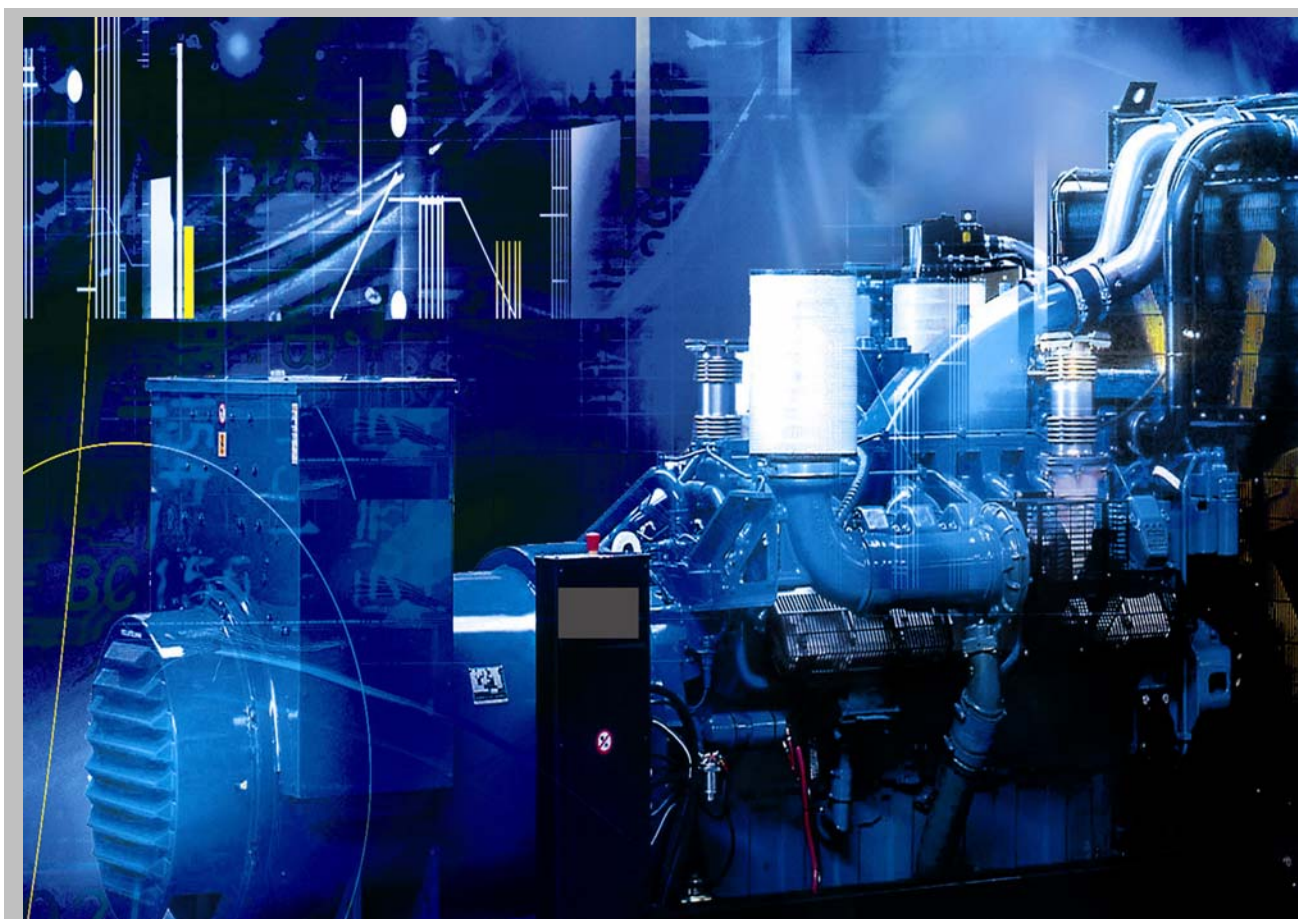


Users guide and maintenance manual for the generating sets

Model(s) : G130

Control device: M150



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Réf. constructeur : 33501180301

Réf. GPAO : 33501180301NE

Revised (10-12)



Users guide and maintenance manual

All generating sets
General considerations
Safety instructions

Réf. constructeur : MUE-IR A

Réf. GPAO : 33522051901

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Attached documents

User manual for the control unit

User and maintenance manual for the engine

User and maintenance manual and spare parts catalogue for the alternator

Wiring diagrams (supplied with the electrical generating set)

Genset parts catalog.

