Workshop Service Manual

Series BM

Tractor

BM85
BM100
BM110
BM120
BM125i

Mogi
AGCO do Brasil - Rua Capitão Francisco de Almeida, 695 – Mogi das Cruzes/SP
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Original Workshop Service Manual

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English

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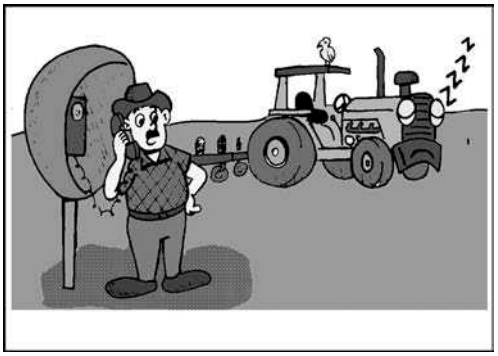
INTRODUCTION

Presentation



The purpose of this Service Manual is to assist the Dealers when performing an efficient maintenance of the BM Series tractors.

A good product support assumes increasing importance. Besides selling a good product, good service is indispensable, because only then you can achieve the ultimate goal which is the Customer satisfaction.

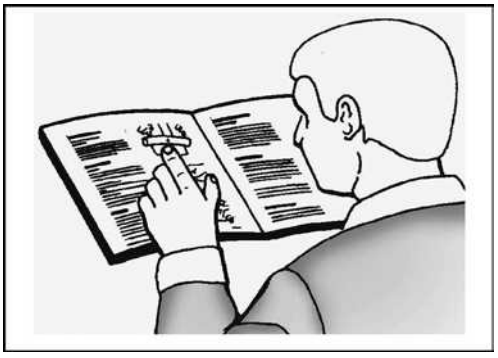
In this context, the maintenance structure provided by the Dealer is of fundamental importance and therefore should only be performed by trained personnel, thoroughly familiar with the different components of the tractor.

Therefore, in addition to taking periodic refresher courses in the AGCO Brazil Training Units, REFER TO this guide before performing the service whenever you have any questions.

For this, the Manual should always be available at the workshop.

In addition to always keeping it in working condition, the Services Department should be alert for updates that will be introduced in the tractors and therefore in the Manual.

How to Read the Services Manual



This manual was divided in systems (1, 2, 3, 4, 5, etc.), each describing a specific system of the tractor. Examples: Information, Engine, Electric, Transmission, Rear Axle and Brake, Front Axle and Steering, Chassis, Tires and Wheels, etc.

Each system is divided in groups (10, 20, 30, 40, 50, etc.), each describing a specific group. Examples: Engine, Transmission, Hydraulic System, Chassis, Tires and Wheels, etc.

Each group is divided in sections (01, 02, 03, 04, 05, etc.), each describing a specific section. Examples: in the case of Engines: Introduction, the engine itself, Cooling System, Lubrication System, Fuel System, etc. Other examples: Transmission: Gearbox, Clutch, Power Take Off, etc.

Each section page has a sequential number, starting with 01.

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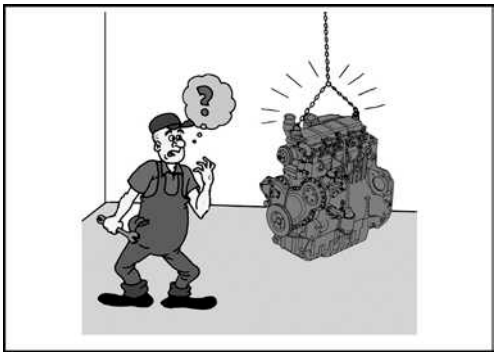
Security

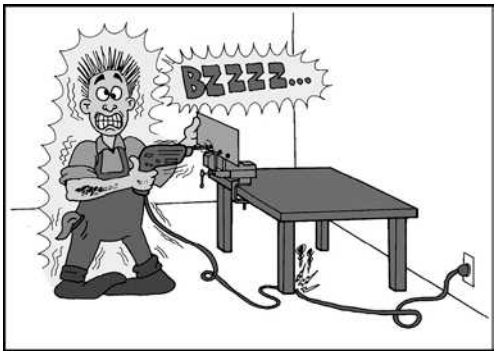
Your safety and that of others, must be the first concern when performing maintenance work. For this to become effective, three things are necessary: awareness, proper use of tools and adoption of protective equipment, individually and collectively, PPE and PSAO respectively.

With regard to awareness, it depends on individuals, that is to say, each one must obtain it, based on the risks to which they are subject at work. Upon learning about any security rule, this cannot be interpreted as "Do not do this, do not do that ...". First TRY to think about what might happen in case of not observing a certain rule. Do not be attached to the outdated idea that "we must make mistakes to learn," because the consequences may be irreparable. REMEMBER: after an accident, the first thought that arises is that one would have done anything - if they still had the time - to prevent that damage. Walking twenty meters to seek "that appropriate tool" can be tiresome, but not as disastrous as an accident with personal and/or material injury.

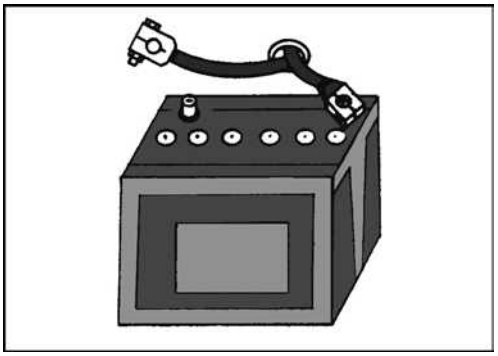
With regard to the rules themselves, it is impossible to gather all. There are countless situations of risk. Thus, we list some basic rules for illustrative purpose.



- Always USE the appropriate tools and devices at work, especially when dealing with whole sets and/or heavy parts. MAKE SURE that the hydraulic jack, the hoist, the chain are in perfect condition, and with the corresponding load capacity.



- Whenever using an electrical appliance, MAKE SURE that it is grounded and that there is no bare wire.



- Always TURN OFF the battery negative cable, preventing someone from triggering the accidental or inadvertent starter actuation.

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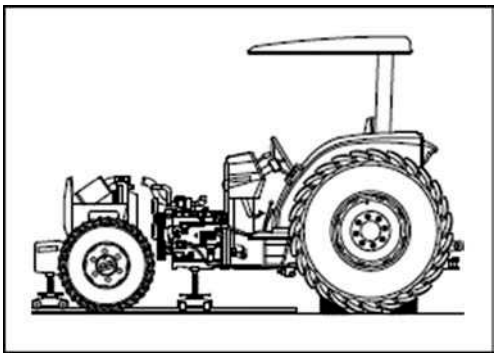
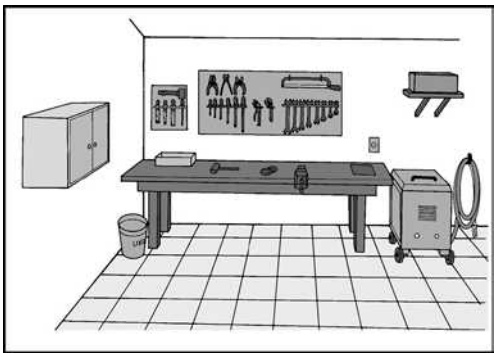
- To perform welds, besides disconnecting the battery, USE the necessary protections: mask or goggles, gloves and apron. The lack of eye protection, for example, affects the eyesight in a short time, often irreversibly.

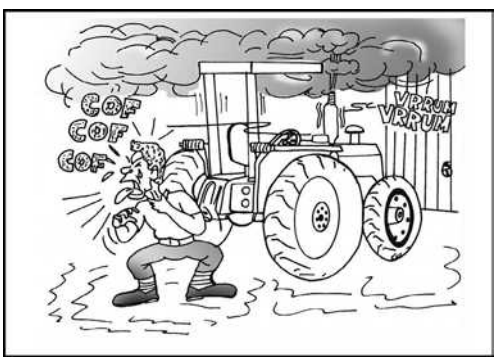


- When opening the tractor, it is essential to use the appropriate trails and carts. This provides, besides safety, a profitable and quality service. Always USE wooden blocks in wedge to shim the wheels that will not be displaced for the opening.



- Do not allow the workshop floor to be soaked in oil; this may cause slip and falls, besides compromising the workshop appearance. REMEMBER: organization mirrors the quality of the professional who works there.

- Never stand under suspended loads. No matter how safe the equipment is, you may not want to risk.



- Do not run the engine indoors and in a non-ventilated room. Toxic gases can suffocate you in a few minutes.
- Do not smoke in the workplace, there is always the risk of fire due to the wide variety of flammable products.

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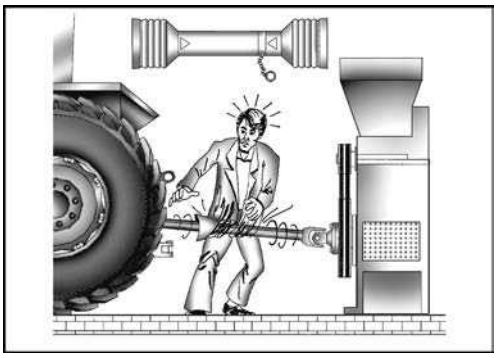


- Do not wear long or down hair, as well as loose clothing. When in contact with moving parts, these can cause serious accidents.

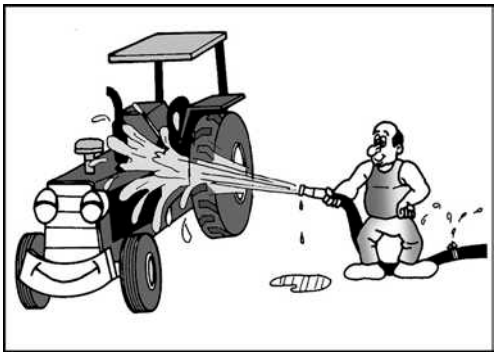
- Before starting the engine of any tractor, MAKE SURE that there is no one working on it. CHECK also if there are no tools or other utensils under the tractor.
- USE a warning card attached on the panel to prevent anyone from starting the engine with parts removed.

