FIATALLIS

FR 90
wheel loader

Service Manual

Print No. 604.02.203

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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 operator's safety.*

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

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SAFETY RULES

GENERALITIES

Study this Manual before starting, operating, maintaining, fuelling or servicing the machine.

Read and heed all safety rules before any intervention.

Do not allow unauthorised personnel to operate service or maintain this machine.

Do not wear rings, wrist watches, jewellery, loose or hanging apparels, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as recommended for the job. Examples: hard hat, heavy gloves, ear protection, safety glasses or goggles, reflector vests, respirator. Consult your employer for specific safety equipment requirements.

Keep operator's compartment, stepping points, grab-rails and handles clear of foreign objects, oil, grease, mud or snow accumulation to minimize the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.

Do not jump on or off the machine. Keep two hands and one foot, or two feet and one hand in contact with step grab rails and handles at all times.

Do not use controls or hoses as hand holds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Controls also may be inadvertently moved causing accidental machine or equipment movement.

Never attempt to operate the machine or its tools from any position other than seated in the operator's seat. Keep head, body, limbs, hands and feet inside operator's compartment at all times to reduce exposure to hazards outside the operator's compartment.

Be careful of slippery conditions on stepping points, hand rails, and on the ground. Wear safety boots or shoes that have a high slip resistant sole material.

Do not leave the machine until it is completely stopped.

Check the seat safety belt at least twice a year. If there are signs of wear or fraying or other signs of weakness that could lead to failure, replace it.

STARTING

NEVER START OR OPERATE AN UNSAFE MACHINE. Before operating a machine, always ensure that any unsafe condition has been satisfactorily remedied.

Check brakes, steering and attachment controls before moving. Advise the proper maintenance authority of any malfunctioning part or system.

Be sure all protective guards or panels are in place, and all safety devices provided are in place and in good operating conditions.

Be sure exposed personnel in the area of operation are clear of the machine before moving it or its attachments. WALK COMPLETELY AROUND the machine before mounting. Sound horn. Obey flag man, safety signals and signs.

Before starting machine, check, adjust and lock the operator's seat for maximum comfort and control of the machine.

Fasten your seat belt (when provided).

Obey all flag signals and signs.

Due to the presence on the machine of flammable fluids, never check or fill fuel reservoirs or batteries near open flames, smoking materials or sparks.

REMEMBER THAT STARTING FLUID IS FLAMMABLE. Follow recommendations printed on containers and in the Operation and Maintenance Manual.

DO NOT PUNCTURE OR BURN CONTAINERS.

Containers must be stored in fresh, well ventilated places, out of reach of unauthorised persons. Follow strictly the instructions provided by the Manufacturer.

Never use these preducts near open flames, smoking materials or sparks.

OPERATION

Check the fasteners of wheels and rims before starting a working shift. If necessary, retighten to the prescribed torque.

Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.

Roll Over Protective Structures are required on loaders, dozers, graders, excavators. NEVER OPERATE machines without ROPS.

Make sure the Operator's compartment is free of foreign objects, especially if not firmly secured. Never use the machine to transport objects, unless proper securing points are provided.

DO NOT CARRY RIDERS ON MACHINE

Study and familiarize with escape routes alternate to normal exit routes.

Seat belts are required to be provided with Roll Over Protection Structures or cabs. Keep safety belts fastened around you during operation.

For your personal protection, do not climb on or off machine while machine in motion.

SAFETY RULES

Make sure that exposed persons in the area of operation are clear of the machine, before starting the engine and operating the equipment. Obey all indications provided by flags and signals.

NEVER COAST the machine down grades and slopes with the transmission in neutral or neutralized, or power shift type machines, or clutch disengaged on manually shifted machines.

Do not operate machinery in a condition of extreme fatigue or illness. Be especially careful towards the end of working shift.

Do not operate machine with brakes out of adjustment.

Operate the machine at speeds slow enough to ensure complete control at all times.

Travel slowly over rough terrain, on slopes or near drop-offs, in congested areas or on ice or slippery surfaces.

When backing, always look to where the machine is to be moved. Be alert to the position of exposed personnel. DO NOT OPERATE if exposed personnel enter the immediate work area. STOP THE MACHINE.

Maintain a safe distance from other machines. Provide sufficient clearance for ground and visibility conditions. Yield right-of-way to loaded machines.

Maintain clear vision of areas of travel or work. Keep cab windows clean and repaired.

When machines are operating in tandem, the pusher (rear) must be equipped with the appropriate deflectors to protect the unit in front from the air stream coming from the radiator.

When pulling or towing through a cable or chain, do not start suddenly at full throttle; take-up slack carefully.

Inspect carefully for flaws or troubles before using.

Avoid kinking chains or cables. Do not pull through a kinked chain or cable to the high stresses and possibility of failure of the kinked area. Always wear heavy gloves when handling chains or cables.

Be sure chains and cables are anchored and the anchor points are strong enough to handle the expected load. Keep exposed personnel clear of anchor points and cables or chains.

DO NOT PULL UNLESS OPERATOR'S COMPARTMENT OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.

Be alert to soft ground conditions close to newly constructed walls. The fill material and weight of the machine may cause the wall collapse under the machine.

In darkness, check area of operation carefully before moving in with machine. Use all lights provided. Do not move into area of restricted visibility.

If engine has a tendency to stall for any reason under load or idle, report this for adjustment to proper maintenance authority immediately. Do not continue to operate machine, until condition has been corrected.

On machines supplied with suction radiator fans, be sure to periodically check engine exhaust parts for leaks, as exhaust fumes are dangerous to the operator.

Operators must know thoroughly the performances of the machine they are operating. When working on slopes or near sudden level drops of the terrain, avoid areas where ground is loose or soft since rolling-over or loss of control of machine could result.

Where noise exposure exceeds 90 dBA for 8 hours, wear approved ear protection.

When counterweights are provided, do not work machine if they have been removed.

Transport a loaded bucket as far tipped-back and in as low a position as possible for maximum visibility, stability and safest transport of the machine. Move at a proper speed for the load and ground conditions.

The bucket load must always be properly arranged; move with extreme care when transporting oversized loads.

Use only the type of bucket recommended for the machine and the materials to be handled. Follow the recommendations for the loading capacity and the arrangement of the materials, the specifications of the terrain and the job to be performed.

Do not lift and haul loads overhead where persons are standing or working, or downhill when working on slopes; in the latter case, the bucket must be unloaded on the uphill side, whenever possible.