1. PREAMBLE

1.1. Introduction

1.1.1 General recommendations

Thank you for choosing an electrical generating set from our company.

This manual has been designed to help you operate and maintain your electrical generating set correctly.

Read the safety instructions carefully in order to prevent any accident, incident or damage. These instructions must always be followed.

In order to obtain optimum efficiency and the longest possible life for the electrical generating sets, maintenance operations must be carried out according to the periods indicated in the attached preventative maintenance tables.

If the electrical generating set is used under dusty or unfavourable conditions, some of these periods will be shorter.

Ensure that all adjustments and repairs are carried out by personnel who have received the appropriate training. The dealers are suitably qualified and can answer all of your questions. They can also supply you with spare parts and other services.

The left and right sides can be seen from the back of the electrical generating set (the radiator is at the front).

Our electrical generating sets have been designed so that damaged or worn parts can be replaced by new or reconditioned parts thereby reducing the out of action period to a minimum.

For all parts replacement, contact your nearest dealer representing our company who will have the necessary equipment and properly trained and informed staff to carry out maintenance, parts replacement and even total reconditioning of generating sets.

Contact your local dealer for the available repair manuals and to make the necessary arrangements for training personnel in implementation and maintenance.

IMPORTANT

Some user manuals and maintenance manuals for the engines fitted to the electrical generator assemblies include information on the control units and detail the engine starting and stopping procedures.

As the electric generator assemblies are fitted with assembly-specific test and control panels, only the information in the documentation regarding the panels fitted to the assemblies should be taken into consideration.

1.1.2. Structure of the reference material

The reference material delivered with the generating sets enables you to get to know the equipment, operate it and maintain it, both on a daily basis and periodically.

The reference material for the engines and alternators fitted to the sets consists of engine user and maintenance manuals (from the manufacturer) and alternator user and maintenance manuals (from the manufacturer).

The reference material contains:

- the user and maintenance manual, containing among other things:
 - o general recommendations and safety regulations to be adhered to
 - o general recommendations for installing generating sets
 - o tables of capacities (lubricants and coolants) and fuel tanks of different engines that may be fitted to the sets according to their configurations
 - o general reference material for maintaining starter batteries
- user and maintenance manual for the engine fitted to the set
- maintenance manual for the alternator fitted to the set
- user manual for the control panel
- wiring diagrams (these diagrams are delivered with the generating set)

1.2. Pictograms and their meanings



Warning danger



Warning, risk of electric shock



Warning, toxic materials



Warning, pressurised liquids



Warning, high temperature, risk of burns



Publications delivered with the generating set must be referred to



Protective clothing must be worn



Your eyes and ears must be protected



Periodic maintenance must be carried out



Battery level must be checked



Warning, rotating or moving parts (risk of getting caught in the machinery)



Lifting point required



Warning, corrosive product



Stacking point required



Warning, risk of explosion



Naked flames and unprotected lights prohibited.
No smoking



Entry prohibited to non-authorised persons



Exinction by water prohibited



Power



When on a trailer, earth the set before starting it



Earth



Emergency cut-out

Application of EU Machine Directive 98/37 of 22 June 1998 in relation to generating sets.

- access restricted to authorised personnel only according to the legislation in force
- live installation: possible automatic start-up.

1.3. Safety instructions and regulations

THESE SAFETY PRECAUTIONS ARE IMPORTANT

If you do not understand or have any questions about any point in this manual, contact your dealer who will explain it to you or give you a demonstration. A list of risks and precautionary measures to take follows. You should also refer to any local and national regulations that apply in accordance with your own jurisdiction.

