

Operation & Maintenance Manual



WB97S-2

BACKHOE-LOADER

SERIAL NUMBER

WB97S-2 97SF11205 and up



WARNING

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine.

This manual should be kept inside the cab for reference and periodically reviewed by all personnel who will come into contact with the machine.



1.1 FOREWORD

- This manual has been carried out by Komatsu Utility in order to supply their customers with all the necessary information on the machine and the safety regulations related to it, together with the use and maintenance instructions that enable the operator to exploit the capacity of the machine with optimal results and to keep the machine efficient over time.
- The operation manual, together with the spare parts catalogue, is an integral part of the machine and must accompany it, even when it is resold, until its final disposal.
- The manual must be handled with the greatest care and always kept on board the machine, so that it can be consulted at any moment; it must be placed in the appropriate compartment behind the seat, where also the ownership documents and the logbook are usually kept (see “3.5.10 TECHNICAL DOCUMENTATION”).
- This manual must be given to the persons who have to use the machine and carry out the routine maintenance operations; they must read the contents carefully more than once, in such a way as to clearly understand what are the correct operating conditions and the dangerous conditions that must be avoided.
In case of loss or damage, request a new copy to Komatsu Utility or your Komatsu Utility Dealer.
- The illustrations contained in this manual may represent machine configurations available upon request. Komatsu Utility machines are constantly improved in order to increase their efficiency and reliability; this manual sums up all the information regarding the most recent techniques applied at the moment in which the machine is marketed.
For any further and/or updated information, contact your Komatsu Utility Dealer.
- For the various maintenance phases it is advisable to consult the hour meter and in particular the maintenance plan set on the electronic unit of the machine frequently. The display of the maintenance plan can be obtained by means of an appropriate screen positioned on the upper part of the front dashboard. In any case, the maintenance plan can be also consulted on the relevant manual provided. Keep to the various maintenance intervals indicated on the screen and on the use and maintenance manual.
- Over the years Komatsu Utility Dealers have gathered considerable experience in customer service. If more information is needed, do not hesitate to contact your Komatsu Utility Dealer: he always knows how to get the best performance from the machine, he can suggest the use of the equipment that is most suitable for specific needs and can provide the technical assistance necessary for any change that may be required to conform the machine to the safety standards and traffic rules.
Furthermore, Komatsu Utility Dealers also ensure their assistance for the supply of Komatsu Utility genuine spare parts, which alone guarantee safety and interchangeability.
- The table included in this manual must be filled in with the machine data, which are the data that must always be indicated to the Dealer when requiring assistance and ordering spare parts.



CAUTION

- **The incorrect use of the machine and inappropriate maintenance operations may cause serious injuries and even death.**
 - **Operators and maintenance personnel must carefully read this manual before using the machine or performing maintenance operations.**
 - **Any serious accident that may occur during the use of the machine or during maintenance operations is due to failure to comply with the instructions given herein.**
 - **The procedures and precautions described in this manual are valid for application to the machine only when it is used correctly.**
If the machine is used for any purpose or in any way other than those described herein, the operator shall be responsible for his own safety and for the safety of any other person involved.
-

1.2 INFORMATION ON SAFETY

Many accidents are caused by insufficient knowledge of and failure to comply with the safety regulations prescribed for the maintenance operations that must be performed on the machine.

In order to avoid accidents, before starting work and before carrying out any maintenance operation, carefully read and be sure to understand all the information and warnings contained in this manual and given on the plates applied onto the machine, so that you can follow the instructions without making mistakes.

To identify the messages regarding safety that are included in this manual and written on the machine plates, the following words have been used.



DANGER

- This word is used in the safety warnings in the manual and on the plates when the situation is dangerous and it may possibly result in serious injuries or even death.

These messages describe the safety precautions to be taken in order to avoid any risk. Non-compliance with these instructions may also result in serious damage to the machine.



CAUTION

- This word is used in the safety warnings in the manual and on the plates to signal risks that may cause moderate damage or injuries.

The message can be used even to indicate the risk of damage to the machine only.



IMPORTANT

- This word is used when precautions are indicated, which must be taken to avoid actions that may shorten the life of the machine.
-

Komatsu Utility cannot reasonably predict every circumstance that might involve a potential hazard during the operation or maintenance of the machine; for this reason, the safety messages included in this manual and applied onto the machine may not include all possible safety precautions.

If all the procedures and operations prescribed for this machine are kept to, you can be sure that the operator and the persons in the vicinity can work in total safety, with no risk of damaging the machine. In case of doubt regarding the safety measures necessary for some procedures, contact Komatsu Utility or your local Dealer.



DANGER

- Before starting any maintenance operation, position the machine on firm and level ground, engage the safety locks of the equipment and controls, stop the engine and apply the parking brake.
-



DANGER

- To make the information clearer, some illustrations in this manual represent the machine without safety guards. Do not use the machine without guards and do not start the engine when the engine protection casing is open, if this is not expressly prescribed for some specific maintenance operations.
-

**DANGER**

- It is strictly forbidden to modify the setting of the hydraulic system safety valves; Komatsu Utility cannot be held liable for any damage to persons, property or the machine, if this has been tampered with by modifying the standard setting of the hydraulic system.
-

**DANGER**

- Before carrying out any electrical welding, disconnect the battery, the alternator and the connector of the gearshift unit installed under the steering wheel (see “2.8.13 PRECAUTIONS CONCERNING THE BATTERY AND THE ALTERNATOR” - “2.8.15 PRECAUTIONS CONCERNING THE GEARSHIFT”).
-

**DANGER**

- Install only authorized additional equipment (see “6.1 AUTHORIZED OPTIONAL EQUIPMENT”).
-

**DANGER**

- The machine can travel on roads only if provided with homologated equipment; before travelling on roads, make sure that the equipment with which the machine is provided is homologated and that the safety locks are correctly connected.
-

