1455.943	1456.681	1457.418	1458.156	1458.894	1459.631
1980	1460.369	1461.106	1461.844	1462.581	1463.319	1464.056	1464.794	1465.531	1466.269	1467.007
1990	1467.744	1468.482	1469.219	1469.957	1470.695	1471.432	1472.170	1472.907	1473.645	1474.382
2000	1475.120	1475.857	1476.595	1477.333	1478.070	1478.808	1479.545	1480.283	1481.020	1481.758
2010	1482.495	1483.233	1483.970	1484.708	1485.446	1486.183	1486.921	1487.658	1488.396	1489.134
2020	1489.871	1490.609	1491.346	1492.084	1492.821	1493.559	1494.296	1495.034	1495.771	1496.509
2030	1497.247	1497.984	1498.722	1499.459	1500.197	1500.934	1501.672	1502.409	1503.147	1503.885
2040	1504.622	1505.360	1506.097	1506.835	1507.573	1508.310	1509.048	1509.785	1510.523	1511.260
2050	1511.998	1512.735	1513.473	1514.210	1514.948	1515.686	1516.423	1517.161	1517.898	1518.636
2060	1519.374	1520.111	1520.849	1521.586	1522.324	1523.061	1523.799	1524.536	1525.274	1526.011
2070	1526.749	1527.487	1528.224	1528.962	1529.699	1530.437	1531.174	1531.912	1532.649	1533.387
2080	1534.125	1534.862	1535.600	1536.337	1537.075	1537.812	1538.550	1539.288	1540.025	1540.763
2090	1541.500	1542.238	1542.975	1543.713	1544.450	1545.188	1545.926	1546.663	1547.401	1548.138
2100	1548.876	1549.613	1550.351	1551.089	1551.826	1552.564	1553.301	1554.039	1554.776	1555.514