1.3.1 General advice

- Read and understand the manuals provided with the generating set in full.
 - Do not wear loose clothing and do not go near the machines when operating. Note that the fans are not clearly visible when the engine is running.
 - Warn all people present to keep well back during operation.
-
- The generating set should always be controlled by an experienced person.
 - Always test the generating set from the control panel.
 - Follow the maintenance table and its directions.
 - Never let anyone else use the generating set without having first given them the necessary instructions.
 - Do not run the engine without having refitted the protective covers.
 - Engine with turbocharger: never start the engine without fitting the air filter. The rotating compressor wheel in the turbocharger can cause severe physical injury. Foreign objects in the intake duct can cause mechanical damage.
 - Engine with air preheating (starter components): never use starter aerosol or similar product as starter assistance.
When it comes into contact with the starter component, an explosion may occur in the inlet manifold and lead to physical injury.
 - Never let a child touch the generating set, even when not in use. Avoid using the generating set in the presence of animals (can distress the animal).
 - Never start the engine without an air filter or exhaust.
 - Always follow current local regulations regarding generating sets and use of fuel (petrol and gas) before using your generating set.
 - Never use sea water or any other electrolytic or corrosive product in the coolant circuit.



- Disconnect the battery and pneumatic starter (if there is one) before carrying out any repair, to prevent the engine from starting accidentally. Fit a panel over the controls to prevent any attempt at starting.
- Do not modify the engine.
- Only use the correct techniques for turning the crankshaft to rotate the crankshaft manually. Do not try to rotate the crankshaft by pulling or exerting force on the lever on the fan. This method can cause serious physical or material harm or damage the fan blade (s), leading to premature breakdown of the fan.
- Always use tools in good condition. Check that you have understood how to use them before starting a procedure.
- Only fit original spare parts.
- Use tools that correspond to the work being carried out.
- Clean all traces of oil or coolant with a clean cloth.
- Never use petrol or other flammable substances to clean parts. Use only approved cleaning solvents.
- Do not use a high-pressure cleaner for cleaning the engine and fittings. The radiator, hoses, electrical components etc. could be damaged.
- Avoid accidental contact with parts that reach high temperatures (exhaust manifold, exhaust)
- Engage the parking brake when the generating set on its trailer is installed on the operating site.
- When setting on a slope; check that no-one is behind the trailer.
- Protective eyewear must be worn when handling during maintenance operations. Operators should remove watches, chains, etc.

1.3.2 Risks related to feed gas (concerns gas sets)

WARNING – DANGER

The gas is explosive. It is forbidden to smoke, go near or create sparks when the tank is being filled and near to the generating set.

- Request the user technical notes and LPG or NG safety data sheets from your gas supplier.
-
- Gas installations must be installed, maintained and repaired by recognised specialists.
- Do not attempt to open, unseal or intervene in gas supply pressure relief valves and on the gas line in general.
-
- Gas supply procedures must be carried out in fresh air (outside) in accordance with local regulations, in an area well away from fire, people or animals.

1.3.3 Risks related to exhaust gases and fuels

WARNING - DANGER

generating sets should not be operated in unventilated areas.

- Always follow the local regulations in force regarding generating sets and use of fuel (petrol, diesel and gas) before using your generating set.
- Fuel filling should be carried out when the engine is stopped (except for sets with an automatic filling system)
- Engine exhaust gases are toxic: Do not operate the generating set in non ventilated areas. When installed in a ventilated area, the additional requirements for protection against fire and explosions must be observed.
- If a burnt gas exhaust leaks, the generating set may become more noisy. In order to be sure of its efficiency, you should periodically examine the burnt gas exhaust.
- Pipes must be replaced as soon as their condition requires it.

1.3.4 Risks related to toxic products

WARNING – DANGER

The corrosion inhibitor contains alkali. This substance should not come into contact with the eyes. Avoid any prolonged or repeated contact with skin. It should not be swallowed. In the event of skin contact, wash thoroughly with water and soap. In the event of contact with eyes, rinse immediately with plenty of water for at least 15 minutes. CALL A DOCTOR IMMEDIATELY. KEEP THE PRODUCT OUT OF THE REACH OF CHILDREN.

The anti-rust product is toxic and dangerous if absorbed. Avoid any contact with skin or eyes. Read the instructions on the packaging.

Glycol is a toxic product and dangerous if absorbed. Avoid any contact with skin or eyes. Read the instructions on the packaging.