1.3 INTRODUCTION

1.3.1 INTENDED USES

The Komatsu Utility BACKHOE LOADERS described in this manual have been designed and constructed to be used mainly for the following functions:

- LOADER
- EXCAVATOR

Through the installation of optional equipment, the machine can also be used for the following applications:

- HANDLING OF MATERIALS (4IN1 BUCKET - PALLET FORKS)
- SNOWPLOUGH (ANGLED OZER BLADE - SNOWPLOUGH)
- DEMOLITION (HAND HAMMER - HAMMER ON THE BACKHOE)
- DITCH CLEANING AND DIGGING (SPECIAL BUCKETS)

1.3.2 IMPROPER OR UNAUTHORIZED USES



CAUTION

- **This paragraph describes some of the improper or unauthorized uses of the machine; since it is impossible to predict all the possible improper uses, if the machine happens to be used for particular applications, contact your Komatsu Utility Dealer before carrying out the work.**
-



IMPORTANT

- **The instructions regarding the authorized optional equipment are given in the relevant operation and maintenance manuals; if the equipment is supplied by Komatsu Utility, these publications are enclosed to this manual.**
 - **The instructions regarding the assembly of the authorized equipment, the controls requiring special arrangement on the machine and the hydraulic couplings necessary for the operation of the equipment are grouped in the final section of this manual.**
-

Komatsu Utility backhoe loaders are constructed exclusively for the handling, excavation and treatment of inert materials; therefore, the following uses are absolutely forbidden:

- USE OF THE MACHINE BY MINORS OR INEXPERIENCED PERSONS.
- USE OF THE MACHINE FOR LIFTING PERSONS OR OBJECTS.
- TRANSPORTATION OF PERSONS even if they are in the operator's cab.
- TRANSPORTATION OF CONTAINERS with fluids, flammable fluids, loose material, without the appropriate slinging equipment.
- TRANSPORTATION AND LIFTING (EVEN IF IN EXCEPTIONAL CASES) OF EQUIPMENT OR MATERIALS THAT PROTRUDE FROM THE BUCKET OR ARE NOT SECURED TO THE BUCKET BY MEANS OF ROPES OR CHAINS.
- USE OF THE BUCKET FOR DRIVING OR EXTRACTING PILES.
- USE OF THE MACHINE FOR TOWING DAMAGED VEHICLES ON ROADS.
- USE OF THE MACHINE FOR LIFTING DAMAGED VEHICLES.

1.3.3 MAIN CHARACTERISTICS

- Simple and easy operation.
- Servo-assisted steering with priority hydraulic system.
- Three steering modes that can be selected with a push button:
 - Two-wheel steering
 - All-wheel steering
 - Crab steering
- Gearshift with electronic gear selection through solenoid valve actuators and transmission with hydraulic converter; reversal and gear shifting with controls on a single lever.
- Loader control through a single lever ensuring also combined movements that can be modulated proportionally and continually.
- Backhoe controls with two levers ensuring also combined movements that can be modulated proportionally and continually.
- Complete series of instruments visible from the two operating positions (loader or backhoe).
- Separate accelerator controls for the two operating positions.
- Foot brake control.
- Easy maintenance with simplified intervals.
- Automatic engagement and disconnection of the differential locking on both axles (front and rear).

1.3.4 RUNNING-IN

Every machine is scrupulously adjusted and tested before delivery.

A new machine, however, must be used carefully for the first 100 hours, in order to ensure proper running-in of the various components.

If the machine is subjected to excessive work load at the beginning of operation, its potential yield and its functionality will be shortly and untimely reduced.

Every new machine must be used carefully, paying special attention to the following indications:

- After the start, let the engine idle for 5 minutes, in such a way as to warm it up gradually before actual operation.
- Avoid operating the machine with the limit loads allowed or at high speed.
- Avoid abrupt starts or accelerations, useless sudden decelerations and abrupt reversals.
- After the first 250 hours, carry out the following operations, in addition to those to be performed every 250 hours:
 - 1 - Change the hydraulic transmission oil and filter.
 - 2 - Change the differential unit oil (front and rear axle).
 - 3 - Change the oil in the final reduction gears (front and rear axle).
 - 4 - Check and adjust the engine valve clearance.
 - 5 - Change the hydraulic circuit oil filter.

SYNTHETIC BIODEGRADABLE OIL TYPE HEES

On machines in which the synthetic biodegradable oil type HEES is used, the following operations are to be performed besides the standard maintenance operations:

- After the first 50 hours of operation, change the hydraulic circuit drain filter.
- After the first 500 hours of operation, change the hydraulic circuit oil.



IMPORTANT

- **When changing the oil filters (cartridges), check their inner part to make sure that there are no deposits.**
If considerable deposits are observed, find out what may have caused them before starting the machine.
- **The number of operation hours is indicated by the hour meter, while the partial service hours for the various maintenance operations to be carried out on the machine are stored and displayed on the electronic screen positioned on the front dashboard.**

1.4 PRODUCT IDENTIFICATION

The Komatsu Utility backhoe loader and its main components are identified by serial numbers stamped on the identification plates.

The serial number and the identification numbers of the components are the only numbers that must be indicated to the Dealer when requiring assistance and ordering spare parts.