With a full bucket, start and stop the machine carefully; avoid starting without first reducing the engine r.p.m..

Overtaking manoeuvres must be performed only when absolutely necessary and unavoidable. Beware of possible uneven terrains, poor visibility conditions, the presence of other machinery or persons out of sight.

Operate the machine at a speed adequate to the working conditions in the site and slow enough to ensure complete control at all times.

Check monitoring instruments at start-up and frequently during operations. In case of abnormal condition warnings, stop immediately the machine.

Never use the bucket as a man lift or to carry riders.

Never use the machine as a work platform or scaffolding, nor other inappropriate operations (i.e pushing railway

cars, trucks or other machines).

Be alert of people in the operating area of the machine. Load trucks from the driver's side whenever possible. When operating a machine, know what clearances will be encountered, overhead doors, cables, pipes, bearing load limitations of ground, bridges, floors or ramps.

When roading, find-out what conditions are likely to be encountered, clearances, traffic congestion, type of road surfacing, etc. Beware of fog, smoke or dust elements that obscure visibility.

When crossing gullies or ditches, move at an angle with reduced speed after ensuring ground conditions will permit a safe traverse.

Explore the working area to identify potential risks such as: slopes, overhangs, pits, demolition rubble, fires, ravines, ditches, soft terrain, heavy traffic, crowded parking areas, closed ambients. In such conditions, proceed with extreme care.

Whenever possible, avoid going over obstacles such as rough terrain, rocks, logs highly irregular ground, steps, ditches, railroad tracks. When obstructions must be crossed, do so with extreme care at an angle, if possible. Reduce speed, shift-down. Ease up to the break over point, pass the balance point slowly on the obstruction and ease down on the other side.

In steep down-hill operation, do not allow engine to overspeed. Select proper gear before starting down grade.

Avoid side hill travel, whenever possible. Drive up and down the slope. Should the machine slipping sideways, turn it immediately downhill.

The grade of slope you should attempt will be limited by factors such as condition of the ground, load being handled, type of machine, speed of machine and visibility.

There is no substitute for good judgement when working on slopes.

Avoid operating equipment too close to an overhang or high wall, either above or below the machine. Be on the look-out for caving edges, falling objects and slides. Beware of concealment by brush and undergrowth of these danger.

When pushing-over trees, the machine must be equipped with proper overhead guarding. Never allow a machine to climb up on the root structure particularly while the tree is being felled. Use extreme care when pushing over any tree with dead branches.

Avoid brush piles, logs or rocks. never drive over them or other surface irregularities that brake traction with the ground, especially when on slopes or near drop-offs.

Be alert to avoid changes in traction conditions that could cause loss of control. DO NOT DRIVE on ice or frozen ground conditions when working the machine on steep slopes or near drop-offs.

Working in virgin and rough terrains is characterized by the presence of all the perils and risks listed above. In these conditions, it is emphasised the danger represented by large tree limbs (possibly falling on the machine), large roots (acting as a leverage under the machine when up-rooted causing the roll-over of the unit) etc..

STOPPING

When the machine is stopped for whatever reason, follow the instructions of chapters "**Stopping the machine**" and "**Stopping the engine**" of the Operation and Maintenance Instruction Manual.

Always remember to position the transmission drive control in neutral and engage the control lock to secure the machine.

Set parking brake.

NEVER LEAVE THE MACHINE UNATTENTED with the engine running.

Always before leaving the operator's seat and after making sure all people are clear of the machine, slowly lower the attachments or tools flat to the ground in a positive ground support position.

Park in a non- operating and no-traffic area or as instructed. Park on firm level ground if possible. Where not possible, position machine at a right angle to the slope, making sure there is no danger of uncontrolled sliding movements. Set parking brake.

If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and signals as required. Also provide advance warning signals in the traffic lane of approaching traffic.

Always disconnect the master switch before any intervention (i.e. cleaning, repairing, maintaining, refuelling etc.). Do the same when parking for prolonged periods of time to avoid accidental or unauthorized starting.

Never lower attachments or tools other than seated in operator's seat. Sound horn. Make sure area near the attachment is clear. Lower the attachment slowly. do not use float position of hydraulic system.

Securely block the machine and lock it every time you leave it unattended. Return keys to authorized security. Heed all shut-down operations of the Operation and Maintenance Instruction Manual are followed. Every time you leave the machine, engage parking brake (if equipping unit).

SAFETY RULES

MAINTENANCE

GENERALITIES

Before operating or performing any intervention on the machine:
- read carefully all the rules contained by this Manual;
- read and obey all safety related plates and instructions located on the machine.

Do not allow unauthorized personnel to perform any maintenance operation. Do not perform maintenance operation without prior authorization. Follow all recommended maintenance and service procedures.

Keep operator's compartment free of all loose objects that are not properly secured.

Do not wear rings, wrist watches, jewellery, loose or hanging apparels, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as recommended for the job. Examples: hard hat, heavy gloves, ear protection, safety glasses or goggles, reflector vests, respirator. Consult your employer for specific safety equipment requirements.

Do not perform any service operation on the machine with a person seated in the operator's compartment, unless he is an authorized operator co-operating in the operation to be performed.

Keep operator's compartment, stepping points, grab-rails and handles clear of foreign objects, oil, grease, mud or snow accumulation to minimize the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.

Keep shoes free of mud or grease before climbing or driving the machine.

Never attempt to operate the machine or its tools from any position other than seated in the operator's seat.

Never stand under the boom.

When maintenance operations require moving hydraulically operated attachments by means of machine's hydraulic system remember that all manoeuvres must be made only when seated in the operator's seat. Before starting machine or moving attachment or tools, set brakes , sound horn and call for an all clear. Raise attachment slowly.

Never perform interventions with engine running, except as called for in a Manual. Do not wear loose clothing or jewellery near moving parts.

When servicing or maintenance require access to areas that cannot be reached from the ground, use a ladder or step platform that meet local and national regulations, to reach the service point. If such ladder or platform are not available, use the machine hand holds and steps as provided. Perform all service or maintenance carefully.

Shop and/or field service platforms or ladders must be constructed and maintained in accordance with local and national regulations.

Disconnect batteries and TAG all controls according to current regulations to warn that work is in progress. Block machine and all attachments that must be raised according to current regulations.
Due to the presence of flammable fluids, never check or fill fuel tanks, batteries, nor use starting fluid near lighted smoking materials or open flames.

BRAKES ARE INOPERATIVE when manually released for servicing. Provisions must be made to maintain control of the machine by blocking or other means.