- Never expose the equipment to liquid splashes or rainfall, and do not place it on wet ground.
- Always use the recommended fuels. Using low quality fuels risks damaging the engine and altering performance
- The battery electrolyte is harmful to skin and especially eyes. If splashes get into eyes, rinse immediately with running water and/or a 10% diluted boric acid solution.
- Wear protective eyewear and strong base resistant gloves for handling the electrolyte .

1.3.5 Risk of fire, burns and explosion

WARNING – DANGER

The engine should not be operated in areas containing explosive products. There is a risk of sparks forming where all electrical and mechanical components are not shielded.

- Beware of creating sparks or flames and do not smoke near batteries as the electrolyte gases are highly flammable (especially when the battery is being filled). Their acid is also harmful to the skin and particularly the eyes.
- Never clean, lubricate or adjust an engine when it is in operation (unless you are qualified to do so, in which case extreme care must be taken to avoid accidents)
- Never make adjustments that you are not familiar with.
- Never cover the generating set with any material while it is working or just after it stops (wait until the engine has cooled)
- Do not touch hot components such as the exhaust pipe and do not put combustible material on them.
- Keep all flammable or explosive products (petrol, oil, cloth, etc.) well away when the set is running.

- Good ventilation is required for your generating set to work properly. Without ventilation, the engine will quickly reach an excessive temperature that could lead to accidents or damage to the equipment and surrounding items.
- Do not take off the radiator cap when the engine is hot and the coolant is pressurised due to risk of burns.
- Depressurise the air, oil and coolant circuits, before removing or disconnecting any unions, ducts or connected components. Be aware of any possible pressure that might be present when disconnecting a device from a pressurised system. Do not look for pressure leaks manually. High pressure oil can cause physical accidents.
- Some preservative oils are flammable. Also, some are dangerous to inhale. Check that ventilation is good. Use a protective mask.
- Hot oil causes burns. Avoid contact with hot oil. Check that the system is no longer pressurised before carrying out any procedures. Never start or run the engine when the oil filling cap is off as oil may be ejected.
- Never start or run the engine when the oil filling cap is off as oil may be ejected.
- Never cover the generating set with a fine layer of oil for anti-rust protection.
- Never fill up the oil or coolant when the generating set is running or when the engine is hot.

1.3.6 Risks related to electrical networks

- The electrical equipment supplied with the generating set complies with standard NF C15.100 or the standards of the relevant countries
 - Read the manufacturer's identification plate carefully. The values for voltage, power, current and frequency are shown. Check that these values match the supply use.
 - Never accidentally touch naked wires or disconnected connections.
 - Never handle a generating set with wet hands or feet.
 - Maintain electrical wires and connections in good condition. Using equipment in poor condition can lead to electrocution and damage to equipment.
-
- Any procedure on the equipment must be carried out voltage free.
 - Electrical connections must be made in accordance with current standards and regulations in the country.
 - Do not use faulty, poorly insulated or provisionally connected wires.
 - Do not invert the positive and negative terminals of batteries when connecting them. Such an inversion can lead to severe damage to the electrical equipment. Follow the wiring diagram supplied by the manufacturer.
 - The generating set should not be connected to any other power sources, such as the public distribution network. In specific cases where there is a reserve connection to existing electrical networks, it must only be carried out by a qualified electrician, who should take the operating differences of the equipment into account, according to whether the public distribution network or generating set is being used.
 - Protection against electric shocks is ensured by an assembly of specific equipment. If this needs to be replaced, it should be by components with identical nominal values and specifications.
 - Due to strict mechanical specifications you should only use flexible resistant rubber sleeved wires, in compliance with CEI 245-4 or equivalent wires.

1.3.7 Dangers presented by electric currents (first aid)

First aid

In the event of an electric shock, cut off the voltage immediately and activate the set's emergency stop. If the voltage has not yet been cut off, move the victim out of contact with the live conductor as quickly as possible. Avoid direct contact both with the live conductor and the victim's body. Use a dry plank of wood, dry clothes or other non-conductive materials to move the victim away. The live wire may be cut with an axe. Take extreme care to avoid the electric arc that results from this.