1.4.1 MACHINE SERIAL NUMBER

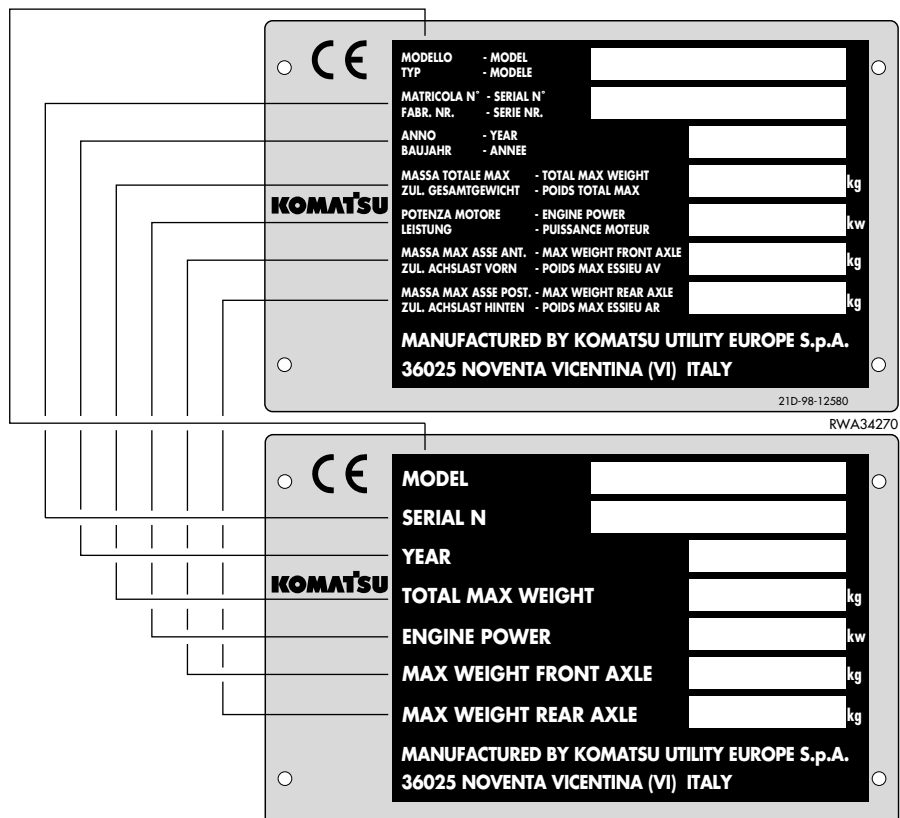
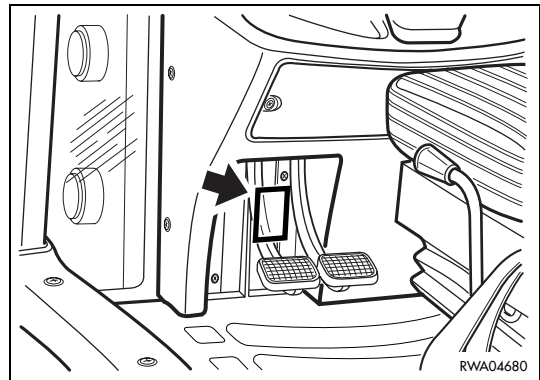
The machine serial number is stamped on the front part of the main frame, on the right side.



1.4.2 MACHINE IDENTIFICATION PLATE

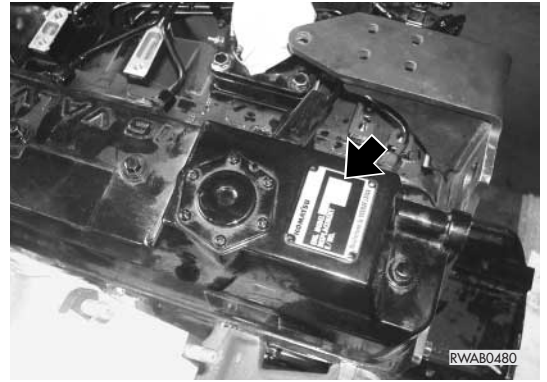
The Komatsu Utility backhoe loaders described in this manual are provided with the CE mark, which certifies that they are in compliance with the CE harmonized standards.

The plate with the mark is applied inside the operator's cab, on the left vertical wall of the frame, in correspondence with the brake pedals.

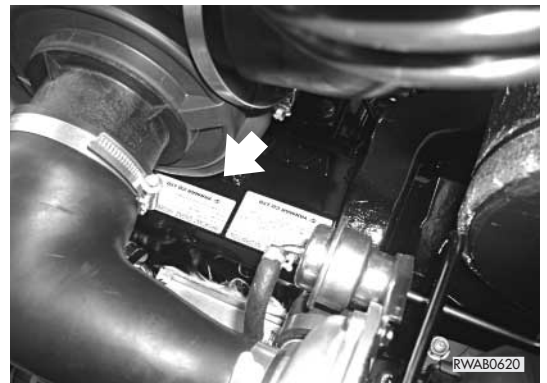


1.4.3 ENGINE SERIAL NUMBER AND EXHAUST GAS EMISSION PLATE

The engine serial number is stamped on the plate positioned on the rear side of the tappet cover.

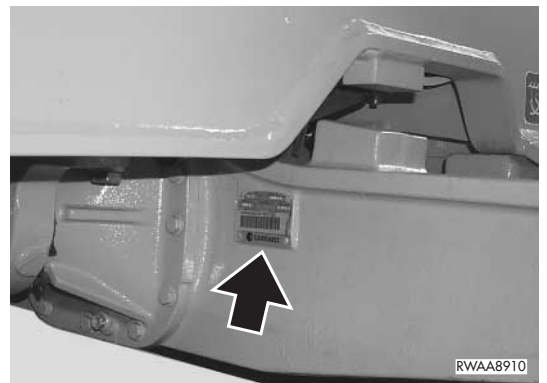


The plate regarding the exhaust emission regulations is applied to the front side of the tappet cover.



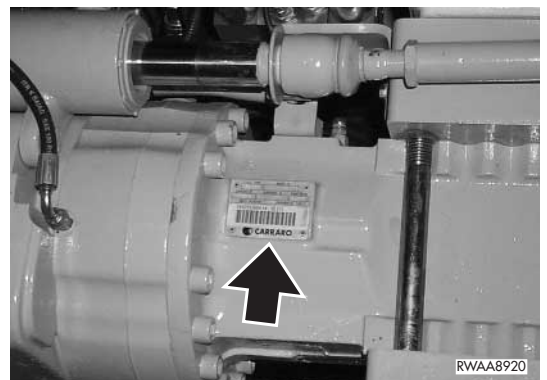
1.4.4 FRONT AXLE SERIAL NUMBER

The serial number of the front axle is stamped on the plate positioned on the right side of the axle body.