Proper Services Strategies in Workshops

Most of the procedures recommended for repairs and services in different parts of this Manual are described considering that the assembly to be repaired is completely dismantled and removed from the machine.

Many services, in particular of certain parts, may be performed without completely removing the assembly from the machine. The mechanic will determine the need for removing it or not, taking into account the degree and extent of services needed and the degree of difficulty of access.

The following are important points to be remembered and put into practice:



- **IDENTIFY the breakdown and CLEAN the machine before taking it apart.**

  If it is possible to make a complete diagnosis to determine the extent of the repair to be done, TAKE all necessary precautions to safely avoid any foreign material entering into the hydraulic systems, fuel supply or air.

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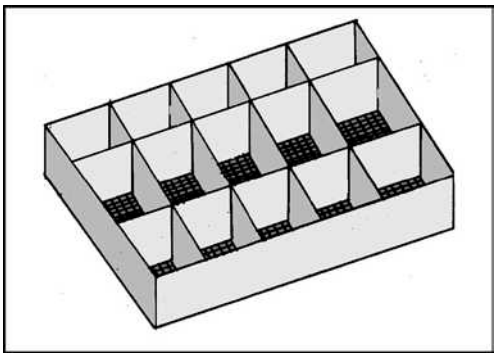


- **SEPARATE the parts.**

  PAY ATTENTION during disassembling, observing the special parts that cannot shift position. SEPARATE the various bolts and nuts in "trays" with dividers and bottom screen to allow the flow of oil and washing water.

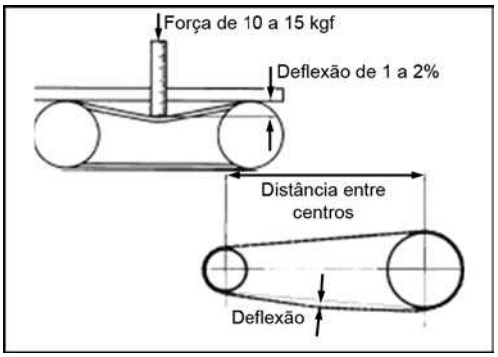
- **INSPECT the parts during disassembly, cleaning them well..**
- **ATTACH labels on the parts and PROTECT the precision and polished surfaces.**

Use of Original Valtra Replacement Parts

The use of not recommended spare parts can be a source of major problems. Do not believe that all parts that look alike are equal. Some parts have special properties, known only by the manufacturer. They are the result of special requirements established by intense research and engineering tests and from field experience.

AGCO keeps a constant parts improvement program. Many of these improvements cannot be detected by visual comparison. It is therefore critical to use only genuine spare parts.

Rule for tensioning belts and chains in general



To check the belt tension, always FOLLOW the rule below:

Apply a load of 10-15 kg in the center of the largest distance between the supports.

The deflection found in belts or chains must be 1-2% of this distance.

In the case of chains, APPLY a sufficient force to bring the entire deflection to either side: deflection also must be 1-2% of the distance between centers.

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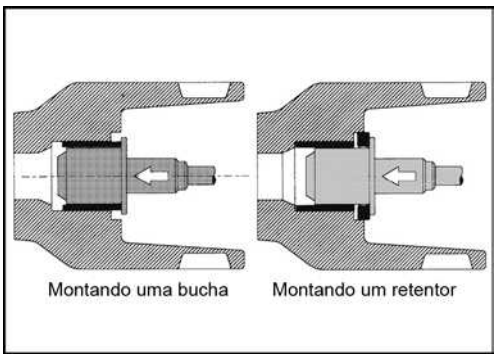
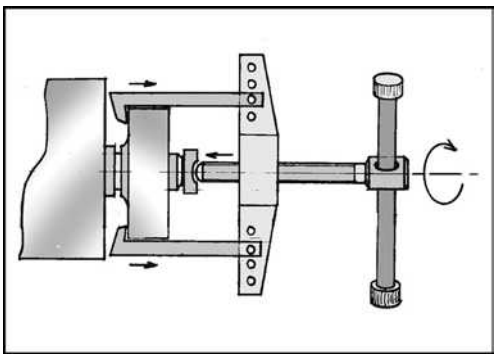
Bushings, Retainer Rings and Bearings Mounting with Interference



Always USE the special tool for this purpose. Where necessary, APPLY stress, by a press.

Improvisation results in these cases, besides loss of time, in damaged parts, which inevitably will present problems in the operation.

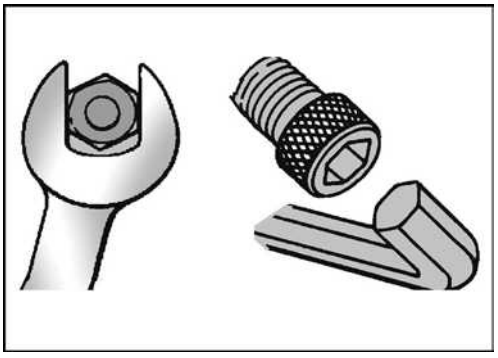
In the case of bushings, after assembly CHECK the inside diameter (or outside if any) and ADJUST if necessary, based on clearance technical specifications for each case.



- **USE the appropriate pullers to pull pulleys, hubs and gears.**

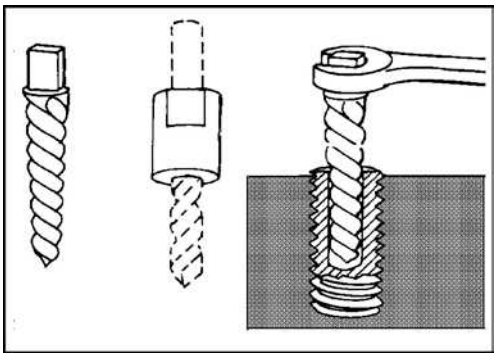
  The use of sledge hammers and levers, in addition to the risk of damaging the parts, can require much more time in the operation.

  NOTE: Always USE a protector for the shaft end.



- **Always USE the appropriate tool for each case.**

  Saving a few steps to find the right key can result in more lost time, after damaging a hexagonal, a slot, etc.



- **To remove a stud that broke inside the hole:**

  MAKE a hole having a diameter approximately half the diameter of the broken stud and USE a puller such as in the figure, with a thread opposite to the stud thread.

  Then REMOVE the stud, turning the puller counterclockwise (if right-hand thread).

NOTE: when mounting studs or screws into non-passing holes, MAKE SURE that there is no oil or other impurities in the hole. The oil forms a hydraulic shim which can crack the housing.

- **To remove a stuck nut:**

  There are several ways, depending on the situation. In any case, they must not damage the surrounding parts.

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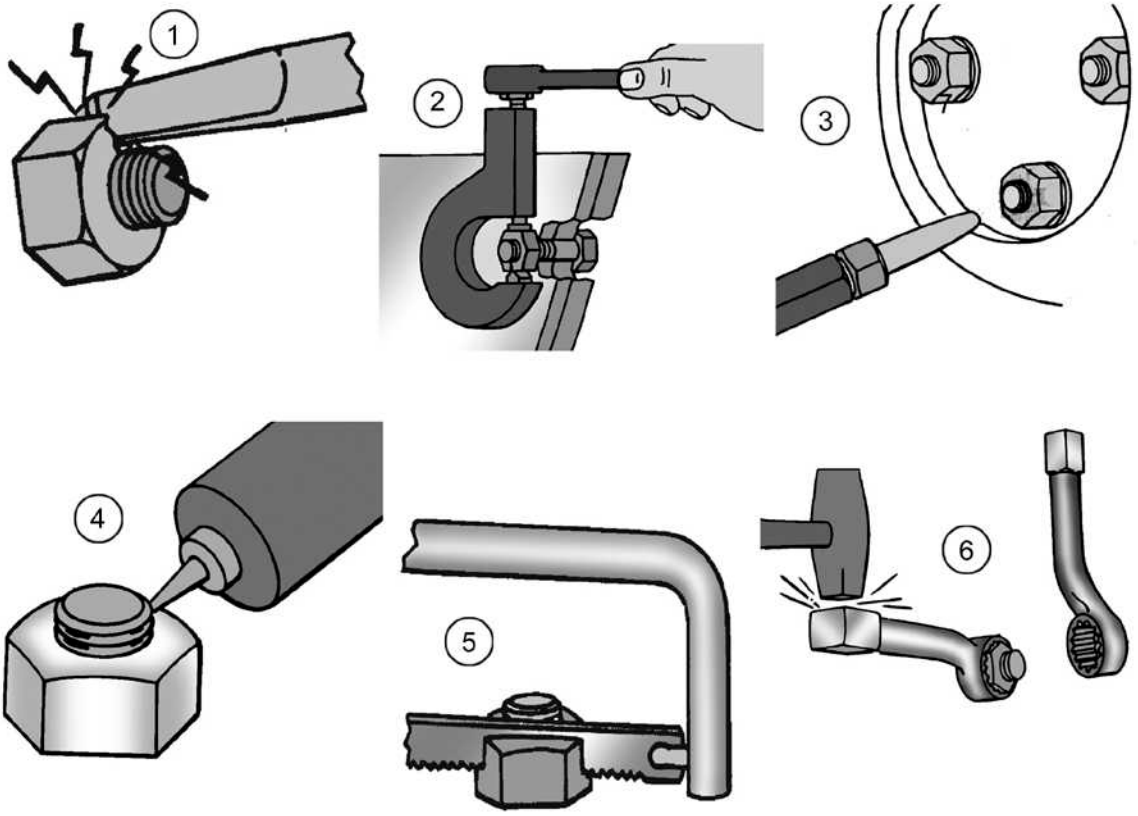
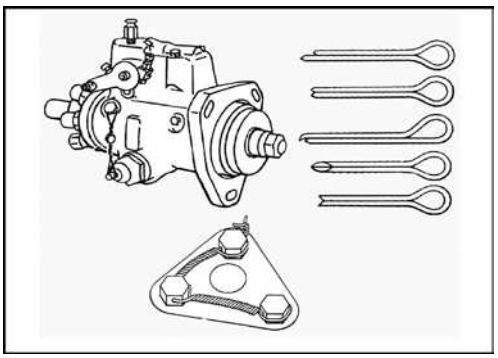