Begin emergency procedures

Resuscitation

If breathing has stopped, begin artificial respiration at once in the same place the accident took place unless the victim or operator's life could be endangered by this.

In the event of cardiac arrest, carry out cardiac massage.

1.3.8 Risks related to moving the set

- Use lifting units to lift the generating set. Always make sure that the lifting equipment is in good condition and has a sufficient lifting capacity.
- In order to work in complete safety and prevent the components fitted to the top of the engine from being damaged, the engine should be lifted with an adjustable boom. All chains and cables should be parallel to one another and as perpendicular as possible to the top of the set.
- If other equipment fitted to the generating set alters its centre of gravity, special lifting devices may be required to maintain the correct balance for working in total safety.
- Never carry out work on a generating set that is suspended on a lifting device only.

1.3.9 Recommendation for the operator and environment

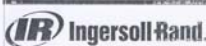
- Operating personnel should be aware of the safety and operating instructions. These will be regularly updated.
- Operating should be monitored, directly or indirectly, by someone designated by the operator who is familiar with the installation and dangers and problems regarding products stored and used in the installation.
-
- Manufacturers' notes should be available to technical staff, on site if possible.
- Written operating instructions must be available for operations that involve dangerous handling procedures and driving installations. In particular, these instructions prescribe:
 - o Operating modes
 - o Frequency of testing for safety devices and devices for handling pollution and other harmful substances generated by the installation
 - o Methods for maintenance, checking and use of adjustment equipment and safety devices.
- The presence of dangerous or combustible materials on premises where combustion apparatus is sheltered is limited to what is required for the operation.
- The installations must be operated under the constant supervision of a qualified person. This person should periodically check that the safety devices are working properly and ensure the correct fuel supply to the combustion apparatus.
- Apart from combustion apparatus, flames in any form are prohibited. This should be displayed in bold on a sign.
- Residual water, mud and waste spray is prohibited.
- The fuels to be used should correspond to the ones in the declaration file and the specifications prescribed by the combustion apparatus manufacturer.
- The fuel is considered as being in the physical state that is introduced into the combustion chamber.
- Always protect your hands when detecting leaks. Pressurised fluids can enter body tissues and cause severe harm. Risk of blood poisoning.
- Drain and discard engine oil in a designated container (the fuel distributors can collect your used oil).

1.4. Identifying sets

generating sets and their components are identified by means of identification plates.
The precise rules for identifying each major component (engine, alternator etc.) are set out in each manufacturer's documents contained in this manual.

Examples of identification plates

generating set

| PLAQUE CONSTRUCTEUR / MANUFACTURER PLATE | | | | |
|---|------|------------------------------------|---------|--------------|
| GROUPE ELECTROGENE / GENERATING SET | | | | |
|  | | Type | G200 | |
| | | Execution | IV | |
| | | Version | | |
| | | Masse (Kg) | 2980 | |
| | | Weight | | |
| V | Hz | rpm | Cos Phi | Phase |
| 400/230 | 50 | 1500 | 0.8 | 3 |
| PRP | | ESP | | |
| Kva | 180 | 198 | | |
| Kw | 144 | 158.4 | | |
| A | 260 | 286 | | |
| Ambiance(°C) | | Alt(m) | | |
| Ambiant | | 25 | | |
| PRP: | | Puissance Principale / Prime Power | | |
| ESP: | | Service Secours / Standby Duty | | |
| Année | 2002 | Numéro de Série | | 020002009371 |
| Year | | Serial Number | | |
| INGERSOLL-RAND Co. Ltd. - Hindley Green Wigan UK | | | | |

| CEE 84-536 PUISSANCE ACOUSTIQUE / SOUND POWER | | | | |
|---|--|-----------------|--|--|
| L _{WA} | | 98.5 | | |
| Numéro Homologation | | M216.6068HF160. | | |

| PRESSION ACOUSTIQUE / SOUND PRESSURE | | | | |
|--------------------------------------|-------|------|-----|------|
| dB(A) | | 1 m | 7 m | 15 m |
| | 50 HZ | 80.5 | 71 | 67 |
| | 60 HZ | 87 | 77 | 73 |