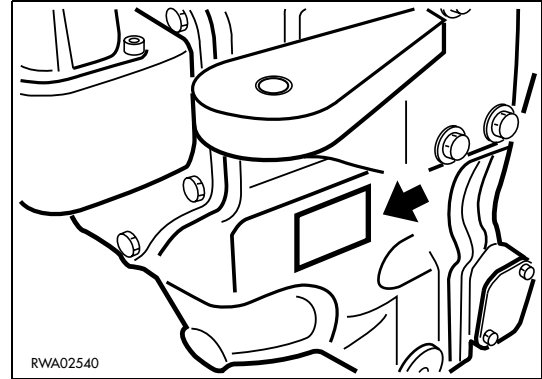
1.4.5 REAR AXLE SERIAL NUMBER

The serial number of the rear axle is stamped on the plate positioned on the left side of the axle body.



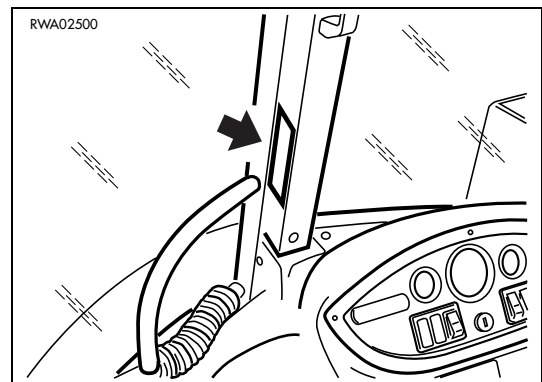
1.4.6 TRANSMISSION SERIAL NUMBER

The transmission serial number is stamped on the plate positioned on the right side of the transmission case.



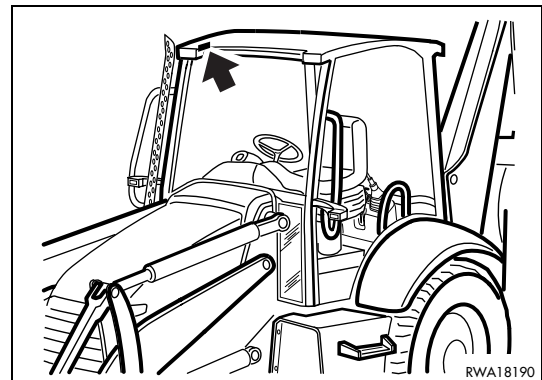
1.4.7 CAB SERIAL NUMBER

The cab serial number is stamped on the plate positioned on the right center pillar.



1.4.8 CANOPY SERIAL NUMBER (if provided)

The serial number is stamped on the plate positioned inside the canopy, on the front right part.



1.4.9 SERIAL NUMBERS AND DEALER'S ADDRESS

Machine n. _____ Model _____

Engine n. _____

Front axle n. _____

Rear axle n. _____

Transmission n. _____

Cab n. _____

Canopy n. _____

Dealer:

Address: _____

_____ Tel. _____

Person to contact: _____

NOTES: _____

THIS PAGE WAS INTENTIONALLY LEFT EMPTY

TABLE OF CONTENTS

1.1	FOREWORD	1
1.2	INFORMATION ON SAFETY	2
1.3	INTRODUCTION	4
1.3.1	INTENDED USES	4
1.3.2	IMPROPER OR UNAUTHORIZED USES	4
1.3.3	MAIN CHARACTERISTICS	5
1.3.4	RUNNING-IN	5
1.4	PRODUCT IDENTIFICATION	6
1.4.1	MACHINE SERIAL NUMBER	6
1.4.2	MACHINE IDENTIFICATION PLATE	6
1.4.3	ENGINE SERIAL NUMBER AND EXHAUST GAS EMISSION PLATE	7
1.4.4	FRONT AXLE SERIAL NUMBER	7
1.4.5	REAR AXLE SERIAL NUMBER	8
1.4.6	TRANSMISSION SERIAL NUMBER	8
1.4.7	CAB SERIAL NUMBER	8
1.4.8	CANOPY SERIAL NUMBER (if provided)	8
1.4.9	SERIAL NUMBERS AND DEALER'S ADDRESS	9
SAFETY AND ACCIDENT PREVENTION		
2.1	SAFETY, NOISE AND VIBRATION PLATES	20
2.1.1	POSITION OF THE SAFETY PLATES	20
2.1.2	PICTOGRAMS AND RELEVANT MEANINGS	22
2.1.3	POSITION OF THE NOISE PLATES ON MACHINES WITH CAB	26
2.1.4	VIBRATIONS TO WHICH THE OPERATOR IS SUBJECTED	27
2.2	GENERAL PRECAUTIONS	28
2.2.1	GENERAL SAFETY RULES	28
2.2.2	SAFETY DEVICES AND GUARDS	28
2.2.3	CLOTHING AND PERSONAL PROTECTION ITEMS	28
2.2.4	UNAUTHORIZED MODIFICATIONS	29
2.2.5	LEAVING THE OPERATOR'S SEAT	29
2.2.6	GETTING ON AND OFF THE MACHINE	30
2.2.7	CHECKING THE REAR-VIEW MIRRORS	30
2.2.8	PREVENTING FIRES DUE TO FUEL AND OIL	30
2.2.9	PREVENTING BURNS	31
2.2.10	PREVENTING DAMAGE DUE TO ASBESTOS POWDER	31
2.2.11	PREVENTING DAMAGE CAUSED BY THE WORK EQUIPMENT	32
2.2.12	FIRE EXTINGUISHERS AND FIRST AID KIT	32
2.2.13	PRECAUTIONS CONCERNING THE CAB STRUCTURE	32
2.2.14	PRECAUTIONS CONCERNING THE EQUIPMENT	32
2.3	PRECAUTIONS TO BE TAKEN BEFORE STARTING THE ENGINE	33
2.3.1	SAFETY ON THE WORK SITE	33
2.3.2	FIRE PREVENTION	33
2.3.3	PRECAUTIONS TO BE TAKEN FOR THE OPERATOR'S CAB	33
2.3.4	ROOM VENTILATION	34
2.3.5	CLEANING WINDOWS, MIRRORS AND LIGHTS - CHECKING THE WINDSHIELD WIPER BLADES AND THE BULBS	34