Item	Description
1	Using a chisel
2	With a “*splitter*”
3	Heating
4	Penetrating oil
5	Cut with a saw
6	Impact wrench

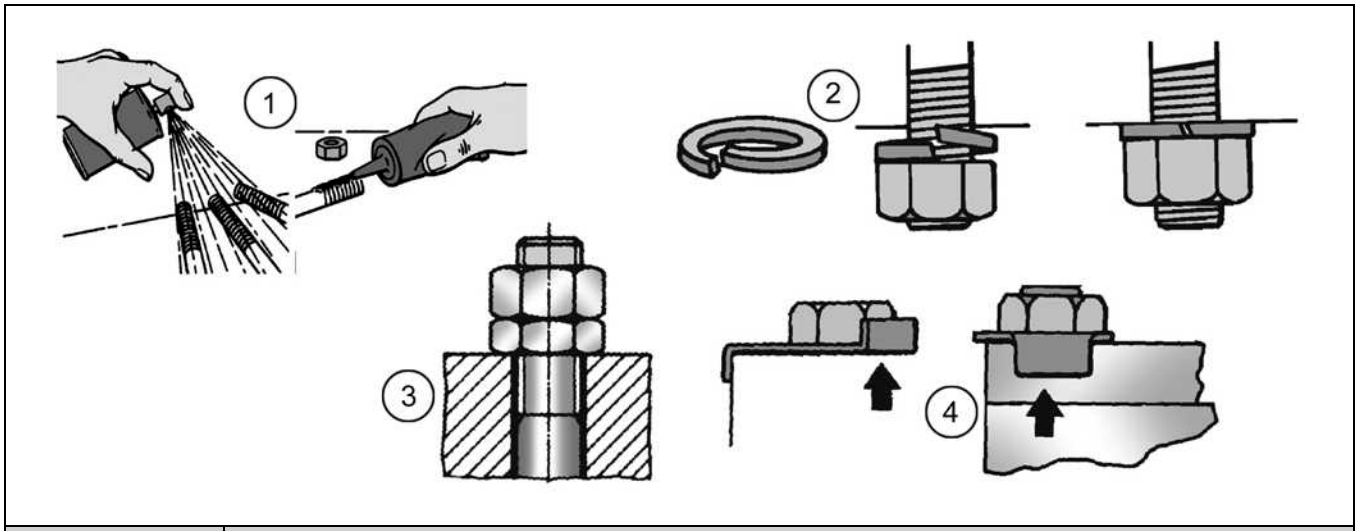
Correct locking of nuts and bolts



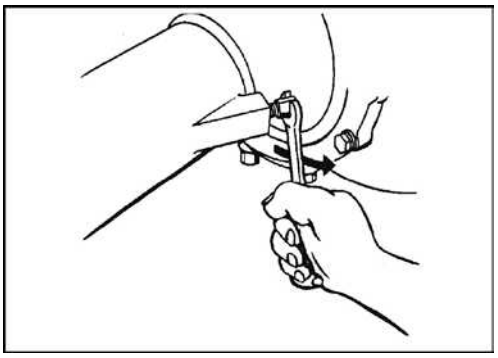
Counter pins, cotter pins and other means whenever removed must be replaced.

- **How to prevent screws or bolts to loosen with the normal vibration required by the work:**

  There are several ways, common sense and practice should dictate the best way for each case.

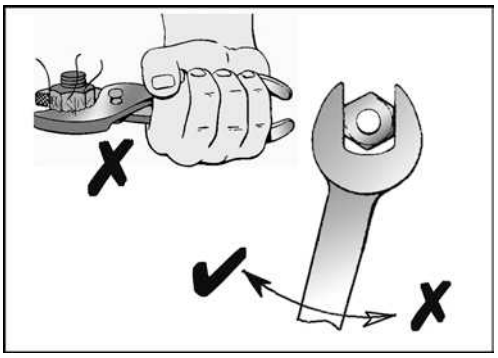


Item	Description
1	Locking decal
2	Spring washer
3	Lock nut
4	Locking plates



- **Always EXERCISE force on the wrenches in order to pull the lever.**

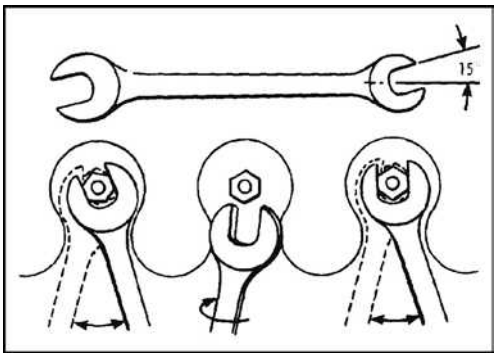
  AVOID pushing, because in cases where the wrench slips, you may suffer hand injuries.



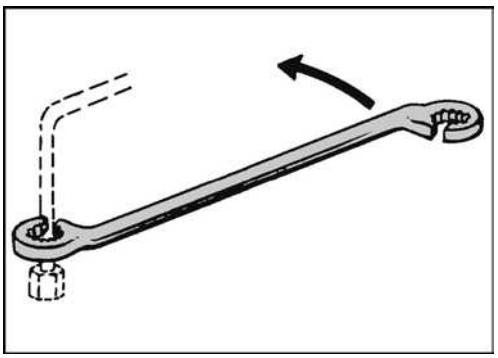
- **USE the open wrenches properly.**

  Working with the wrench reversed, there is a greater effort in their structure.

  Do not improvise using another type of tool.

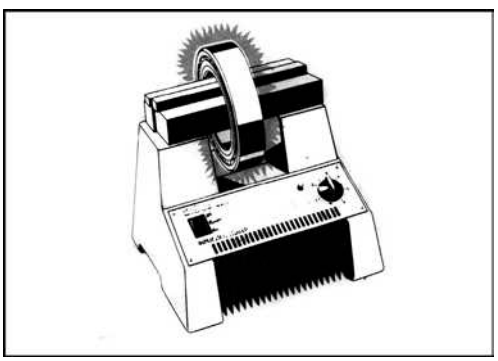


Only if you remove screws that are difficult to access, USE an open wrench in the two positions (angles) alternately, until releasing the bolt or nut.



- **For releasing the connection nuts from the injector pipes:**

  USE a special wrench or a flare nut wrench. But for this, MAKE an opening (cut) on the way to the tube, allowing this wrench only for this purpose.

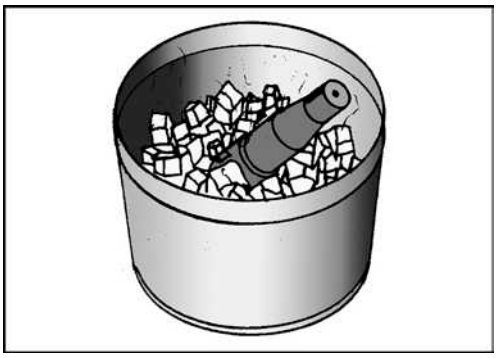


- **Assembling pieces with interference:**

  Always TRY to warm the external parts (bearings, hubs) and/or to cool the internal parts (axles, seats and valve guides, etc.).

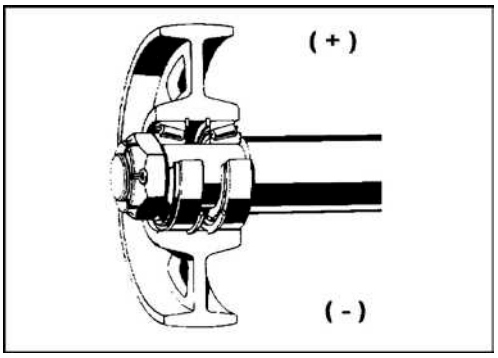
  This procedure, besides facilitating the assembly, avoids damaging the parts, since when cold they contract and when heated they expand (swell).

  Heating should never be done under the action of direct fire on the parts, as this makes them fragile.



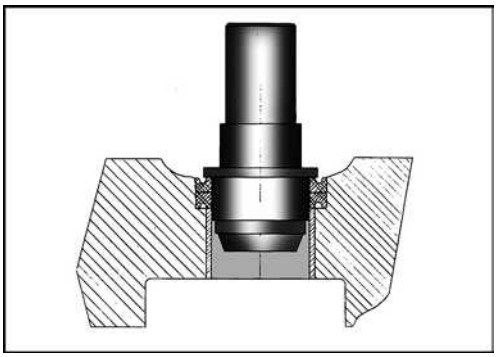
USE oil heated to 80-90 degrees Celsius and electrical induction heating.

The cooling of the parts can be done in a freezer or by placing them in a container with dry or wet ice.



- **When performing welding:**

  Always disconnect the battery, and REMEMBER the following: ATTACH the negative terminal (-) of the welder to the same part you are welding (+). This is to avoid having a high current flowing through parts like bearings and damaging them.