020002009371

INGERSOLL-RAND

020002009371

INGERSOLL-RAND


| | |
|-------|--------------|
| S/N | 020002009371 |
| TYPE | G200 |
| Année | 2002 |
| Year | |

Engines

| JOHN DEERE | |
|---|------------------|
| Engine Serial Number | |
| *CD4045T123456* | |
| CD4045TF150 | Abs. Coeff. X.XX |
| DEERE & COMPANY MOLINE, ILLINOIS MADE IN FRANCE | |




| VOLVO PENTA | |
|-----------------------------------|-----------------|
| ENGINE MODEL | XXXXXXXX |
| SPEC. NO. | XXXXXX |
| SERIAL NO. | XXXXXXXXXX |
| RATED NET POWER without fan kW/hp | XXX/XXX |
| with fan kW/hp | XXX/XXX |
| SPEED AT RATED POWER rpm | XXXX |
| PRELIFT mm/INJ. TIMING | X,X+X,X/XX±X,X° |
| MADE IN SWEDEN 3826077 | |

Alternator


ALTERNATEURS PARTNER ALTERNATORS

LSA 44.2S7 C 6/4 **Date** 01/14
N° 117204 / 9 60 Hz
Min-1/R.P.M. 1800 **Protection** IP23
Cos Ø / P.F. 0,8 **Cl.ther./Th.class** H
Régulateur/A.V.R. R438 LS/C AREP
Altitude < 1000m **Masse/Weight** 440 Kg
Rlt AV/D.E bearing
Rlt AR/N.D.E bearing 6309 2RS
Graisse/Grease Esso UNIREX N3
Valeurs excit/Excit.values 480 V / 40°C
on charge / full load 17,78 V / 3,84 A
à vide / at no load 0,95 A

PUISSANCE / RATING

| | | | | | | | |
|-----------------|---|---|--|---|---|---|-----|
| Tension Voltage | 480 | 440 | 415 | 240 | 208 | 240 | V |
| Phase | 3 | 3 | 3 | 3 | 3 | 1 | |
| Conn. |  |  |  |  |  |  | |
| Cont. | 150 | 135 | 130 | 150 | 130 | 78 | kVA |
| Base | 120 | 108 | 104 | 120 | 104 | 62.4 | KW |
| 40°C | 180 | 177 | 180 | 361 | 361 | 325 | A |
| Secours | 155 | 150 | 144 | 165 | 144 | 87 | kVA |
| Std by | 132 | 120 | 115 | 132 | 115 | 69.6 | KW |
| 27°C | 198 | 197 | 200 | 397 | 400 | 363 | A |


LR 57008


Conforme à C.E.I 34-1(1994). According to I.E.C 34-1(1994).

Made by Leroy Somer - 1 024 93046

2. INSTALLATION

2.1. Unloading

2.1.1 Safety during unloading

In order to unload generating sets from their transport mountings, under optimum conditions of safety and efficiency, you should check that the following points are being followed correctly.

- Suitable lifting vehicles or equipment for the work.
- Slings positioned in the rings provided for this procedure or lifting arms resting fully underneath the frame cross beams.
- Suitable ground to accommodate the load of the set and lifting vehicle, without strain (if not, put down sufficiently strong and stable boards).

Remove the set as close as possible to its place of use or transport, in a clear space with free access.

2.1.2 Example of material

- crane, slings, lifting beam, safety hook, shackles.
- fork lift truck.