	Page
2.4 PRECAUTIONS TO BE TAKEN WHEN WORKING	35
2.4.1 STARTING THE ENGINE	35
2.4.2 RULES FOR ROAD TRAVEL	35
2.4.3 CHECKS FOR TRAVELLING IN REVERSE	36
2.4.4 MOVING THE MACHINE	36
2.4.5 WORKING ON SLOPES	37
2.4.6 PREVENTING ELECTROCUTION	38
2.4.7 VISIBILITY	39
2.4.8 WORKING ON ICY OR SNOW-COVERED SURFACES	39
2.4.9 PREVENTING DAMAGE CAUSED BY THE WORK EQUIPMENT.....	39
2.4.10 WORKING ON LOOSE GROUND.....	39
2.4.11 PARKING THE MACHINE	40
2.5 TRANSPORTING THE MACHINE ON OTHER VEHICLES	41
2.5.1 LOADING AND UNLOADING THE MACHINE	41
2.5.2 THE ROUTE	41
2.6 BATTERY	42
2.6.1 SAFETY PRECAUTIONS FOR WORK ON BATTERIES	42
2.6.2 STARTING WITH BOOSTER CABLES.....	42
2.7 PRECAUTIONS FOR EMERGENCY RECOVERY	43
2.8 PRECAUTIONS TO BE TAKEN DURING MAINTENANCE	44
2.8.1 WARNING PLATES	44
2.8.2 TOOLS	44
2.8.3 PERSONNEL	44
2.8.4 EQUIPMENT	45
2.8.5 WORKING UNDER THE MACHINE	45
2.8.6 KEEPING THE MACHINE CLEAN	45
2.8.7 USE OF THE ENGINE DURING MAINTENANCE	46
2.8.8 PERIODICAL CHANGE OF THE PARTS THAT ARE CRITICAL FOR SAFETY	46
2.8.9 STOP THE ENGINE BEFORE CARRYING OUT ANY MAINTENANCE OPERATION OR INSPECTION	47
2.8.10 RULES FOR REFUELLING AND ADDING OIL	48
2.8.11 CHECKING THE COOLANT LEVEL IN THE RADIATOR	48
2.8.12 USING LAMPS	48
2.8.13 PRECAUTIONS CONCERNING THE BATTERY AND THE ALTERNATOR	49
2.8.14 PRECAUTIONS CONCERNING THE STARTER	49
2.8.15 PRECAUTIONS CONCERNING THE GEARSHIFT	50
2.8.16 HANDLING HIGH-PRESSURE PIPES	50
2.8.17 PRECAUTIONS TO BE TAKEN WHEN HANDLING HIGH-PRESSURE OIL	50
2.8.18 PRECAUTIONS FOR MAINTENANCE WORK INVOLVING HIGH TEMPERATURES AND PRESSURES	51
2.8.19 COOLING FAN AND FAN BELT	51
2.8.20 WASTE MATERIALS.....	51
2.8.21 PRECAUTIONS TO BE TAKEN WHEN INFLATING TYRES	52
2.8.22 PRECAUTIONS FOR THE INSTALLATION OF THE EXHAUST SYSTEM TAILPIPE.....	52
2.8.23 PRECAUTIONS FOR THE USE OF THE SYNTHETIC BIODEGRADABLE OIL TYPE HEES	53

DESCRIPTION AND USE OF THE MACHINE

3.1	SAFETY LOCKS	56
3.1.1	FRONT LOADER LOCKS	56
3.1.2	BACKHOE LOCKS	58
3.2	GENERAL VIEWS	59
3.2.1	FRONT GENERAL VIEW	59
3.2.2	BACKHOE GENERAL VIEW	60
3.2.3	CAB INSIDE GENERAL VIEW	61
3.2.3.1	CAB INSIDE GENERAL VIEW (Standard version)	61
3.2.3.2	CAB INSIDE GENERAL VIEW (Version with servcontrols available on request)	62
3.3	INSTRUMENTS AND CONTROLS	63
3.3.1	FRONT INSTRUMENTS	63
3.3.2	SIDE INSTRUMENTS	75
3.3.2.1	SIDE INSTRUMENTS (Standard version)	75
3.3.2.2	SIDE INSTRUMENTS (Version with servo controls available on request)	76
3.3.3	PUSH BUTTONS ON THE FRONT LOADER CONTROL LEVER	84
3.3.4	ELECTRICAL ACCESSORIES	85
3.3.5	MACHINE CONTROLS	86
3.3.5.1	MACHINE CONTROLS (Standard version)	86
3.3.5.2	MACHINE CONTROLS (Version with servo controls available upon request) ..	87
3.4	FUSES AND RELAYS	127
3.4.1	EQUIPMENT FUSES AND RELAYS	127
3.4.1.1	FUSES	128
3.4.1.2	RELAYS	129
3.4.2	ENGINE LINE FUSES AND RELAYS	129
3.4.2.1	FUSES	130
3.4.2.2	RELAYS	130
3.4.3	SIDE DASHBOARD RELAYS	131
3.4.4	SIDE DASHBOARD RELAYS AND FUSES (Only with servo controls)	131
3.4.4.1	RELAYS	131
3.4.4.2	FUSES	131
3.5	GUARDS, CAB AND DRIVER'S SEAT	132
3.5.1	ENGINE HOOD	132
3.5.2	CANOPY (if provided)	132
3.5.3	CAB	133
3.5.4	VENTILATION AND HEATING	136
3.5.5	AIR CONDITIONER (if installed)	137
3.5.6	SEAT	139
3.5.6.1	SEAT (STANDARD)	139
3.5.6.2	SEAT (OPTIONAL)	140
3.5.7	SAFETY BELT	141
3.5.8	FIRE EXTINGUISHER	141
3.5.9	FIRST AID KIT	141
3.5.10	TECHNICAL DOCUMENTATION	141
3.5.11	ADDITIONAL TOOL BOX (if provided)	142
3.6	USE OF THE MACHINE	143
3.6.1	CHECKS BEFORE STARTING THE ENGINE	143
3.6.1.1	VISUAL CHECKS	143
3.6.1.2	DAILY CHECKS	143
3.6.1.3	OPERATIONAL CHECKS	144