w60w70w80-compact-wheel-loader-service-repair-workshop-manua

SERVICE DATA

Nm	0	1	2	3	4	5	6	7	8	9
2110	1556.251	1556.989	1557.727	1558.464	1559.202	1559.939	1560.677	1561.414	1562.152	1562.889
2120	1563.627	1564.365	1565.102	1565.840	1566.577	1567.315	1568.052	1568.790	1569.528	1570.265
2130	1571.003	1571.740	1572.478	1573.215	1573.953	1574.690	1575.428	1576.166	1576.903	1577.641
2140	1578.378	1579.116	1579.853	1580.591	1581.328	1582.066	1582.803	1583.541	1584.279	1585.016
2150	1585.754	1586.491	1587.229	1587.967	1588.704	1589.442	1590.179	1590.917	1591.654	1592.392
2160	1593.129	1593.867	1594.604	1595.342	1596.080	1596.817	1597.555	1598.292	1599.030	1599.768
2170	1600.505	1601.243	1601.980	1602.718	1603.455	1604.193	1604.930	1605.668	1606.406	1607.143
2180	1607.881	1608.618	1609.356	1610.093	1610.831	1611.568	1612.306	1613.043	1613.781	1614.519
2190	1615.256	1615.994	1616.731	1617.469	1618.207	1618.944	1619.682	1620.419	1621.157	1621.894
2200	1622.632	1623.369	1624.107	1624.844	1625.582	1626.320	1627.057	1627.795	1628.532	1629.270
2210	1630.007	1630.745	1631.482	1632.220	1632.958	1633.695	1634.433	1635.170	1635.908	1636.646
2220	1637.383	1638.121	1638.858	1639.596	1640.333	1641.071	1641.808	1642.546	1643.283	1644.021
2230	1644.759	1645.496	1646.234	1646.971	1647.709	1648.447	1649.184	1649.922	1650.659	1651.397
2240	1652.134	1652.872	1653.609	1654.347	1655.084	1655.822	1656.560	1657.297	1658.035	1658.772
2250	1659.510	1660.247	1660.985	1661.722	1662.460	1663.198	1663.935	1664.673	1665.410	1666.148
2260	1666.885	1667.623	1668.361	1669.098	1669.836	1670.573	1671.311	1672.048	1672.786	1673.523
2270	1674.261	1674.999	1675.736	1676.474	1677.211	1677.949	1678.686	1679.424	1680.162	1680.899
2280	1681.637	1682.374	1683.112	1683.849	1684.587	1685.324	1686.062	1686.800	1687.537	1688.275
2290	1689.012	1689.750	1690.487	1691.225	1691.962	1692.700	1693.437	1694.175	1694.913	1695.650
2300	1696.388	1697.125	1697.863	1698.601	1699.338	1700.076	1700.813	1701.551	1702.288	1703.026
2310	1703.763	1704.501	1705.239	1705.976	1706.714	1707.451	1708.189	1708.926	1709.664	1710.401
2320	1711.139	1711.876	1712.614	1713.352	1714.089	1714.827	1715.564	1716.302	1717.040	1717.777
2330	1718.515	1719.252	1719.990	1720.727	1721.465	1722.202	1722.940	1723.677	1724.415	1725.153
2340	1725.890	1726.628	1727.365	1728.103	1728.841	1729.578	1730.316	1731.053	1731.791	1732.528
2350	1733.266	1734.003	1734.741	1735.479	1736.216	1736.954	1737.691	1738.429	1739.166	1739.904
2360	1740.641	1741.379	1742.116	1742.854	1743.592	1744.329	1745.067	1745.804	1746.542	1747.280
2370	1748.017	1748.755	1749.492	1750.230	1750.967	1751.705	1752.442	1753.180	1753.917	1754.655
2380	1755.393	1756.130	1756.868	1757.605	1758.343	1759.080	1759.818	1760.555	1761.293	1762.031
2390	1762.768	1763.506	1764.243	1764.981	1765.719	1766.456	1767.194	1767.931	1768.669	1769.406
2400	1770.144	1770.881	1771.619	1772.356	1773.094	1773.832	1774.569	1775.307	1776.044	1776.782
2410	1777.520	1778.257	1778.995	1779.732	1780.470	1781.207	1781.945	1782.682	1783.420	1784.157
2420	1784.895	1785.633	1786.370	1787.108	1787.845	1788.583	1789.320	1790.058	1790.795	1791.533
2430	1792.271	1793.008	1793.746	1794.483	1795.221	1795.958	1796.696	1797.434	1798.171	1798.909
2440	1799.646	1800.384	1801.121	1801.859	1802.596	1803.334	1804.072	1804.809	1805.547	1806.284
2450	1807.022	1807.759	1808.497	1809.234	1809.972	1810.710	1811.447	1812.185	1812.922	1813.660
2460	1814.397	1815.135	1815.873	1816.610	1817.348	1818.085	1818.823	1819.560	1820.298	1821.035
2470	1821.773	1822.510	1823.248	1823.986	1824.723	1825.461	1826.198	1826.936	1827.674	1828.411
2480	1829.149	1829.886	1830.624	1831.361	1832.099	1832.836	1833.574	1834.312	1835.049	1835.787
2490	1836.524	1837.262	1837.999	1838.737	1839.474	1840.212	1840.949	1841.687	1842.425	1843.162
2500	1843.900	1844.637	1845.375	1846.113	1846.850	1847.588	1848.325	1849.063	1849.800	1850.538
2510	1851.275	1852.013	1852.750	1853.488	1854.226	1854.963	1855.701	1856.438	1857.176	1857.914
2520	1858.651	1859.389	1860.126	1860.864	1861.601	1862.339	1863.076	1863.814	1864.552	1865.289
2530	1866.027	1866.764	1867.502	1868.239	1868.977	1869.714	1870.452	1871.189	1871.927	1872.665
2540	1873.402	1874.140	1874.877	1875.615	1876.353	1877.090	1877.828	1878.565	1879.303	1880.040
2550	1880.778	1881.515	1882.253	1882.990	1883.728	1884.466	1885.203	1885.941	1886.678	1887.416
2560	1888.153	1888.891	1889.628	1890.366	1891.104	1891.841	1892.579	1893.316	1894.054	1894.792
2570	1895.529	1896.267	1897.004	1897.742	1898.479	1899.217	1899.954	1900.692	1901.429	1902.167
2580	1902.905	1903.642	1904.380	1905.117	1905.855	1906.593	1907.330	1908.068	1908.805	1909.543
2590	1910.280	1911.018	1911.755	1912.493	1913.230	1913.968	1914.706	1915.443	1916.181	1916.918
2600	1917.656	1918.393	1919.131	1919.868	1920.606	1921.344	1922.081	1922.819	1923.556	1924.294
2610	1925.031	1925.769	1926.507	1927.244	1927.982	1928.719	1929.457	1930.194	1930.932	1931.669
2620	1932.407	1933.145	1933.882	1934.620	1935.357	1936.095	1936.832	1937.570	1938.307	1939.045
2630	1939.783	1940.520	1941.258	1941.995	1942.733	1943.470	1944.208	1944.946	1945.683	1946.421
2640	1947.158	1947.896	1948.633	1949.371	1950.108	1950.846	1951.583	1952.321	1953.059	1953.796
2650	1954.534	1955.271	1956.009	1956.747	1957.484	1958.222	1958.959	1959.697	1960.434	1961.172
2660	1961.909	1962.647	1963.385	1964.122	1964.860	1965.597	1966.335	1967.072	1967.810	1968.547
2670	1969.285	1970.022	1970.760	1971.498	1972.235	1972.973	1973.710	1974.448	1975.186	1975.923
2680	1976.661	1977.398	1978.136	1978.873	1979.611	1980.348	1981.086	1981.823	1982.561	1983.299
2690	1984.036	1984.774	1985.511	1986.249	1986.986	1987.724	1988.462	1989.199	1989.937	1990.674
2700	1991.412	1992.149	1992.887	1993.625	1994.362	1995.100	1995.837	1996.575	1997.312	1998.050
2710	1998.787	1999.525	2000.262	2001.000	2001.738	2002.475	2003.213	2003.950	2004.688	2005.426
2720	2006.163	2006.901	2007.638	2008.376	2009.113	2009.851	2010.588	2011.326	2012.063	2012.801
2730	2013.539	2014.276	2015.014	2015.751	2016.489	2017.226	2017.964	2018.701	2019.439	2020.177
2740	2020.914	2021.652	2022.389	2023.127	2023.865	2024.602	2025.340	2026.077	2026.815	2027.552
2750	2028.290	2029.027	2029.765	2030.502	2031.240	2031.978	2032.715	2033.453	2034.190	2034.928
2760	2035.666	2036.403	2037.141	2037.878	2038.616	2039.353	2040.091	2040.828	2041.566	2042.303
2770	2043.041	2043.779	2044.516	2045.254	2045.991	2046.729	2047.466	2048.204	2048.941	2049.679
2780	2050.417	2051.154	2051.892	2052.629	2053.367	2054.104	2054.842	2055.580	2056.317	2057.055
2790	2057.792	2058.530	2059.267	2060.005	2060.742	2061.480	2062.218	2062.955	2063.693	2064.430
2800	2065.168	2065.905	2066.643	2067.380	2068.118	2068.856	2069.593	2070.331	2071.068	2071.806

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

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