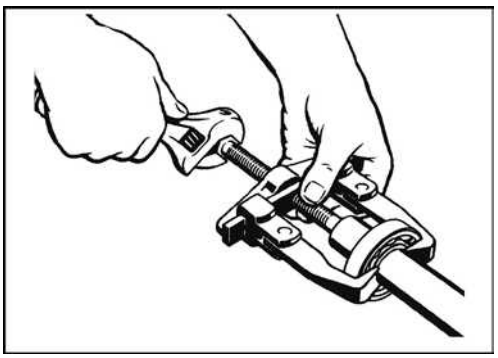
- **When assembling retainers, always USE a special tool for this purpose to ensure the correct mounting position and prevent damages to the retaining ring.**

  Otherwise, there is danger of leakage after the first hours of work.

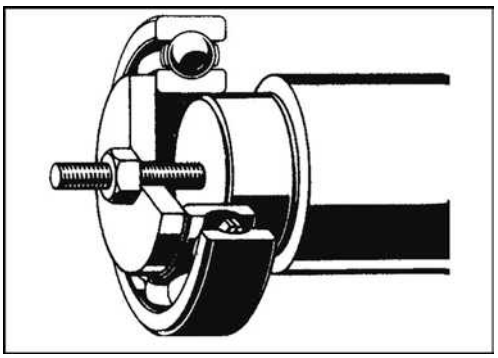
  Moreover, the retainer housing must be free of impurities. LUBRICATE the retainer ring lip with all-purpose industrial grease E-P2.

TAKE care during assembly when the retainer ring is traversed by a splined shaft, a keyway, etc. At the slightest sign of a cut on the lip, there are leaks later.

Removing and Installing Bearings



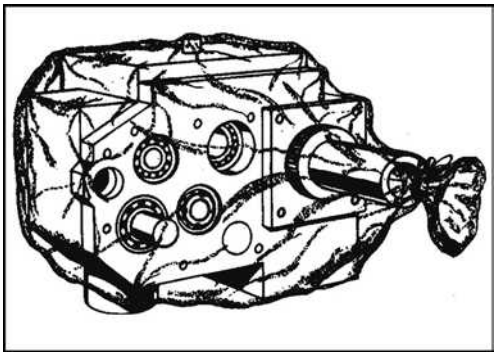
To remove bearings, USE special or proper pullers. It is important that the puller be supported in the track which is mounted with interference (internal or external), preventing the balls or rollers from being damaged.



When assembling:

- Do not hit directly with the hammer on the bearing when assembling. USE a special or suitable cup- or disk-shaped tool.
- When installing bearings on shafts, PRESS the inner track and when installing bearings in holes, PUSH the outer track.

Protection of Disassembled Sets



If the machine is to remain disassembled for some time, ORGANIZE the parts and PROTECT them against dust and moisture.

KEEP the new parts in their containers until the time they are used.

When assembling, MAKE SURE that the parts are perfectly clean, with no obstructed hole or gallery.

The injection pump and nozzles connections, pipes and terminals must be covered to prevent the entry of impurities.

The same treatment should be provided to the turbocharger, intake and exhaust manifolds, etc.

Precision and Safety Checks

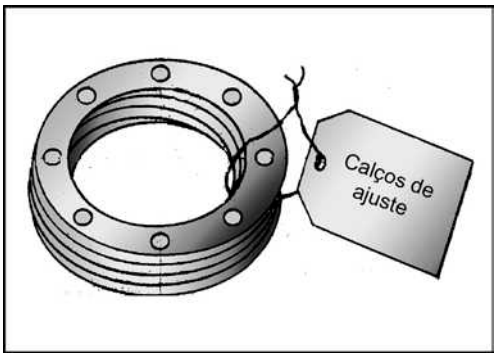
When assembling, COMPLETE every step.

FINISH the assembly of one part or component before proceeding to the next.

Make all of the adjustments as recommended.

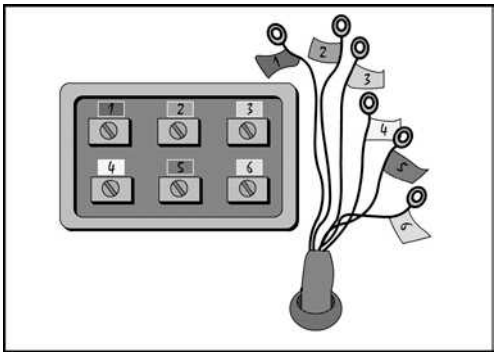
CHECK as many times as necessary to make sure that everything is exactly right.

Adjustment Shims



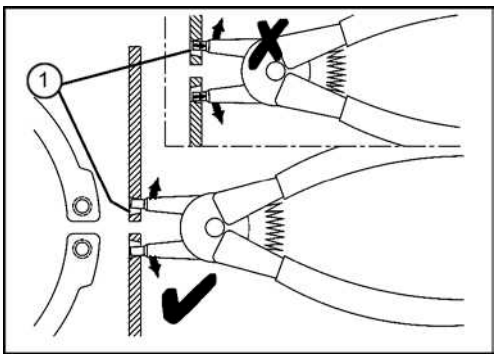
When removing bearing adjustment shims, KEEP them together, identify their location, store them clean and flat.

Electrical Wires



Whenever you remove or disconnect a group of wires or cables, IDENTIFY them as to the correct position of each one with a tape label, to avoid incorrect reassembly.

Removal of Snap Rings



Always USE appropriate nose pliers to remove and install snap rings or elastic rings.

But TAKE NOTE: the engagement holes (1) for the nose pliers are normally conical, with the purpose of facilitating the nose pliers mounting, when removing and assembling the rings.

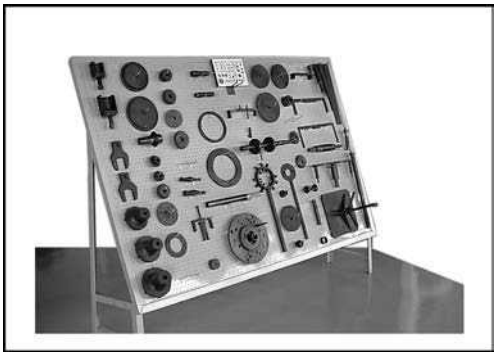
But for that, the rings should be assembled with the smaller diameter of the conical holes facing the pliers side.

It will be difficult to handle a reversed ring, because the ends of the pliers tend to be pushed outwards the ring. SEE the detail in the picture.

Besides making the operation difficult, with potential damages to the ring, this can be violently thrown away, causing serious injuries.

Always USE goggles.

Valtra Special Tools



They should be stored in their frames, properly identified with their numbers.

NOTE: All the precision tools should be submitted to a gauging procedure.

Without that, the precision measurements, as the crankshaft wearing, will not be reliable and they may lead to serious errors.

Trouble Diagnosis Procedure

This is a task that usually requires some experience. Even so, you should follow a methodical procedure, which will prove its value in many occasions.

This procedure consists of following an order defined in the troubleshooting, following the principle "beginning, middle and end".

Basically, we can define the steps as follows:

a) DETERMINE what the problem is by analyzing the symptoms.

b) LIST all possible causes.

c) KEEP a record of what you have checked.

d) DO the tests in a logical order, to find the actual cause of the problem.

NOTE: It is very important to talk with the machine operator to get the most detailed description you can of the symptoms.

e) WORK OUT the time and the parts needed to do the job.

f) DO the repairs.

g) After the repair and before the delivery, MAKE a final check and if necessary, a practice test, simulating the operating conditions.

h) If necessary, INSTRUCT the Operator so that the problem can be avoided.

General Table for Recommended Bolts and Nuts Torques

Instructions to Use the Tables

USE these tables only when the torque is not specified.

When to use the tables 1A and 2A for LOW torque:

- When there is a potential for damages to the components joined by bolts.
- When there are thick and/or compressible gaskets between the components.
- When non-flat surfaces of junction or non-parallel surfaces are found;

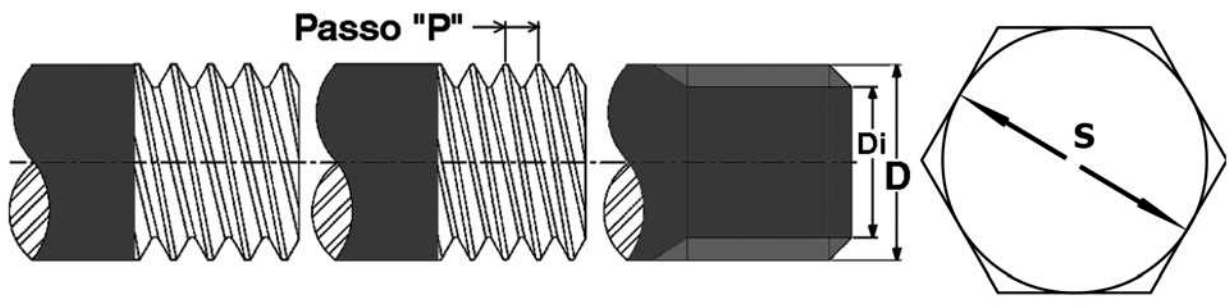
The picture below shows that the correct tightening is essential, because it determines the tension submitted to the bolts (or studs) and consequently, the compression of the joined components.

Non-flat surfaces, without milling, for the bolt head (or nut).

When to use the tables 1B and 2B for NORMAL torque:

- When there are no potential to damages to the components.
- When it is necessary a tightening that ensures a higher bolt or nut mounting.
- When the thread is not lubricated before the assembly.

The gauge of the nuts and bolts, in millimeters (ISO) or in inches, is the “D” diameter according to the drawing below and not the "s" width of the head.