	Page	
3.6.2	STARTING THE ENGINE	145
3.6.2.1	STARTING WITH WARM ENGINE OR IN TEMPERATE CLIMATES	145
3.6.2.2	STARTING WITH COLD ENGINE OR IN COLD CLIMATES	146
3.6.3	WARMING THE ENGINE	147
3.6.4	HEATING THE HYDRAULIC OIL	147
3.6.5	HOW TO MOVE THE MACHINE	148
3.6.5.1	ENGAGING THE FOUR-WHEEL DRIVE	149
3.6.5.2	MOVING ON SLOPES	150
3.6.5.3	MAXIMUM IMMERSION DEPTH	151
3.7	PARKING THE MACHINE	152
3.7.1	PARKING ON LEVEL GROUND	152
3.7.2	PARKING ON SLOPES	153
3.8	STOPPING THE ENGINE	154
3.9	TRANSPORTING THE MACHINE ON OTHER VEHICLES	155
3.9.1	LOADING AND UNLOADING THE MACHINE	155
3.9.2	TRANSPORT	156
3.10	PRECAUTIONS TO BE TAKEN IN THE COLD SEASON	157
3.10.1	FUEL AND LUBRICANTS	157
3.10.2	COOLANT	157
3.10.3	BATTERY	157
3.10.4	OTHER PRECAUTIONS	158
3.10.5	PRECAUTIONS TO BE TAKEN AT THE END OF WORK	158
3.11	PRECAUTIONS TO BE TAKEN IN THE WARM SEASON	159
3.12	USING THE MACHINE AS A LOADER	160
3.12.1	BUCKET POSITION INDICATOR	160
3.12.2	ORGANIZING THE WORK AREA	160
3.12.2.1	LOADING HEAPED AND LEVEL MATERIAL	161
3.12.2.2	LOADING OPERATIONS ON SLOPES	162
3.12.3	CHANGING THE STANDARD FRONT BUCKET	162
3.13	USING THE MACHINE AS AN EXCAVATOR	163
3.13.1	POSITIONING THE BUCKET ACCORDING TO THE WORK TO BE CARRIED OUT	163
3.13.2	POSITIONING THE MACHINE FOR DIGGING OPERATIONS	164
3.13.3	SLIDING THE BACKHOE UNIT SIDEWARDS	165
3.13.4	DIGGING METHOD	166
3.13.5	CHANGING THE BACKHOE BUCKET	167
3.14	LONG PERIODS OF INACTIVITY	168
3.14.1	BEFORE THE PERIOD OF INACTIVITY	168
3.14.2	DURING THE PERIOD OF INACTIVITY	170
3.14.3	AFTER THE PERIOD OF INACTIVITY	170
3.15	TROUBLESHOOTING	171
3.15.1	HOW TO REMOVE THE MACHINE	171
3.15.2	IF THE FUEL HAS BEEN COMPLETELY DEPLETED	171
3.15.3	IF THE BATTERY IS DEPLETED	172
3.15.3.1	STARTING WITH BOOSTER CABLES	173
3.15.4	OTHER TROUBLES	174
3.15.4.1	ELECTRICAL CIRCUIT	174
3.15.4.2	HYDRAULIC SYSTEM	174
3.15.4.3	BRAKING SYSTEM	175
3.15.4.4	CONVERTER	175
3.15.4.5	ENGINE	176