The fuel filling nose must be kept constantly inside the filling neck. Keep this contact from the beginning to the end of the fuelling operation to avoid the possibility that sparks due to static electricity are generated.

Use only designated towing or attaching points. Use care in making attachments. Make sure pins and/or locks are secure before pulling. Stay clear of drawbars, cables or chains under load.

To move a disabled machine, use a trailer or a low-boy, if available. In case towing is needed , use all necessary signals required by local and national regulations, and follow the directions provided in this Manual.

To load/unload a machine from transporter, choose a level surface ensuring firm support to the wheels of truck or trailer. Use strong access ramps, with adequate height and angle. Keep surface free of mud, oil or slippery materials.

Anchor the machine securely to the bed of truck or trailer and block wheels or tracks with appropriate wedges.

Never align holes with fingers or hands; always use appropriate aligning tools.

Eliminate all sharp edges and burrs from re-worked parts.

Use only approved grounded auxiliary power sources for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shocks.

Lift and handle heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch-out for people in the vicinity.

Never pour gasoline or diesel fuel into open, wide and low containers. Never use gasoline, solvent or other flammable fluid to clean parts. Use exclusively qualified, non-flammable, non-toxic commercial solvents.

When using compressed air for cleaning parts, use safety glasses with side shields or goggles. Limit pressure to 2 bar, in accordance with local and national regulations.

SAFETY RULES

Do not run the engine in closed areas without proper ventilation to remove deadly exhaust fumes.

Do not smoke or permit any open flames or spark near when re-fuelling or handling flammable materials.

Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.

Make sure that all mechanic's tools are in good conditions. NEVER USE tools with mushroomed heads or frayed. Always wear eye protections.

Move with extreme care when working under the machine, its attachments and or on or near them. Always wear protective safety equipment as required, such as hard hat, goggles, safety shoes, ear plugs.

When performing operations requiring running of the engine, have a qualified operator in the operator's seat at all times with the mechanic on sight. Place the transmission in neutral and set the brakes and safety lock. KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS.

For field service, move machine to level ground, if possible, and block it. If work on an incline is absolutely necessary, first block machine and its attachments securely, than move it to level ground as soon as possible.

Do not trust worn and/or kinked chains and cables: do not use them for lifting or pulling operations. To handle them, always use heavy gloves.

Avoid kinking chains or cables. Do not pull through a kinked chain or cable to the high stresses and possibility of failure of the kinked area. Always wear heavy gloves when handling chains or cables.

Be sure chains and cables are anchored and the anchor points are strong enough to handle the expected load. Keep exposed personnel clear of anchor points and cables or chains.

DO NOT PULL UNLESS OPERATOR'S COMPARTMENT OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.

Keep the area where maintenance operations are performed clean and dry. Eliminate immediately all water and oil spillages.

Do not pile oily or greasy rags; they represent a fire hazard. Store in closed metal container.

Before starting machine, check, adjust and lock the operator's seat for maximum comfort and control of the machine. Be sure exposed personnel in the area of operation are clear of the machine before moving it or its attachments. Sound horn.

Rust inhibitors are volatile and flammable Use only in well ventilated areas. Keep open flames away - DO NOT SMOKE - Store containers in a cool well ventilated place, secure against unauthorised personnel.

Do not carry loose objects in pockets that might fall unnoticed into open compartments.

Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.

Wear welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes, when welding or burning. Wear dark safety glasses near welding zones. DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.

Know your jacking equipment and its capacity. Be sure the jacking point used on the machine is appropriate for the load to be applied. Be sure the support of the jack at the machine and under jack is appropriate and stable. Transfer load to appropriate blocking as a safety measure, before proceeding with service or maintenance work, according to local or national regulations.

Steel cables are frayed after prolonged use; always wear appropriate protections (heavy gloves, goggles etc.).

Handle all parts carefully. Keep hands and fingers away from structures, gears or moving parts. Use and wear always the appropriate protections

Compressed air systems can have water deposits created by moisture condensation due to changes of atmospheric conditions. If required, discharge deposits, as instructed.

Before performing any maintenance or service operation, lock the frames of the machine with the appropriate safety device. Remember to remove it at the end of the operation.

If the machine is equipped with hydraulic brakes, make sure that the reservoir is always filled up to the correct level.

Block always all wheels, front and rear, before proceeding with any maintenance or service operation involving the bleeding of braking system or removal of piping or cylinders.

STARTING

Do not run the engine in closed areas without proper ventilation to remove deadly exhaust fumes.

Do not place head, body, limbs, feet, hands or fingers, near rotating fans or belts. Be especially alert near pusher fans.

REMEMBER THAT STARTING FLUID IS FLAMMABLE. Follow recommendations printed on containers and in the Operation and Maintenance Manual.

Containers must be stored in fresh, well ventilated places, out of reach of unauthorised persons. Follow strictly the instructions provided by the Manufacturer.
DO NOT PUNCTURE OR BURN CONTAINERS.

ENGINE

Loosen the radiator cap very slowly, to release pressure from the system, before removing it. All coolant level top-ups must be performed with engine OFF.

Avoid that flammable materials touch exhaust parts. Should this be possible, provide the necessary protections.

Do not run engine when refuelling and use care if the engine is hot due to the increased possibility of a fire if fuel is spilled.

Never attempt to check or adjust fan belts when engine is running.

Do not adjust engine fuel pump when machine is moving.

Do not lubricate the machine with engine running.

Do not run the engine with air intakes, door or protections open.

ELECTRICAL SYSTEM

Disconnect batteries prior to any intervention on machine or electrical system (cleaning, repair, maintenance).

Should booster batteries be used, remember to connect both ends of the booster cables in the proper manner (+) with (+) and (-) with (-). Avoid short-circuits of the terminals. Follow thoroughly the instructions of this Manual.

Before any intervention, make sure that the main switch is OFF.

BATTERY GAS IS HIGHLY FLAMMABLE. Leave battery box open to improve ventilation when recharging batteries. Never check charge by placing metal objects across the posts. Keep sparks or open flames away from batteries. Do not smoke near battery to guard against the possibility of causing an explosion.

Before any intervention, make sure that there are no fuel or electrolyte leakages; eliminate them before proceeding with further work.

HYDRAULIC SYSTEM

Fluid escaping under pressure from a very small hole can be almost invisible and can have sufficient force to penetrate the skin. Use a piece of cardboard or wood to search for suspected pressure leaks. DO NOT USE HANDS. If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

Stop the engine and release all pressures in the system before removing panels, housings, plugs or covers.