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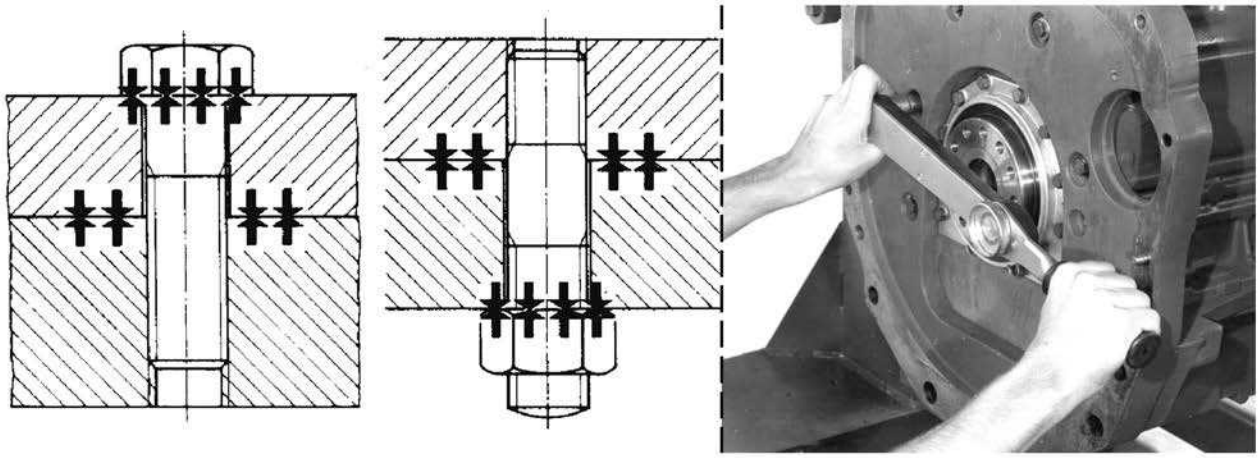


E1A – General Table for Bolts and Nuts Torques, in Nm

ISO Metric Thread, LOW torque									
Class	**ISO 4,6 = SAE 1**			**Class ISO 8.8 = SAE 5**			**Class ISO 10.9 = SAE 8**		
Gauge	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**
M3	0.5	0.6	0.4	1.2	1.4	1.0	1.7	1.9	1.5
M4	1.15	1.3	1.0	2.9	3.3	2.5	4.0	4.6	3.4
M5	2.1	2.4	1.8	5.6	6.4	4.8	8.0	9.2	6.8
M6	3.6	4.0	3.2	9.5	11.0	8.0	14.0	16.0	12.0
M8	8.8	10.0	7.6	24.0	28.0	20.0	33.0	37.0	29.0
M10	17.5	20.0	15.0	48.0	56.0	40.0	67.0	77.0	57.0
M12	30.0	34.0	26.0	84.0	96.0	72.0	115.0	130.0	100.0
M16	78.0	88.0	68.0	185.0	210.0	160.0	280.0	320.0	240.0
M20	150.0	170.0	130.0	395.0	450.0	340.0	560.0	640.0	480.0
M24	260.0	290.0	230.0	670.0	770.0	570.0	920.0	1040.0	800.0
M30	500.0	570.0	430.0	1300.0	1400.0	1100.0	1950.0	2200.0	1700.0
M36	800.0	1000.0	760.0	2300.0	2600.0	2000.0	3350.0	38.00	2900.0

E1B – General Table for Bolts and Nuts Torques, in Nm

ISO Metric Thread, Normal Torque									
Class	**ISO 4,6 = SAE 1**			**Class ISO 8.8 = SAE 5**			**Class ISO 10.9 = SAE 8**		
Gauge	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**
M3	0.6	0.7	0.5	1.5	1.7	1.3	2.1	2.4	1.8
M4	1.4	1.6	1.2	3.6	4.1	3.1	5.0	5.7	4.3
M5	2.6	3.0	2.2	7.0	8.0	6.0	10.0	11.5	8.5
M6	4.5	5.0	4.0	12.0	14.0	10.0	17.0	20.0	14.0
M8	11.0	12.5	9.5	30.0	35.0	25.0	41.0	46.0	36.0
M10	22.0	25.0	19.0	60.0	70.0	50.0	84.0	96.0	72.0
M12	38.0	43.0	33.0	105.0	120.0	90.0	140.0	160,	120,
M16	97.0	110.0	84.0	230.0	260.0	200.0	350.0	400.0	300.0
M20	185.0	210.0	160.0	490.0	560.0	420.0	700.0	800.0	600.0
M24	320.0	360.0	280.0	840.0	960.0	720.0	1150.0	1300.0	1000.0
M30	630.0	720.0	540.0	1600.0	1800.0	1400.0	2450.0	2800.0	2100.0
M36	1100.0	1250.0	950.0	2900.0	3300.0	2500.0	4200.0	4800.0	3600.0

Technical Units

Conversion Chart

1. Distance

To obtain:

– 1 meter	MULTIPLY by 39.37 inches (")
– 1 meter	MULTIPLY by 1.094 yards (yd)
– 1 centimeter	MULTIPLY by 0.3937 inches (")
– 1 millimeter	MULTIPLY by 0.03937 inches (")
– 1 kilometer	MULTIPLY by 0.622 miles
– 1 foot	MULTIPLY by 30.48 centimeters (cm)
– 1 foot	MULTIPLY by 0.3048 meters (m)
– 1 foot	MULTIPLY by 12.0 inches (")
– 1 inch	MULTIPLY by 25.4 millimeters (mm)
– 1 inch	MULTIPLY by 0.0833 feet (or ")
– 1 yard	MULTIPLY by 0.914 meters (m)
– 1 mile (legal)	MULTIPLY by 1,609.0 meters (m)
– 1 mile (nautical)	MULTIPLY by 1,853.0 meters (m)
– 1 knot	MULTIPLY by 21.938 meters (m)
– 1 fathom	MULTIPLY by 1.828 meters (m)
– 1 league (Brazilian)	MULTIPLY by 6,600.0 meters (m)

2. Mass

To obtain:

– 1 kilogram	MULTIPLY by 35.27 ounces (oz.)
– 1 kilogram	MULTIPLY by 1000 grams (g)
– 1 kilogram	MULTIPLY by 2.205 pound (lb.)
– 1 ton	MULTIPLY by 1000 kilograms (kg)
– 1 pound	MULTIPLY by 0.453 kilograms (kg)
– 1 ounce	MULTIPLY by 28.35 grams (g)
– 1 arroba	MULTIPLY by 14.7 kilograms (kg)

3. Power

To obtain:

– 1 kgf.	MULTIPLY by 9.81 Newton (N)
– 1 kgf.	MULTIPLY by 2.205 pounds force (lbf.)
– 1 pound force	MULTIPLY by 0.453 kilogram force (kgf.)
– 1 Newton	MULTIPLY by 0.102 kilogram force (kgf.)
– 1 pound force	MULTIPLY by 4.448 Newton (N)

4. Speed

To obtain:

– 1 km/h	MULTIPLY by 0.6214 miles per hour (mph)
– 1 km/h	MULTIPLY by 0.2778 meters perp second (m/s)
– 1 mph	MULTIPLY by 1.6093 kilometers per hour (km/h)

5. Volume

To obtain:

– 1 cubic meter	MULTIPLY by 1000 liters (l)
– 1 cubic meter	MULTIPLY by 35.31 cubic feet (foot³)
– 1 liter	MULTIPLY by 1000 cubic centimeters (cm³)
– 1 liter	MULTIPLY by 0.001 cubic meter (m³)
– 1 liter	MULTIPLY by 0.264 American gallons (gal)
– 1 liter	MULTIPLY by 2.12 pints (pt)
– 1 cubic inch	MULTIPLY by 16.387 cubic centimeters (cm³)
– 1 cubic foot	MULTIPLY by 0.02832 cubic meter (m³)
– 1 cubic foot	MULTIPLY by 28.32 liters (l)
– 1 American gallon	MULTIPLY by 3.785 liters (l)
– 1 English gallon	MULTIPLY by 4.546 liters (l)
– 1 pin	MULTIPLY by 0.47 liters (l)
– 1 quart (UK–qty.)	MULTIPLY by 1.137 liters (l)
– 1 quart (US–liquid)	MULTIPLY by 0.946 liters (l)
– 1 buschel	MULTIPLY by 35.24 liters (l)
– 1 ounce	MULTIPLY by 30.0 milliliters (ml)

6. Area

To obtain:

– 1 square inch	MULTIPLY by 6.452 square centimeters (cm^2)
– 1 square meter	MULTIPLY by 10000 square centimeters (cm^2)
– 1 square meter	MULTIPLY by 10.76 square feet ($foot^2$)
– 1 square foot	MULTIPLY by 144.0 square inches (in^2)
– 1 square foot	MULTIPLY by 929.03 square centimeters (cm^2)
– 1 square yard	MULTIPLY by 0.836 square meters (m^2)
– 1 square meter	MULTIPLY by 1.196 square yards (yd^2)
– 1 acre	MULTIPLY by 4,047.0 square meters (m^2)
– 1 hectare	MULTIPLY by 4,046.86 square meters (m^2)
– 1 bushel	MULTIPLY by 2.4 hectares (ha)

7. Pressure

To obtain:

– 1 kgf/cm^2	MULTIPLY by 0.981 bar
– 1 bar	MULTIPLY by 1.019 kilograms per square centimeter (kgf/cm^2) = 1 atmosphere (atm)
– 1 atm	MULTIPLY by 1.0132 bar
– 1 kgf/cm^2	MULTIPLY by 101,325.0 pascal (Pa)
– 1 kgf/cm^2	MULTIPLY by 14.22 pounds per square inch (lbf/in^2 = PSI)
– 1 bar	MULTIPLY by 14.50 pounds per square inch (lbf/in^2 = PSI)
– 1 MPa	MULTIPLY by 145.038 pounds per square inch (lbf/in^2 = PSI)
– 1 PSI	MULTIPLY by 0.00689 mega pascal

8. Outflow, flow

To obtain:

– 1 l/min.	MULTIPLY by 0.264 gallons per minute (gpm)
– 1 gpm	MULTIPLY by 3.788 liters per minute (l/min.)