MAINTENANCE

4.1	GUIDE TO MAINTENANCE	178
4.2	MAINTENANCE NOTES	180
4.2.1	NOTES REGARDING THE ENGINE	180
4.2.1.1	ENGINE OIL	180
4.2.1.2	COOLANT	180
4.2.1.3	FUEL	181
4.2.2	NOTES REGARDING THE HYDRAULIC SYSTEM	181
4.2.3	NOTES REGARDING THE ELECTRICAL SYSTEM	182
4.2.4	NOTES REGARDING LUBRICATION	182
4.2.5	PARTS SUBJECT TO WEAR THAT PERIODICALLY NEED CHANGING	183
4.3	FUEL, COOLANT AND LUBRICANTS	184
4.3.1	HOMOLOGATED HEES SYNTHETIC BIODEGRADABLE LUBRICANTS	186
4.4	DRIVING TORQUES FOR SCREWS AND NUTS	187
4.4.1	STANDARD DRIVING TORQUES	187
4.4.2	SPECIFIC DRIVING TORQUES	187
4.5	LUBRICATION	188
4.5.1	LUBRICATION DIAGRAM	188
4.5.2	LUBRICATION DIAGRAM (4in1 bucket and pallet forks)	189
4.5.3	LUBRICATION DIAGRAM (Front bucket rapid couplings)	190
4.5.4	LUBRICATION DIAGRAM (Telescopic arm)	191
4.5.5	LUBRICATION DIAGRAM (Offset device)	192
4.6	PERIODICAL CHANGE OF THE COMPONENTS CONNECTED WITH SAFETY	193
4.6.1	CRITICAL PARTS FOR SAFETY	194
4.7	MAINTENANCE PLAN	198
4.7.1	WHEN REQUIRED	202
4.7.1.a	CHECKING, CLEANING OR CHANGING THE AIR CLEANER CARTRIDGE ..	202
4.7.1.b	CHECKING AND CLEANING THE CAB AIR FILTER	203
4.7.1.c	CHECKING AND CLEANING THE RECIRCULATING AIR FILTER (only for machines with air conditioner)	204
4.7.1.d	BLEEDING THE BRAKING CIRCUIT	205
4.7.1.e	CLEANING THE WATER SEPARATOR	206
4.7.1.f	CHECKING AND ADJUSTING THE WHEEL TOE-IN	206
4.7.1.g	CHECKING AND ADJUSTING THE PARKING BRAKE	207
4.7.1.h	CHECKING THE BRAKING EFFICIENCY	208
4.7.1.j	CHECKING AND ADJUSTING THE BRAKE PEDAL STROKE	209
4.7.1.k	ADJUSTING THE AUTOMATIC RETURN-TO-DIG DEVICE OF THE FRONT BUCKET (if installed)	209
4.7.1.l	CHECKING AND ADJUSTING THE STABILIZER SLACK	210
4.7.2	MAINTENANCE INTERVALS IN CASE OF USE OF THE DEMOLITION HAMMER	211
4.7.2.a	CHANGING THE HYDRAULIC OIL FILTER	211
4.7.2.b	CHANGING THE HYDRAULIC OIL	211
4.7.3	CHECKS BEFORE STARTING	212
4.7.3.a	VARIOUS CHECKS	212
4.7.3.b	CHECKING THE COOLANT LEVEL	212
4.7.3.c	CHECKING THE FUEL LEVEL	213
4.7.3.d	CHECKING THE ENGINE OIL LEVEL	213
4.7.3.e	CHECKING THE HYDRAULIC CIRCUIT OIL LEVEL	214
4.7.3.f	DRAINING THE WATER SEPARATOR	215
4.7.4	MAINTENANCE EVERY 10 HOURS OF OPERATION	216
4.7.4.a	LUBRICATING THE JOINTS	216

	Page
4.7.5 MAINTENANCE AFTER THE FIRST 50 HOURS OF OPERATION (Only for machines in which the synthetic biodegradable oil type HEES is used)	218
4.7.6 MAINTENANCE EVERY 50 HOURS OF OPERATION	218
4.7.6.a CHECKING THE RADIATOR FLUID LEVEL	218
4.7.6.b CHECKING THE BRAKING SYSTEM OIL LEVEL	218
4.7.6.c LUBRICATING THE PROPELLER SHAFTS	219
4.7.6.d LUBRICATING THE FRONT AXLE JOINTS AND CENTRAL COUPLING AND THE REAR AXLE JOINTS	220
4.7.6.e CHECKING THE TYRE PRESSURE	220
4.7.6.f CHECKING THE ELECTRICAL SYSTEM	221
4.7.7 MAINTENANCE AFTER THE FIRST 250 HOURS OF OPERATION	222
4.7.8 MAINTENANCE EVERY 250 HOURS OF OPERATION	223
4.7.8.a ADJUSTING THE FAN BELT TENSION	223
4.7.8.b ADJUSTING THE A/C COMPRESSOR BELT TENSION (Only for machines with air conditioner)	224
4.7.8.c CHECKING THE BATTERY ELECTROLYTE LEVEL	225
4.7.8.d CHECKING THE FRONT AXLE OIL LEVELS	226
4.7.8.e CHECKING THE REAR AXLE OIL LEVELS	226
4.7.8.f CHECKING THE HYDRAULIC TRANSMISSION OIL LEVEL	227
4.7.8.g CHECKING THE WHEEL NUT DRIVING TORQUE	227
4.7.9 MAINTENANCE AFTER THE FIRST 500 HOURS OF OPERATION (Only for machines in which the synthetic biodegradable oil type HEES is used)	228
4.7.10 MAINTENANCE EVERY 500 HOURS OF OPERATION	229
4.7.10.a CHANGING THE ENGINE OIL	229
4.7.10.b CHANGING THE ENGINE OIL FILTER	230
4.7.10.c CHANGING THE HYDRAULIC SYSTEM OIL FILTER	230
4.7.10.d CHANGING THE FUEL FILTER	233
4.7.10.e DRAINING THE FUEL TANK	234
4.7.10.f DRAINING THE HYDRAULIC OIL TANK (Only for machines in which the synthetic biodegradable oil type HEES is used)	235
4.7.10.g CLEANING THE OUTSIDE OF THE RADIATORS	236
4.7.10.h CLEANING THE OUTSIDE OF THE A/C CONDENSER (Only for machines with air conditioner)	237
4.7.11 MAINTENANCE EVERY 1000 HOURS OF OPERATION	238
4.7.11.a CHANGING THE FRONT AXLE OIL	238
4.7.11.b CHANGING THE REAR AXLE OIL	239
4.7.11.c CHANGING THE HYDRAULIC TRANSMISSION OIL	240
4.7.11.d CHANGING THE HYDRAULIC TRANSMISSION FILTER	241
4.7.11.e CHECKING AND ADJUSTING THE ENGINE VALVE CLEARANCE	241
4.7.12 MAINTENANCE EVERY 2000 HOURS OF OPERATION	242
4.7.12.a CHANGING THE HYDRAULIC SYSTEM OIL AND CLEANING THE SUCTION FILTER	242
4.7.12.b CHANGING THE COOLANT	244
4.7.12.c CHANGING THE BRAKING SYSTEM OIL	246
4.7.12.d CHECKING THE ALTERNATOR AND THE STARTER	246
4.7.12.e CHECKING THE QUANTITY OF COOLANT IN THE A/C SYSTEM (Only for machines with air conditioner)	247
4.7.13 MAINTENANCE EVERY 4000 HOURS OF OPERATION	248
4.7.13.a CHANGING THE A/C DEHYDRATING FILTER (Only for machines with air conditioner)	248
4.7.13.b CHECKING THE OPERATING CONDITIONS OF THE A/C COMPRESSOR (Only for machines with air conditioner)	248