In case pressures must be measured, use instruments of adequate capacity. Always follow the recommended procedures.

TOOLS

Keep head, body, limbs, feet, fingers or hands away from bucket, blade or ripper when in raised position.

Prior to any intervention, install all safety devices according to current rules and regulations. In case equipment on the machine must be operated by hydraulic systems, remember to proceed only after seating in the operator's compartment. Make sure that there are no persons in the operating area of the machine. Alert people before operating using the horn and by voice. Move the equipment very carefully.

Do not use machine to transport loose objects, unless proper devices for this purpose are provided.

Clutches and brakes of this machine and eventual auxiliary equipment and attachments (such as operating cylinder or winches control valves) must always be properly adjusted in accordance with the instructions provided by the Manuals of the Manufacturer. Never perform adjustments with engine running, except when called for by the above instructions.

TYRES AND WHEELS

Make sure that the inflation pressure of the tyres is according to the specifications issued by the Manufacturer and check it periodically.

Should the pressure be changed, stand on the side of the tyre at a safe distance.

Pressure check operations must be performed with unloaded machine and cold tyres.

Never use reconditioned tyre rims, since eventual weldings, heat-treatments or repairs not performed correctly can weaken the wheel, thus causing subsequent damages or dangers.

Do not perform torch cutting or welding operations on rims with inflated tyres installed.

Spare tyres must be inflated only as far it is necessary to keep the rim components assembled; remember that when not installed on the disc, a tyre inflated to maximum pressure can explode.

SAFETY RULES

Maximum care must be taken when handling a tyre inflated to maximum pressure.

Before operating on tyres, block all wheels, front and rear. After jacking the machine, block it with stands according to current safety rules and regulations.

Before removing objects from the tyre tread, deflate it.

Never inflate tyres with flammable gas; explosions and serious bodily injuries may result!!

When changing work shift, check that wheel or rim securing screws and brackets are not loosen; if necessary, retighten to the prescribed torque.

WARNING

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 before servicing, adjusting and/or repairing. If it is necessary to have the hydraulically, mechanically, and/or cable controlled equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the hydraulic lift cylinders, cable and/or mechanical devices used for controlling the equipment.

SECTION 0

GENERALITIES

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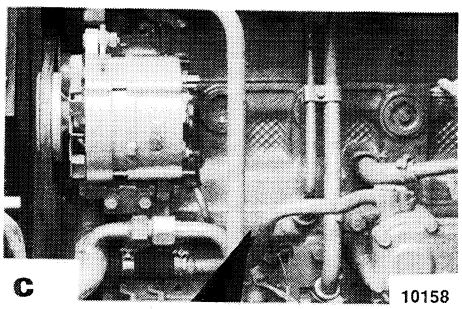
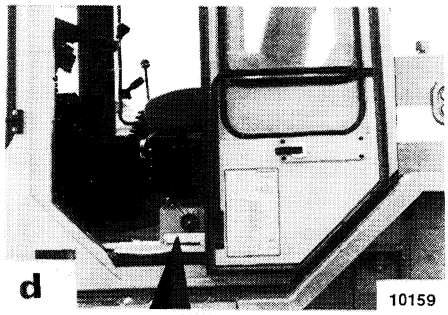
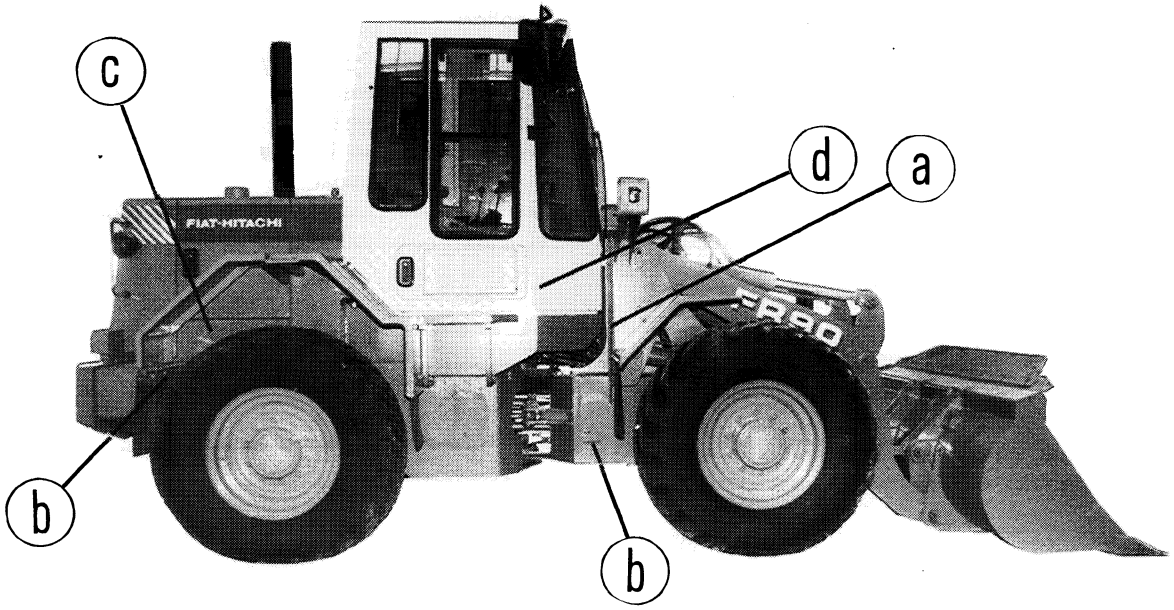
IDENTIFICATION DATA







a. Machine identification data plate, with serial number and engine type (r.h. side)
b. Serial number (r.h. side)
c. Type and serial number of engine (r. h. side)
d. Cab safety structure plate (l.h. side)

SPECIFICATIONS

ENGINE

Type	8045.25.395
Diesel cycle, four-stroke, direct injection, turbocharged.	
Number of cylinders:	4
Cylinder bore:	104 mm
Stroke	115 mm
Total displacement:	3908 cu. cm
Compression ratio:	16.5 : 1
Rated speed:	2300 rpm
Rated speed at max. torque:	1600 rpm

Lubrication

Forced type by gear pump.
Strainer on pump suction line, full-flow filtering on oil delivery through throw-away cartridge.
Low engine oil pressure indicator located on Data Monitor Panel.