9. Torque

To obtain:

– 1 N.m	MULTIPLY by 8.851 pounds-force x inch (lbf.in.)
– 1 N.m	MULTIPLY by 0.738 pounds-force x foot (lbf.ft)
– 1 N.m	MULTIPLY by 10.0 kilograms-force x centimeter (kgf.cm)
– 1 lbf.in.	MULTIPLY by 0.113 Newton x meter (N.m)
– 1 lbf.foot	MULTIPLY by 1.356 Newton x meter (N.m)
– 1 kgf.m	MULTIPLY by 7.239 pounds-force x foot (lbf.ft)
– 1 kgf.m	MULTIPLY by 86.8 pounds-force x inch (lbf.in.)
– 1 kgf.m	MULTIPLY by 9.81 Newton x meter (N.m)
– 1 N.m	MULTIPLY by 10.0 kilograms-force x centimeter (kgf.cm)
– 1 kgf.cm	MULTIPLY by 0.10 Newton x meter (N.m)
– 1 N.m	MULTIPLY by 0.102 kilogram-meters (kgf.m)
– 1 N.m	MULTIPLY by 8.851 pounds-force (lbf.in.)
– 1 lbf.in	MULTIPLY by 0.113 Newton x meter (N.m)

10. Power

To obtain:

– 1 cv	MULTIPLY by 735.7 watts (W)
– 1 cv	MULTIPLY by 0.9863 horse power (hp)
– 1 hp	MULTIPLY by 1.014 cv (or PS)
– 1 hp	MULTIPLY by 746 watts (W)
– 1 kW	MULTIPLY by 1.36 cv (or PS)
– 1 kW	MULTIPLY by 1.341 horse power (hp)
– 1 kW	MULTIPLY by 1000 watts (W)

11. Temperature

To obtain:

– °F (Fahrenheit) = (°C x 1.8) + 32
  Examples: 50°C = 122°F; 10°C = 50°F

– °C (Celsius) = 5/9 x (°F – 32)
  Examples: 60°F = 15.5°C; 49°F = 9.44°C

  NOTE the coincidence: – 40°F = – 40°C

Equivalence between Units - English System (Imperial) and IS

Units			
Greatnesses	**English system**	**International System (IS)**	**Practices or Derivatives**
Distance	foot	m	mm, cm, km
Area	foot²	m²	mm², cm², km², há, bushel...
Volume	foot³	m³	mm³, cm³, l, gallon
Mass	lb	kg	g
Specific mass	lb/foot³	kg/m³	g/cm³, g/l, kg/l
Specific volume	foot³/lb	m³/kg	cm³/g, l/kg
Power	lbf	Newton (N)	kgf, dyna
Speed	foot/s	m/s	km/h, m/min
Rotation	grad/s	rad/s	rpm, rps

Units			
Greatnesses	**English system**	**International System (IS)**	**Practices or Derivatives**
Torque	lbf.foot	N.m	m.kgf, cm.kgf
Pressure	lbf.foot²	N/m² (or Pa)	kgf/m², kgf/cm², kgf/mm²
Outflow	foot³/s	m³/s	m³/h, l/h, l/min, l/s
Time	s	s	min, h
Work	lb.foot	J	kgf.m
Power	Btu	W	hp, cv

Prefixes of Technical Units

To form the multiple or sub-multiple of a unit, place the name of the prefix desired in front of the unit. Do the same with the symbol.

To multiply the unit volt by 1000: kilo + volt = kilovolt and k + V = kV.

To divide the unit volt by 1000: milli + volt = millivolt and m + V = mV.

These prefixes can also be used with non-SI units: mbar; kilocalorie; megaton; hectoliter, etc.

For historical reasons, the name of the mass unit contains a prefix: quilogram. Therefore, the multiples and sub-multiples of that unit are formed from gram.

Name of Prefixes

Name	Symbol	Unit Multiplication Factor		
yotta	Y	10^{24} = 1 000 000 000 000 000 000 000 000	Multiples	Symbols in capital letters
zetta	Z	10^{21} = 1 000 000 000 000 000 000 000		
exa	E	10^{18} = 1 000 000 000 000 000 000		
peta	P	10^{15} = 1 000 000 000 000 000		
tera	T	10^{12} = 1 000 000 000 000		
giga	G	10^{9} = 1 000 000 000		
mega	M	10^{6} = 1 000 000		

Name	Symbol	Unit Multiplication Factor		
kilo	k	10^3 = 1 000	Multiples	Symbols in capital letters
hecto	h	10^2 = 100		
deca	da	10		
deci	d	10^{-1} = 0.1	Sub-multiples	
centi	c	10^{-2} = 0.01		
milli	m	10^{-3} = 0.001		
micro	µ	10^{-6} = 0.000 001		
nano	n	10^{-9} = 0.000 000 001		
pico	p	10^{-12} = 0.000 000 000 001		
femto	f	10^{-15} = 0.000 000 000 000 001		
atto	a	10^{-18} = 0.000 000 000 000 000 001		
zepto	z	10^{-21} = 0.000 000 000 000 000 000 001		
yocto	y	10^{-24} = 0.000 000 000 000 000 000 000 001		

Lock and Sealing Chemical Products

Loctite 241/242: Medium resistance lock for bolts and nuts.

Medium resistance lock to disassembly for bolts and nuts. It facilitates the assembly, eliminates the mechanical systems locking, avoids the looseness by vibration, prevents the corrosion and rust, leakages, eliminates retighten and allows the disassembly with conventional tools.

Loctite 277: Lock of high resistance to disassembly for bolts, nuts and studs.

It facilitates the assembly, eliminates the mechanical systems locking, avoids the looseness by vibration, prevents the corrosion and rust, leakages, eliminates retighten. It allows disassembly with conventional tools.

Loctite 290: It locks and seals bolts after the assembly.

Penetration by capillarity, filling all the blank spaces. It facilitates the assembly, eliminates the mechanical systems locking, avoids the looseness by vibration, prevents the corrosion and rust, leakages, eliminates retighten and seals micro porosities. It allows disassembly with conventional tools.

Loctite 567: Thread seals with Teflon®.

For any threaded assembly. It avoids clogging, does not contaminate the system, seals NPT connections instantly up to 17 bar (250 psi). It facilitates the placement of parts such as connections.

Loctite 601: Assembling of bearings, bushings and other cylindrical parts.

It allows the assembly by sliding and prevents the corrosion between the parts. It exempts the polished finishing of the parts; disassembly with conventional tools.

Loctite 660: Assembly of bearings with big clearances, keys, etc.

It fills in big clearances and does not require rectified surfaces. It assembles and seals the parts. It allows disassembly with conventional tools.

Liquid Gaskets

In case there is no risk of oil contamination, **Loctite 515, 598, 599** or **Three Bond** can be used.

However, in the housing connection containing oil, it is recommended to apply degreasing Loctite 7070 on all the surface and afterwards, apply a continuous string of liquid gasket **Loctite 509** along the whole surface.

The non-compliance to such recommendations will cause the contamination of the oil or even the filter clogging.

Examples: hydraulic lid (on the gearbox housing) and the union of the gearbox housing with the speeds multiplier housings and power take-off.

Methods for Applying the LOCTITE Products

a) REMOVE all the old traces of glue, impurities, grease and oxidation. USE wire brushes or sandpaper for chemical pickling.

b) RUB a piece of dry cloth on the adhesive application points.

c) DEGREASE the components with a suitable solvent, such as LOCTITE 706.

d) LET the solvent evaporate completely.

e) APPLY the recommended product using a clean brush. To apply the adhesive under a string shape, USE the package nozzle.

NOTE:

After the product application, PERFORM the assembly as soon as possible. Do not use the product in excess in order to avoid:

- **Blocking the adjacent components.**
- **Difficulty in the cure process, which normally occurs with lack of oxygen.**
- **Contamination of the oil inside the mechanical kits and/or obstruction of hydraulic or lubrication systems.**
- **The tightening of bolts and junction of the parts should be done soon. After the adhesive "cure" (drying), do not perform new retightening, for it can cause the sealing film to crack or lock.**

Paints Specified for the Tractor Repainting

Components	Color Specifications (Valtra)
• Monoblock (*powertrain* = front axle, engine, fuel tank, transmission, rear axle). • Remote control support • Stabilizers support • Front weights support • Front weights • Engine protections • Cross counterweight • Lifting system (arms, stabilizers, leveling, etc.) • Remote control • Traction Bar • Front fenders support • Chassis and cardan shaft protections • Exhaust pipe support • Front grille screen • Partial application on the side covers in the engine compartment • Ladders • Footsteps • Spare tank support • Battery box	Fent Gray
• Air filter, pre-filter and filter support • Levers in general • Steering column • Mirrors rods • Tool box • Seat frame • Cabin frame • Steering column closing (metal) • Platform • Console • Steering and pedals structure in general • Intake and cooling system pipes	Shine Black

Components	Color Specifications (Valtra)
• Wheels • Rear counterweights	White
• Engine hood • Engine compartment side covers • Air conditioned acclimatized cabin roof • Front grille • Single cabin roof molding (fillet) • Rear fenders molding (fillet)	Yellow
• Gray plastic parts in general (without painting) • Dashboard shrouds and fittings • Internal finishings consoles, panels, shrouds and fittings (platform and cabins)	Dull Gray
• Black plastic parts in general (without painting) • Front and rear fenders • Fuel tank (additional) • Cabin front and rear headlights finishing and fixing moldings; air conditioned acclimatized • Windshield and rear window arm and wiper blade	Dull Black
• Muffler and exhaust pipes • Muffler protections • Turbine deflectors • Ejectors (Venturi)	

AGCO Environmental Policy

AGCO do Brasil Comércio e Indústria Ltda, at its factory in Mogi das Cruzes - SP, is committed to the development, production and sale of products aimed at meeting the mechanization needs of agribusiness, both in Brazilian and foreign markets, and always considering and implementing the most appropriate alternatives for the preservation of the environment.