TECHNICAL SPECIFICATIONS

5.1	TECHNICAL DATA	250
5.1.1	STANDARD OVERALL DIMENSIONS WITH CENTERED BACKHOE	250
5.1.2	STANDARD OVERALL DIMENSIONS WITH FOLDED BACKHOE	250
5.1.3	TECHNICAL CHARACTERISTICS	251
5.1.4	LIFTING CAPACITIES	252
5.1.4.1	SYMBOL TABLE	252
5.1.4.2	LIFTING CAPACITY (STANDARD BOOM)	253
5.1.4.3	LIFTING CAPACITY (OFFSET BOOM)	254

AUTHORIZED OPTIONAL EQUIPMENT

6.1	AUTHORIZED OPTIONAL EQUIPMENT	256
6.1.1	CHARACTERISTICS OF THE OPTIONAL EQUIPMENT	256
6.2	FRONT EQUIPMENT QUICK COUPLING DEVICES	257
6.2.1	MANUAL CONTROL QUICK COUPLING	257
6.2.2	HYDRAULIC CONTROL QUICK COUPLING FOR STANDARD BUCKET	258
6.2.3	HYDRAULIC CONTROL QUICK COUPLING FOR 4in1 BUCKET AND OPTIONAL EQUIPMENT WITH UNIDIRECTIONAL OIL FLOW	258
6.3	4in1 BUCKET	259
6.3.1	DESCRIPTION AND CONTROLS	259
6.3.2	SAFETY DEVICES	259
6.3.3	INSTALLING THE 4in1 BUCKET	260
6.3.4	USING THE 4in1 BUCKET	261
6.3.5	MAINTENANCE	261
6.4	PALLET FORKS	262
6.4.1	DESCRIPTION	262
6.4.2	SAFETY DEVICES	262
6.4.3	USING THE FORKS	263
6.4.3.1	PREPARING THE PALLET FORKS FOR USE	263
6.4.3.2	OVERTURNING THE FORKS FOR TRAVEL ON ROADS	264
6.4.4	REMOVING THE FORKS	265
6.4.5	INSTALLING THE FORKS	265
6.4.6	MAINTENANCE	265
6.5	BACKHOE TELESCOPIC ARM	266
6.5.1	DESCRIPTION AND CONTROL	266
6.5.1.1	VERSION WITH STANDARD CONTROLS	266
6.5.1.2	VERSION WITH SERVO CONTROLS (if installed)	266
6.5.2	SAFETY DEVICES	267
6.5.3	USING THE TELESCOPIC ARM	267
6.5.4	MAINTENANCE	268
6.5.4.1	ADJUSTING THE GUIDE SLACK	268

TABLE OF CONTENTS

	Page
6.6 ARRANGEMENT FOR THE INSTALLATION OF THE DEMOLITION HAMMER	270
6.6.1 DESCRIPTION AND CONTROL	270
6.6.1.1 VERSION WITH STANDARD CONTROLS	270
6.6.1.2 VERSION WITH SERVO CONTROLS (if installed)	270
6.6.2 USE OF THE DEMOLITION HAMMER AND RULES TO BE OBSERVED	271
6.6.3 INSTALLING AND REMOVING THE DEMOLITION HAMMER	275
6.6.3.1 INSTALLING THE HAMMER	275
6.6.3.2 REMOVING THE HAMMER	277
6.6.4 USING THE HAMMER	277
6.6.5 MAINTENANCE	277
6.7 APPLICATION OF THE OFFSET DEVICE	278
6.7.1 DESCRIPTION AND CONTROL	278
6.7.1.1 VERSION WITH STANDARD CONTROLS	278
6.7.1.2 VERSION WITH SERVO CONTROLS (if installed)	279
6.7.2 MAINTENANCE	279
6.8 ARRANGEMENT FOR THE OPERATION OF OPTIONAL EQUIPMENT WITH UNIDIRECTIONAL OIL FLOW	280
6.8.1 DESCRIPTION AND CONTROL	280
6.8.1.1 VERSION WITH STANDARD CONTROLS	280
6.8.1.2 VERSION WITH SERVO CONTROLS (if installed)	280
6.8.2 INSTALLING AND CONNECTING THE EQUIPMENT	281
6.8.3 MAINTENANCE	281
6.9 ARRANGEMENT FOR THE INSTALLATION OF THE CLAMSHELL BUCKET	282
6.9.1 DESCRIPTION AND CONTROL	282
6.9.1.1 VERSION WITH STANDARD CONTROLS	282
6.9.1.2 VERSION WITH SERVO CONTROLS (if installed)	283
6.9.2 INSTALLING THE CLAMSHELL BUCKET	284
6.9.3 USING THE CLAMSHELL BUCKET	285
6.9.4 MAINTENANCE	285
6.10 ARRANGEMENT FOR THE INSTALLATION OF THE MANUAL HYDRAULIC HAMMER	286
6.10.1 DESCRIPTION AND CONTROL	286
6.10.2 CONNECTING AND REMOVING THE HAMMER	287
6.10.2.1 CONNECTING THE HAMMER	287
6.10.2.2 REMOVING THE CONNECTIONS	287
6.10.3 USING THE HAMMER	288
6.10.4 MAINTENANCE	288
6.11 LOAD STABILIZER SYSTEM (LSS) (Optional)	289
6.11.1 ACCUMULATOR OF THE LOAD STABILIZER SYSTEM (LSS)	289
6.12 REAR EQUIPMENT RAPID COUPLING DEVICE	290
6.12.1 EQUIPMENT COUPLING AND RELEASE PROCEDURE	291
6.12.2 MAINTENANCE	293