Timing

Overhead valves: camshaft in cylinder block.
Valve/rocker arm working clearance:

- suction	0,25 mm (.0098 in)
- exhaust	0,35 mm (.0137 in)

Fuel system

Double diaphragm feed pump.
Rotary type injection pump with all-speed governor and automatic advance variator.

Firing order	1-3-4-2
Injector setting:	230 ÷ 238 bar

Fuel filtration, throw-away cartridge type.
Dry air-cleaner with centrifugal separator and paper replaceable cartridges.
Air filter cartridge clogging indicator located on Data Monitor Panel.

Cooling

Water, forced circulated by centrifugal pump.
Radiator: tube rows core.
Blowing fan, seven blades.
Water circulation between engine and radiator governed by thermostat.
Engine coolant low level/high temperature warning indicator in electronic data monitor.

Starting

By electric motor.

TRANSMISSION

Converter

Hydraulic torque converter with maximum convertion ratio at stall : 2,6 :1

Transmission

"Power-shift" transmission, with three forward and three reverse speeds, electrically controlled, by a single lever located on the left of the steering column.

Safety system with lever locking the transmission gearshift in neutral.
Gear type converter/transmission pump.
Converter/transmission hydraulic system oil cooling with water circulation through heat-exchanger derived from engine radiator.
Transmission oil filtration by two total flow filters; one metal mesh on suction, the other on delivery with built-in by-pass valve.

AXLES

Front axle

Rigid load-bearing structure, complete with bevel gear - differential and planetary final drives on wheels.
Total reduction ratio 1 : 21.18

Rear axle

Swinging, load-bearing, complete with bevel gear - differential and planetary final drives on wheels.
Total swing angle: 24°
Total reduction ratio: 1 : 21.18
Self-locking "Super Max-Track" front and rear axles.

BRAKES

Service

Disc on all four wheels, with self-adjusting hydraulic calipers.
Hydraulic control with dual-split braking system.
Brakes actuated by pedal located on left side of operator. The same pedal operates the transmission cut-off when braking, after activation of switch on right side of instrument panel.

Parking

Drum type, on transmission shaft between transmission and rear axle.
Controlled by lever, located on left side of seat.

WHEELS

- Tyres: 15.5 x 25 or 17.5 x 25
- Wheel tightening torque: 58 da Nm

STEERING

Hydraulically controlled by steering wheel and power assisted through gear pump (also provides hydraulic system control).
Two, double-acting power cylinders.
As steering wheel is turned, one cylinder exerts a contracting force and the other an extending force, causing the loader to pivot in the articulation point.
Emergency steering system, optional.

LOADER FRAME

Articulated type, consisting of two parts coupled by two ball joints. Both sections are made of welded sheet steel box sections, carrying different operational units.

HYDRAULIC SYSTEM

Sealed oil reservoir with oil level sight glass indicators.
Dual stage gear pump, feeding implement control and steering.
Total flow oil filtration: one steel mesh filter on pump suction; one filter, protected by clogging by-pass valve, on return line to reservoir.
Two-spool control valve incorporating system pressure relief valve, safety and make-up valves.
Single control lever:
- boom raise/lower and float;
- bucket dump and roll-back.

A safety locking lever is provided to retain the implement control levers in hold position, to prevent accidental engagements.
Four double-acting hydraulic operating cylinders. Two for boom lift/lower and two for bucket dump/roll-back.
Automatic and adjustable electromagnetic type bucket positioner and boom kick-out (optional).

ELECTRICAL SYSTEM

Voltage 24 volts.

Alternator

With incorporated electronic voltage regulator.

Starter motor

Automatic pinion engagement.

Batteries

Two, 12 Volts, series-connected.

CAB

Modular type, elastically suspended by elastic pads. The cab ensures top interior comfort whatever the climatic conditions.

WEIGHT AND SPEEDS

Operating weight with 15.5 x 25 tyres, 1.4 cum (1.8 cu yd) bucket, fully filled and with operator: 7690 kg (16.950 lbs).

Max. speeds (forward - reverse) with size 15.5 x 25 tyres:

Speeds		I	II	III
- forward	kmh	5.8	12.9	35.3
	mph	3.6	8.0	21.9
- reverse	kmh	5.8	12.9	35.2
	mph	3.6	8.0	21.9

Max. speeds (forward - reverse) with size 17.5 x 25 tyres:

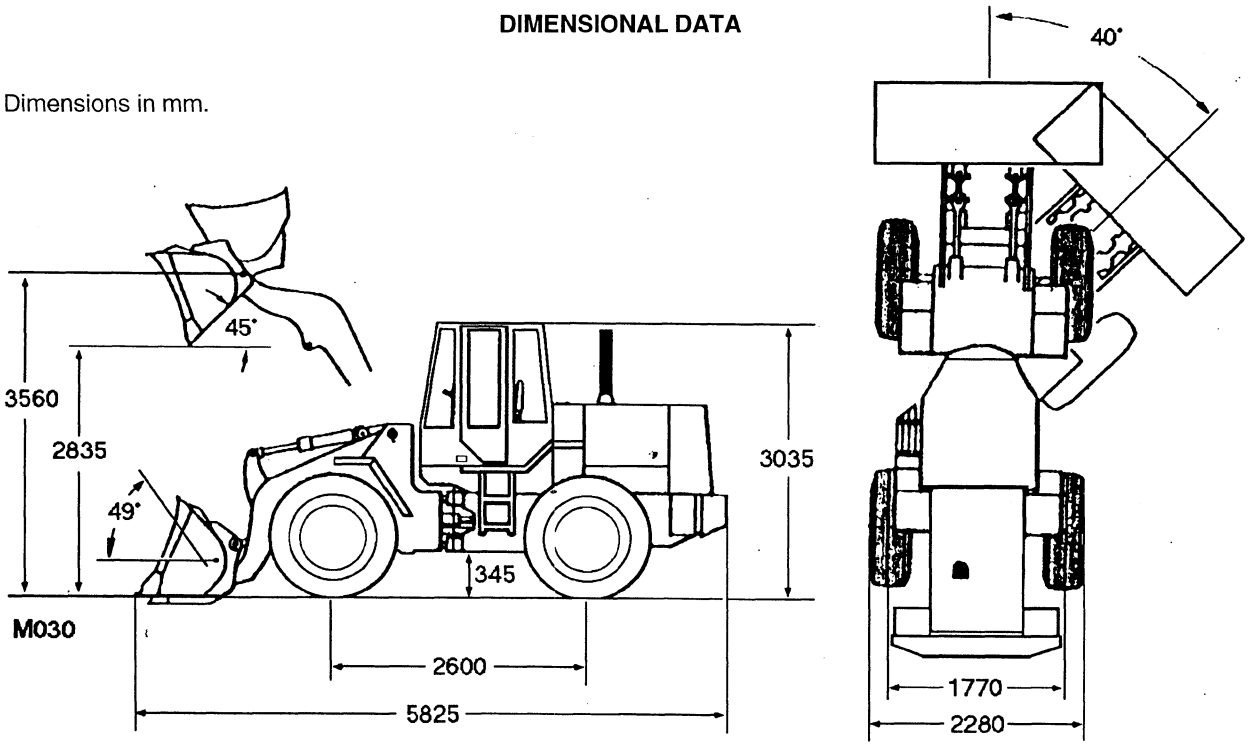
Speeds		I	II	III
- forward	kmh	6.2	13.8	37.3
	mph	3.8	8.5	23.2
- reverse	kmh	6.2	13.7	37.2
	mph	3.8	8.5	23.2