Main Policies

1. Comply with applicable legislation and standards, seeking to follow the new trends of regulations.

2. Undertake continuous improvement of environmental performance; adopt pollution prevention practices, through actions aimed at reducing the generation of solid waste, liquid effluents, air emissions and noise levels, as well as the rational use of natural resources.

3. To be pro-active in the internal and external community, keeping open a channel of communication for information related to environmental concerns.

4. To promote a sense of environmental responsibility, by training employees, and the raising the awareness of suppliers and service providers.

How will we reach these objectives?

Betting on the Company partnership with the environment is to assure its existence in the future.

Believing in the aforementioned statement, AGCO has stipulated its Environmental Policy and the application for its consolidation, by the implementation of an Environmental Management system and a Cleaner Production Program.

What is ISO 14000?

It is a set of environmental management standards defined by the International Standards Organization (ISO) to standardize the environmental management. The ISO 14000 is comprised by 6 groups of Standards, each one approaching a subject related to environmental issue.

For AGCO, the Standard 14001 is valid, which deals with the environmental management system.

Environmental Management System - EMS

It is a set of procedures to manage or administrate a company to obtain the best relationship with the environment.

This system implementation aims to completely analyze the company's activities, products and services related to their influence on the environment and assume a continuous commitment with the environmental quality.

Environmental Issues

Greenhouse Effect

This is the rise in the earth's temperature caused by the build-up of the gases carbon dioxide (CO_2) and methane (CH_4) in the atmosphere. The excess of carbonic gas is generated by industrial process, fossil combustible consumption and forests burning.

"The increased heating of the planet can melt down the polar ice caps and cause floods."

Reduction of the Ozone Layer

Ozone (O_3) that acts as a filter in the upper atmosphere, giving protection against the sun's harmful rays. Some gases, such as Chlorofluorocarbon (CFC), used in refrigeration industry, destroy the ozone, causing a "hole" on the ozone layer.

"As a result, it is estimated that 100,000 people around the world suffer skin cancer each year."

Population explosion

It has been estimated that by the year 2020 we can have 8 billion more people as related to the present population. The majority of these people will live in unsafe conditions, without basic sanitation, education or medical assistance.

"Population growth, together with adverse conditions, is creating an unsustainable situation for the planet."

Sustainable Development

It is a new type of development, which searches a compatible attending of the human being social and economic needs with the need of preserving the environment and natural resources, in a way to assure the life sustainability on earth.

It is believed that the sustainable development will be the only way to change poverty, wastes, social and environmental issues.

Recommendations for Owners and Users of Valtra Tractors

With regard to the environmental issues discussed above, here are some suggestions to help increase your awareness of this issue, which affects the use and maintenance of the tractor throughout its working life.

1. TRY to adopt appropriate agricultural practices and minimize your impact on the environment.

2. USE your tractor with the maximum efficiency as possible, correctly adjusting the implements, using proper implements and operating in proper working conditions (gears, engine revolutions, speed, etc.), as exposed in this manual.

3. TAKE full advantage of your tractor for as long as possible. It can be achieved by the proper preventive maintenance, as described in the Operator Manual.

4. CARRY OUT an integrated pest management, which consists of procedures and monitoring, with the aim of using pesticides only when needed, and in the correct measure.

5. Do not permit fertilizing, seed and defensive wastes, etc. USE all products in the correct measure.

6. Avoid burning off at any cost, and adopt appropriate cultivation techniques, such as "straw planting" or Direct Planting.

7. DISPOSE of fluids and parts replaced in your tractor as stated by Law. TAKE A LOOK at some examples:

Metals:

Metals recycling offers many advantages. Each ton of steel recycled represents a saving of 1,140 kg of iron ore, 454 kg of coal, and 18 kg of lime.

Oils and Fluids:

The use of lubricants in the equipment represents a thermal-oxidative degradation and contaminants accumulation, which makes the changes necessary. Never discard them in nature, COLLECT and RETURN them to the fuel station where they were bought. The oils can be refined or ultimately incinerated in landfills regulated by Law.

Batteries:

Batteries can have a disastrous effect on the environment if dumped. So, TAKE your used batteries to the recycling companies or RETURN them to the manufacturer, as they have as obligation to give the batteries the destination regulated by Law.

Tires:

The energy generation and rebuilding were the fist way of recycling these items.

With improvements in technology, new options arose, such as mixing with asphalt. Despite the great number of tire rebuilding at the present, which extends the tires life cycle in 40%, the larger portion of wear tires are sent to landfills, thrown in roads or river banks, or even in the backyards of houses, attracting insects, carriers of disease.

Plastics:

Plastics are made from oil, and when recycled they consume only 10% of the energy required to make the same amount from raw materials.

Plastic, as well as glass, is not biodegradable in nature and, due to their increasing use, recycling becomes unavoidable.

Glasses:

Glass scraps find various applications such as: asphalt composition, foam and fiberglass production, jewelry and reflective paint.

Cardboard:

Every 50 kilos of used paper transformed into new paper avoid cutting a tree down.

Mandatory Battery Recycling

NOTE: RETURN your battery when you buy a new one. In accordance with CONAMA Resolution 257/99 of 06/30/99.

CONAMA Resolution

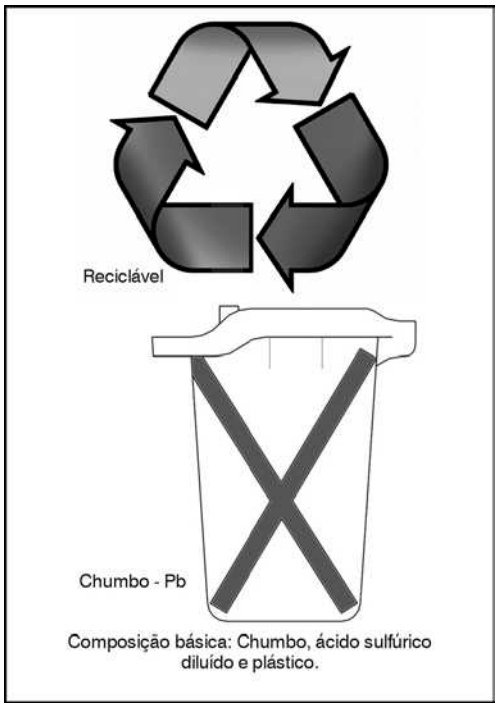
CONAMA - the Brazilian National Environment Council - in Resolution 257, dated June 30th, 1999, defines rules and responsibilities related to the disposal and management of used batteries. This Resolution also states that all establishments that distribute or resale these products must be aware of this Resolution, and must be provided with information and advertisement capable of providing guidelines for the final users about their responsibilities in returning used batteries through the establishments that sell and/or provide technical assistance.

DEAR CLIENT:

All customers/final users are obliged to return used batteries to the point of sale. Do not discard the battery as ordinary waste.

The Points of Sales are required to accept the returned old batteries, as well as store them in a proper place and then return the batteries to the manufacturer for recycling.

Risks of the Contact with Acid Solution and with Lead



The acid solution and lead in batteries can contaminate the soil, the subsoil, and the water if released into the environment.

The water consumption can cause high blood pressure, anemia, depression, weakness, pain in the legs and drowsing feelings.

The contact of acid solution with the eyes can cause chemical conjunctivitis, and with the skin, contact dermatitis.

In case of accidental contact with eyes or skin, wash the area immediately with tap water and SEEK medical assistance.

SECTION 110-02

Identification

Application on the Models: **Medium Duty**

Table of Contents

IDENTIFICATION CODE

Overall View

The Product Identification Number (PIN) is provided at the Brazilian Traffic Code.

The agency responsible for establishing the vehicles identification criteria is CONTRAN (National traffic council), and ABNT (Brazilian Association of Technical Standards) has developed the standard (NBR'S), which defines the PIN structure, based on the criteria defined by CONTRAN.

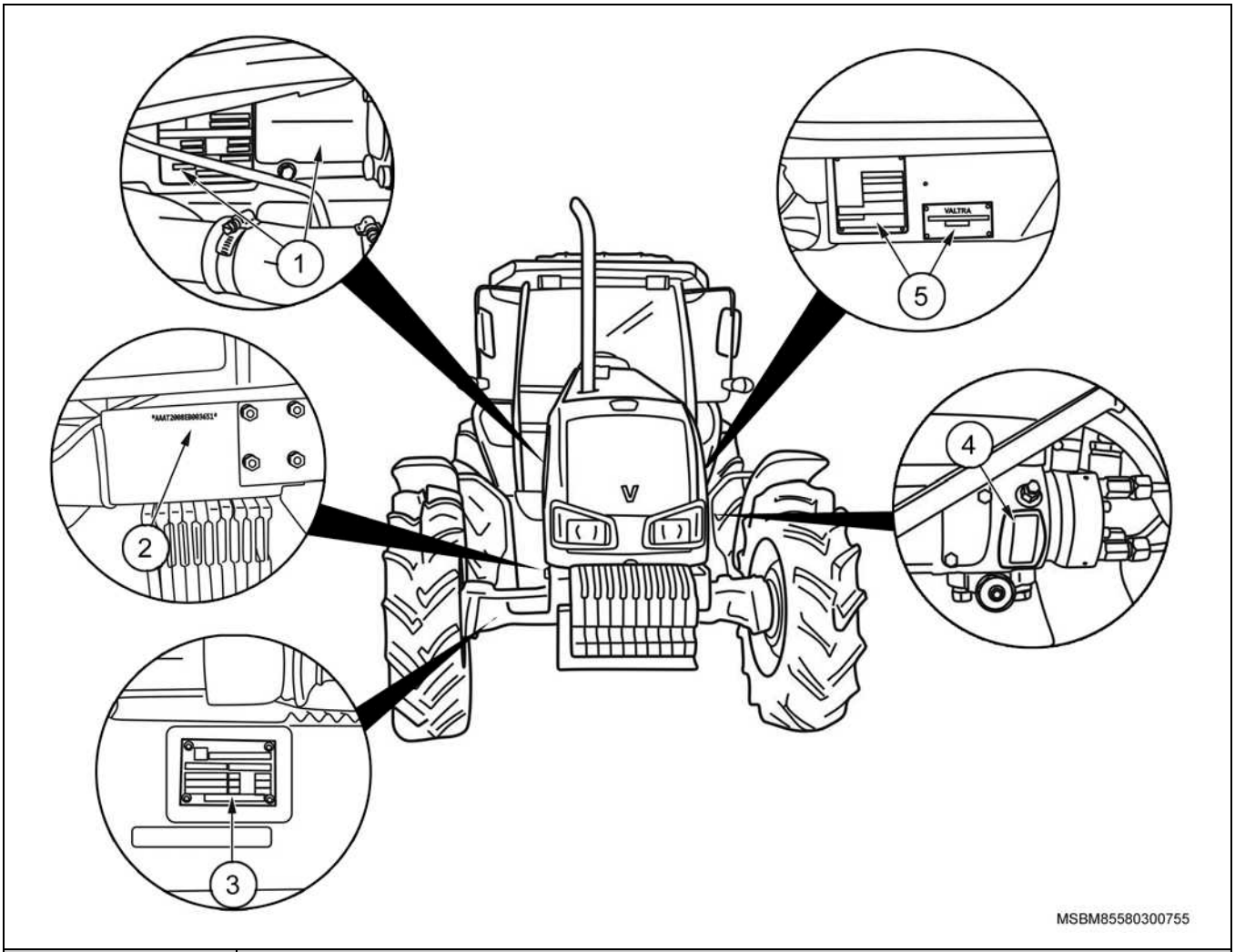
The PIN structure is composed by the combination of 17 characters, structured in 4 sections, which are described below:

- WMC – Manufacturer International Identifier, composed by the PIN characters from 1 to 3 (1st to 3rd).
- MDS – Vehicle Descriptive Section, composed by the characters from 4 to 9 (4th to 9th), which provide descriptive information for the vehicle general characteristics and are completed according to the manufacturer/assembly company criteria.
- MIS – Vehicle Indicator Section, composed by the characters from 10 to 17 (10th to 17th), and it is necessary to identify the manufacturing year, the place where the vehicle was produced and the production sequential order.

The combination of MDS + MIS sections must ensure the uniqueness of PIN, of all vehicles produced by a manufacturer / assembler for a period of 30 years.

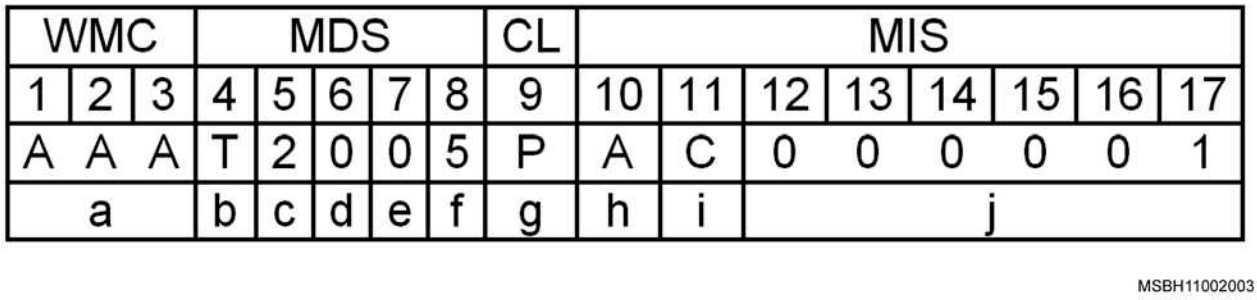
Location of Vehicle Identification Numbering (PIN)

The complete vehicle and the various components are identified by numbers stamped on the chassis, labels and nameplates. It is essential that the vehicle identification number (PIN) is mentioned along with the identification number of the component involved in the completion of warranty claims or field and product reports.



Item	Description
1	Engine serial number: Engraved in a Nameplate and in low relief inn the motor block, in the left side next to the starter motor
2	Main engraving (PIN): Engraved in low relief on the chassis on the front right side of the tractor with 17 digits
3	Front axle serial number: Engraved on a plate on the axis rear right side
4	Injection pump serial number: Engraved on a plate fixed on the pump itself
5	Nameplate (PIN) Located below the door, in the cabin left side

Identification Codes



WMC			MDS					CL	MIS							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	A	A	T	2	0	0	5	P	A	C	0	0	0	0	0	1
a			b	c	d	e	f	g	h	i	j					

MSBH11002003

Item	Description
a	Positions 1, 2 and 3 – world manufacturer code
b	Position 4 – description of the machine
c, d, e, f	Positions 5, 6, 7 and 8 – codes related to the machine groups
g	Position 9 – one-letter code calculated by an ISO system formula
h	Position 10 – manufacturing year
i	Position 11 – building plan
j	Positions 12 to 17 – serial number

Positions 1, 2 and 3 – World Manufacturer Code

Code	Manufacturer
AAA	AGCO do BRASIL

Position 4 – Machine Description Code

Code	Manufacturer
T	Tractor
C	Harvester
P	Platform

Positions 5, 6, 7 and 8 – Codes Related to the Machine Groups

Light Duty	
585	2001
685 ATS	2002
685	2002
785	2003
BF65	2004
BF75	2004
A650	2005
A750	2005
A850	2005
A750L	2006
A950	2006

Medium Duty	
BM 85	–
BM 100	–
BM 110	–
BM 120	–
BM 125i	–

Heavy Duty	
1280R	2009
BH145	2010
BH165	2010
BH180	2010
BH185i	2010
BH205i	2010
1780	2011
BT150	2012
BT170	2012
BT190	2013
BT210	2013

Other Groups	
Pre-Series	2777
Imported	2888
Prototypes	2999

Position 9 – Check Digit, One-letter Code Calculated by an ISO System Formula

P	**(generated by the computer)**

Position 10 – Manufacturing Year

Code	Model
A	2010
B	2011
C	2012
D	2013

Position 11 – Building Plan

Code	Model
M	Mogi das Cruzes
S	Santa Rosa
I	Ibirubá

Positions 12 to 17 – Serial Number

SECTION 110-03

Technical specifications

Application on the Models: **Medium Duty**

Table of Contents

SPECIFICATIONS

ISO Standard Bolt Torque Table

Normal Thread

Bolt size	4.8 galvanized	tolerance	5.8 galvanized	tolerance	8.8 oiled	tolerance
M4	1	0.1	1.8	0.2		
M5	2.8	0.3	3.5	0.4	6.4	0.6
M6	5	0.5	6	0.5	11	1
M8	12	1	15	1.5	25	2
M10	23	2	30	3	50	5
M12	–	–	50	5	90	10
M14	–	–	80	8	140	15
M16	–	–	120	10	220	20
M18	–	–	170	15	300	30
M20	–	–	240	25	430	40
M22	–	–	320	30	570	60
M24	–	–	400	40	740	70
M27	–	–	600	60	1100	100
M30	–	–	800	80	1500	150
M33	–	–	1100	100	2000	200
M36	–	–	1400	150	2500	250
M39	–	–	1800	180	3200	300
M42	–	–	2300	200	4000	400

Bolt size	8.8 galvanized	tolerance	8.8 * Znk	tolerance
M4	–	–	–	–
M5	5.7	0.5	–	–
M6	10	1	12	1.2
M8	23	2	30	3
M10	45	5	60	5
M12	80	8	100	10
M14	125	10	160	15
M16	195	20	250	25
M18	270	30	350	35
M20	380	40	480	50
M22	500	50	650	65
M24	660	70	830	80
M27	950	100	1200	120
M30	1300	130	1600	160
M33	1700	170	2200	220
M36	2200	220	2800	280
M39	2900	300	3700	370
M42	3600	350	4500	450

Bolt size	10.9	tolerance	12.9	tolerance
	oiled		oiled	
M4	–	–	–	–
M5	9	1	11	1
M6	15	1.5	18	2
M8	35	4	45	5
M10	70	7	90	10
M12	125	10	151	15
M14	200	20	240	20
M16	300	30	370	40
M18	430	40	510	50
M20	600	60	720	70
M22	800	80	970	100
M24	1030	100	1250	120
M27	1500	150	1800	180
M30	2040	200	2500	250
M33	2800	280	3300	330
M36	3500	400	4300	430
M39	4500	500	5500	500
M42	5700	600	6800	680

***** Znk = electrolytic galvanized

NOTE: tolerance is plus or minus the value indicated in (N.m).

Thin Thread

Torque Moment (N.m)

Size by thread passed	5.6 oiled	tolerance	8.8 oiled	tolerance	8.8 galvanized	tolerance
M5 by 0.5	3.2	0.3	6.8	0.6	6	0.5
M6 by 0.75	5.4	0.5	12	1	10	1
M8 by 1	13	1.3	28	3	25	3
M10 by 1.25	25	2.5	55	5	45	5
M12 by 1.25	45	5	95	10	80	10
M14 by 1.5	70	7	150	15	130	15
M16 by 1.5	105	10	230	25	200	20
M18 by 1.5	150	15	330	35	300	30
M20 by 1.5	210	20	450	50	400	40
M22 by 1.5	280	25	600	60	540	50
M24 by 2	360	35	770	80	680	70
M27 by 2	520	50	1100	100	980	100
M 30 by 2	720	70	1500	150	1360	130
M33 by 2	960	100	2050	200	1800	180
M36 by 3	1200	120	2600	260	2300	230
M 39 by 3	1560	150	3300	300	3000	300
M42 by 3	1960	200	4200	400	–	–
M45 by 3	2400	240	5200	520	–	–

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