ACCESSORY EQUIPMENT

Some of the equipment items described and illustrated are supplied to certain markets to meet specific requirements.
Other special devices are also available as optional equipment. Check with the Sales Organization.

DIMENSIONAL DATA

Dimensions in mm.



SPECIFICATIONS AND DATA

Engine	Fiat Iveco 8045.25.395
Speeds:	
min. idle	850 - 900 rpm
max. idle	2530 - 2600 rpm
converter stall	2320 - 2460 rpm
implement stall	2310 - 2450 rpm
converter/implement stall	1700 - 1900 rpm
Normal lubrication pressure with engine at low idle and warm oil	0.70 bar
Working clearance between valves and rocker arms with cold engine:	
intake	.25 mm (.0098 in)
exhaust	.35 mm (.0137 in)
Injector setting	230 - 238 bar
Transmission	
Converter	Clark - PA 223 single stage - single phase
Conversion ratio at stall	2.6 : 1
Gearbox speed	3 forward - 3 reverse
Main pressure with engine at max. rated speed	12.6 - 15.6 bar
Pressure on converter output with engine at max. rated speed	4.83 bar
Flow of transmission pump at 2300 rpm	69 lt/min
Steering - Brakes	
Setting of steering main valve	140 bar
Flow of pump steering section (at 2300 rpm with 7 bar pressure)	57.5 lt/min
Setting of brake control valve	~ 30 bar
Implement	
Setting of pressure relief valve	190 ± 5 bar
Flow of pump implement section (at 2300 rpm with 7 bar pressure)	126.5 lt/min
Setting of bucket dump safety valve	210 bar
Setting of bucket roll-back safety valve	120 bar
Setting of boom lifting safety valve	230 bar
General data	
Inflating pressure of front tyres:	
work	3 bar
travel	2.0 bar
Inflating pressure of rear tyres:	
work	1.5 bar
travel	2.0 bar

GENERAL INSTRUCTIONS

INSTALLATION OF SHAFT SEALS

Follow these cautions:

- prior to installation, soak the seals for at least half an hour in the same oil in which they will operate;
- thoroughly clean the shaft and ensure that the contact surface is undamaged;
- position seal lip toward the fluid; if thrower lip type, position the grooves so that during shaft rotation the fluid is thrown back;
- smear the sealing lip with a thin film of lubricant (oil is better than grease);
- install the seal into its seat by pressing or using a flat ended punch; on no account use hammers;
- avoid pushing the seal into its seat in a tilted position. After installation, ensure that the seal is pressed fully home;
- to prevent sealing lip damage during installation, use some sort of protection between seal and shaft.

INSTALLATION OF O-RINGS

Lubricate O-rings before installation and do not twist them when installing, otherwise leakages will occur.

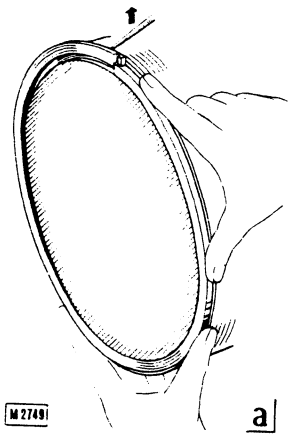
REMOVAL/INSTALLATION OF FACE SEALING RINGS

To remove, proceed as follows:

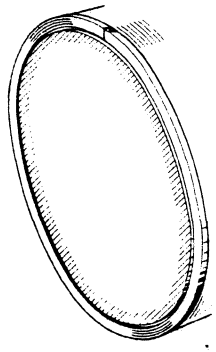
- press one end of the ring into its seat (a);
- hold ring in position and insert a scriber point beneath the other side to separate the interlocking ends, as shown in figure (a);

To install, proceed as follows:

- press one end of ring against the inner face of the seat (b);



- hold ring in this position and lift the free end (b) until the two teeth lock correctly (c).



c

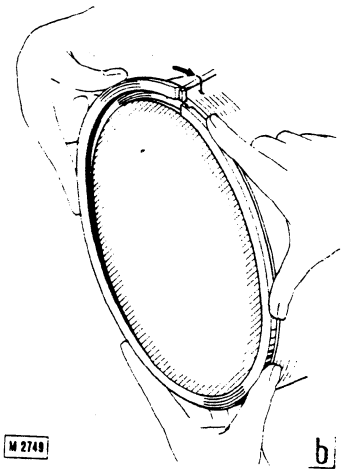
ADVICE FOR DISASSEMBLY AND RE-ASSEMBLY OF GROUPS

The following general information is aimed at facilitating disassembly and reassembly of groups. Read with attention and follow when performing repair operations.

CLEANING

After disconnecting the electrical system, thoroughly clean the parts to be disassembled with a jet of steam.

Many repair and service shops use caustic compounds to remove grease, dirt, paint or remains of gaskets etc. from components. These compounds are extremely useful and effective if used correctly, but may cause considerable damages to certain materials.



b

Materials such as alluminum, rubber, fibres, sintered bronze and binding agents, are particularly sensitive to all high-concentration caustic compounds.

Certain heat exchangers have aluminum fins. To clean both inside and outside of these parts, we recommend the use of solvents that do not react with aluminum.

DISASSEMBLY

When operating on the engine or on other units removed from machine, always use appropriate stands.

Place small items removed from machine in appropriate containers. Be careful not to damage the machine surfaces of components and rest them, after removing them, on shelves or on wood blocks.

When removing alike components, such as valves, tappets etc., place them in suitable containers to avoid incorrect re-reassembly.

ASSEMBLY

Carefully clean all parts to be refitted as described in the Manual.
The use of special tools as specified is recommended. Whenever possible, drive bushings in to their correct position using a press. If it is necessary to use a hammer to install the bushing, employ a suitable punch to prevent any damage.

Lubricate ball bearings before assembly and bushings prior to installing them. Lubricate the sealing lip on seals before installation (see chapter 1.5).

Whenever possible, use new seals. Cylinder head gaskets must always be renewed.

Use screws with dimensions and specifications indicated, making reference to part numbers in the Parts Catalog.

Where shown, use safety washers, cotter pins, locking wires etc.

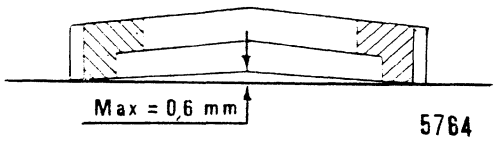
Respect specified torque loads as indicated in the appropriate section of this Manual, using suitable torque wrenches.

Self-locking nuts should be replaced every time a disassembly operation is performed, to ensure a good tightening.

HIGH PRESSURE PIPING, FITTINGS, HOSES AND PIPES

This section contains recommendations and procedures to be followed for the installation of pipings and fittings.

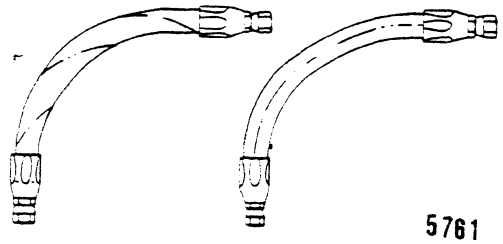
- Keep all inside threads clean.
- Remove the plugs just before connecting the piping and close immediately all free openings.
- Never use or re-use half-flanges out- of-shape more than .6 mm (.023 in) in the center (see illustration).



NOTE - For the application of adhesive sealing compounds, refer to the instructions of the different commercial products.

FIAT-HITACHI EXCAVATORS S.p.A. recommends - if not otherwise indicated - the following adhesive seals: VIT TYPE C, or RHODORSIL CAF 1 or LOCTITE 510.

- Check that the O-Ring seats are not damaged.
- Lubricate the O-rings.
- Check that the O-rings are placed in their seats.
- Tighten in a uniform way, to avoid bending or damages to O-rings.
- Install pipings and supporting clamps letting them slightly loosen (tighten the clamps after tightening the connections).
- Check that pipings can match the part to be connected, without forcing into position.
- If a pipe or hose is mounted straight, allow enough space to absorb contractions caused by pressure.
- Pipings shall not be twisted (see illustration) or touch each other or other parts, especially moving parts.



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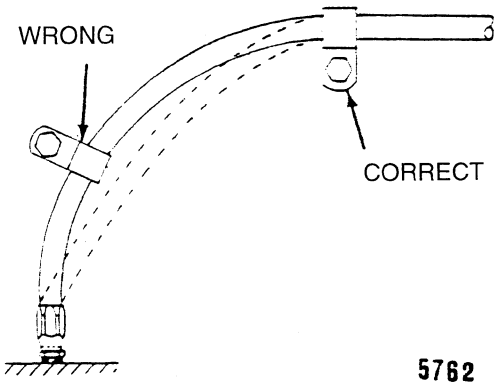
WRONG CORRECT

- Check that clamp sizes are correct by referring to the diameter of the pipe to be fastened, to avoid possible wear (see illustration).

5760

WRONG CORRECT

- Do not mount clamps on a curve with a minimum radius (under pressure, possible efforts arise in the pipe; see illustration - the dashed lines indicate the contraction that is caused by pressure).



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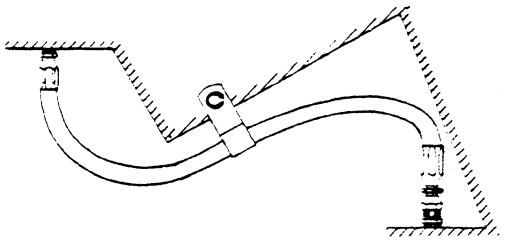
- Ensure that clamps are fitted in the correct position, to keep pipings away from contacts (see figure).



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DIAGNOSTIC CHECKS

GENERAL

For a quick trouble diagnosis, the following rules are recommended:

a) Knowing the machine.

It is not possible the trouble-shooting and formulation of diagnosis without a good knowledge of the machine.
A thorough reading of the descriptions contained in the Repair Manual , about the composition and operation of the various groups is recommended.

b) Check with the operator

Many troubles are caused by wrong use or lack of maintenance. Check with the operator whether the machine had similar troubles previously and whether corrective interventions have been performed with appropriate tools and genuine spare parts. Check also ambient and working conditions of the machine and how normal maintenance is performed.

c) Test the machine.

The best way to check the machine conditions is to test it in real working conditions. Check:
- correct operation of monitoring instruments;
- performance of the machine;
- possible smells or signs of overheating;
- abnormal noises; check their origins and the working conditions in which they occur.

d) Machine inspection.

After step c) is completed stop the machine and perform a visual inspection. Check for possible leakages, loosen screws defects or deformations etc.

e) Diagnosis

Once a trouble has been identified, make a list of the possible causes, with the help of the corresponding section, and find the correct one by means of practical tests, beginning from the most probable causes and the easiest to be performed.

UNITS OF MEASURE

The units of measure of this Manual are those used by the International System and supersedes those of the M.K.S.

Force: decanewton (daN) supersedes kilogram (kg)

Pressure: bar supersedes kg/sqcm

Torque: decanewton x meter (daN m) supersedes kg m

To convert units of measure, use this table:

	multiply	by	to obtain
Force	kg	.9807	daN
Pressure	kg/sqcm	.9807	bar
Torques	kg m	.9807	daN m

NOTE - for common repair use, the following correlations are considered valid: kg = daN; kg/sqcm = bar; kg m = daN m.

CLASSIFICATION OF STANDARD PARTS FOR TORQUE DETERMINATION

NOTE - If in the different sections torque values are not specifically indicated, refer to "TIGHTENING TORQUES" after identifying exactly the part.

The part is identified by a eight-digit code number.

Example:

l	/	a	b	c	d	e	/	f	g

l - Standard index number

It is always represented by digit 1. This number means that the part can be made in different versions, differing for material and coating.

a - b - c - d - e - Standard base number

It is a number always made of five digits indicating the dimensional features of the part.

f - Material index number

This digit indicates the material that is specified for a certain part. The meaning is explained in the table below.

g - Coating index number

This digit indicates the coating that is specified for each part.

Material index No.	FIAT	Strength class and type of material				
		UNI	**DIN**	**SAE**	**BSI**	**BNA**
0	R40	4D- 4S-4A		1	A	42
1	R50	5S-6S		3	P	56
2	R80	8G		5	T	80
3	R100	100	10K	8	V	100
4	Brass	Brass	Messing	Brass	Brass	Laiton
5	Alluminium	Alluminium	Aluminium	Aluminium	Aluminium	Aluminium
6	Copper	Copper	Kupfer	Copper	Copper	Culvre
7	Free for other metals					

WARNING

- Lubricate screws and nuts with engine oil up to 24 mm diameter; for larger diameters use tallow.
- Tolerance on tightening torques is ± 5%.
- Strength classes R80, R100, R120, must be considered as follows:

10.9	supersedes	R100	screws
12.9	"	R120	

10	supersedes	R80	nuts
12	"	R100	

CDT = cadmium plated;
FOSF = phosphate plated;
ZNT = zinc plated

TIGHTENING TORQUE TABLES

If the tightening torque of screws and nuts is not specifically indicated in the single sections, refer to the tables of the following page:

NUTS (ZNT)					SCREWS (ZNT/DEIDR)		
Strength grade: 10 (R80)					Strength grade: 10.9 (R100)		
Diameter and pitch mm	Normal daNm	Low type daNm	with polyamide ring		Diameter and pitch mm	Normal ZNT daNm	Self-locking ZNT daNm
			normal daNm	low type daNm			
M6x1	1.3	1.2	-	-	M6x1	1.3	-
M8x1.25	3.2	2.6	3.9	3.2	M8x1.25	1.3	3.5
M10x1.25	7.2	5.2	8.2	6.2	M10x1.25	7.1	7.9
M10x1.5	6.5	5	7.7	6	M10x1.5	6.5	7
M12x1.25	13	8.7	14.5	10.2	M12x1.25	12.7	13.9
M12x1.75	11	8.1	12.9	9.6	M12x1.75	11	12
M14x1.5	19.5	13	21.6	15	M14x1.5	20	22
M14x2	18	12.5	20	14.6	M14x2	18	19
M16x1.5	30	17	34	20	M16x1.5	30	33
M16x2	-	-	-	-	M16x2	-	-
M18x1.5	45	25	50	29	M18x1.5	45	48
M18x2.5	-	-	-	-	M18x2.5	-	-
M20x1.5	60	30.5	64.5	35	M20x1.5	60	65
M20x2.5	-	-	-	-	M20x2.5	-	-
M22x1.5	80	41	-	-	M22x1.5	80	90
M22x2.5	-	-	-	-	M22x2.5	-	-
M24x2	100	47	108	52.5	M24x2	100	110
M24x3	-	-	-	-	M24x3	-	-
M27x2	95	40.1	-	-	M27x2	100	-
M30x2	130	49.4	-	-	M30x2	140	-
M33x2	170	-	-	-	M33x2	190	-
M36x3	220	-	-	-	M36x3	240	-

LUBRICANTS

Filling	Lubricant	International Classification	Viscosity	Ambient Temperature °C
COOLING SYSTEM	FIAT LUBRIFICANTI PARAFLU 11	Ethylene glycol		
ENGINE	FIAT LUBRIFICANTI AMBRA SUPER	API CF - 4 CCMC D4 MIL - L - 2104 E level	15W-40 10W-30	–10 ↔ + 50 –25 ↔ + 20
TRANSMISSION	FIAT LUBRIFICANTI AMBRA SUPER TUTELA GI/M	API CF - 4 CCMC D4 MIL - L - 2104 E level ATF Type A Suffix A	15W-40 (*) 10W-30 (**) (***)	–10 ↔ + 50 –20 ↔ + 50 –30
AXLES **S.M.T. AXLES**	FIAT LUBRIFICANTI TUTELA W90/M-DA TUTELA W90/LS(****)	MIL - L 2105 D API GL - 5	80W - 90 EP SAE 80W-90	–40 ↔ + 50 –40 ↔ + 50
HYDRAULIC SYSTEM	FIAT LUBRIFICANTI IDRAULICAR AP AP 31 AP 46 AP 51	DIN 51524	 ISO 32 ISO 46 ISO 68	 –25 ↔ + 0 –15 ↔ + 35 – 0 ↔ + 50
BRAKES	FIAT LUBRIFICANTI PLUS 3 240°	NHTSA 116 DOT3	–	–40 ↔ + 50
GREASE FITTINGS	FIAT LUBRIFICANTI TUTELA G9	Lithium grease - Calcium N.L.G.I.2 Consistency	–	–40 ↔ + 50

(*) With the type of oil indicated and outside temperature 0°C
(**) With the type of oil indicated and outside temperature -5°C
(***) With the type of oil indicated and outside temperature -10°C
(****) Oil with anti slick and anti slip additive.

Warm-up the engine for about 20 min. after starting, before moving the machine.

FLUID CAPACITIES

ITEM	QUANTITY	FIAT PRODUCT		TYPE OF SUPPLY
	Liters	Brand	Product	(international classification)
COOLING SYSTEM	18	Paraflu	Paraflu 11	50% water/anti-freeze mixture. Oxidation, corrosion, rust and foam inhibiting, anti-freeze protection to –35°C (–30°C)
FUEL RESERVOIR	117	–	–	Fuel ASTM N. 2-D type TT of good quality and brand
ENGINE	10	AMBRA SUPER	AMBRA SUPER	Engine oil to MIL-L-2104 D or API "CD" Service
TRANSMISSION	19	TUTELA	GI/M	ATF Type A SUFFIX A
AXLE (front and rear)	38	TUTELA	W90/M-DA	Mechanical transmission oil to MIL-L-2105 C or API GL5 service
AXLES S.M.T. (front and rear)	38	TUTELA	W90/LS	SAE 80W90 oil with LS "anti-stick and slip" additives
HYDRAULIC SYSTEM	45	IDRAULICAR AP	IDRAULICAR AP31 & 51	Hydraulic oil to MIL-H-24459 or DIN 51524/51525
BRAKES	1.5	TUTELA	PLUS^3 240°	Hydraulic brake fluid SAE J 1703
GREASE FITTINGS	–	TUTELA	G9	Lithium-calcium base grease N.L.G.I.2 consistency

The quantities of oil indicated are those required for periodic changes as detailed in the drainage and refill instructions for each item.