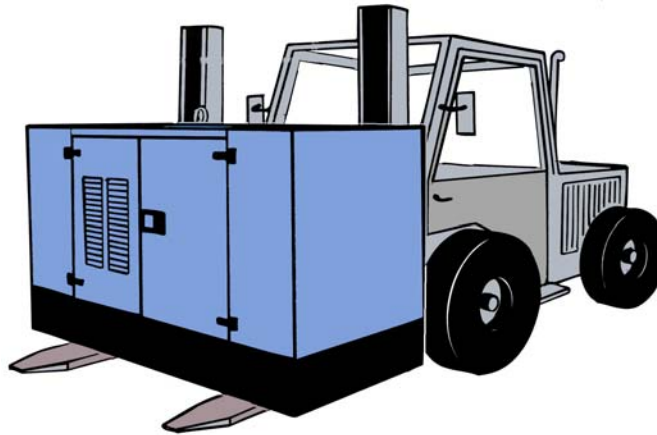
2.1.3 Instructions for unloading

2.1.3.1 Slings

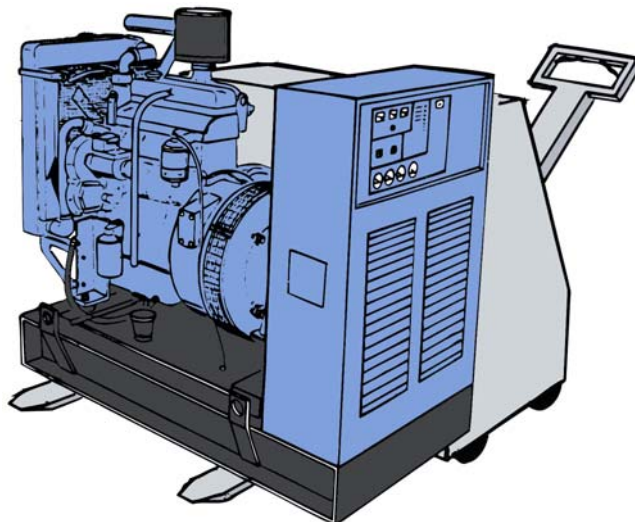
- attach the lifting vehicle slings to the rings on the generating set designed for this procedure.
- hang the slings carefully.
- check that the slings are correctly attached and the equipment is solid.
- lift the generating set carefully.
- direct and stabilise the set towards the chosen position.
- carefully set down the equipment while continuing to position it.
- release the slings, then detach and remove the lifting rings.

2.1.3.2 Fork lift truck

- position the arms of the fork lift under the frame, making sure that only the cross beams are resting on the arms.
- lift and handle the equipment carefully.
- set down the generating set in its unloading position.



It is recommended to use a fork lift truck with arms that are longer than the width of the frame



3. INSTALLATION OF MOBILE SITE SETS

3.1 Specific arrangements

An area will be reserved to install the generating set. It should be flat and strong enough so that the generator does not sink into it. It could be made of concrete or even large planks fitted together.

It should be noted that a generating set that does not rest correctly on its base (frame or trailer) will be subject to vibrations that could cause damage to all the equipment.

The location of the set on site should be chosen for ease of fuel supply and distribution of current to the users.

Access to the set's doors should be available at all times for safety and maintenance reasons. Ventilation of the generating set should not be affected if there are different objects close by. It will cause abnormal heating and reduced power.

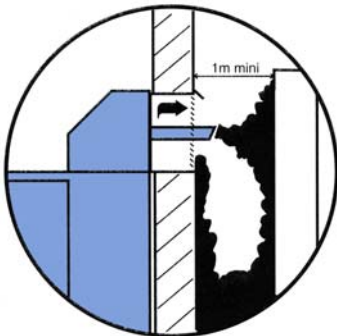
Burnt gas evacuation will take place in such a way that there is no reaspiration into the air filter or cooling system.

The generating set's neutral speed must be used to protect people.

Earthing is carried out using a metal post buried deeply in the ground.

These sets are to be covered or protected from bad weather by a suitable construction (see previous sections).

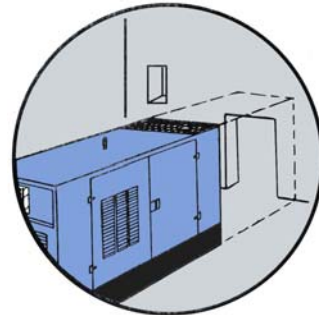
Examples of problems that may be encountered :



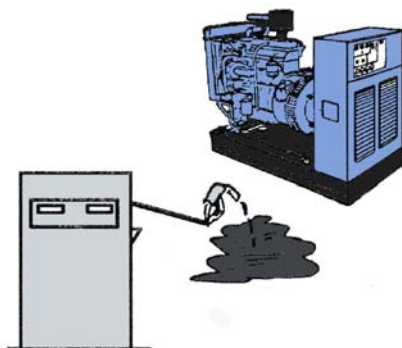
Incorrect exhaust and ventilation



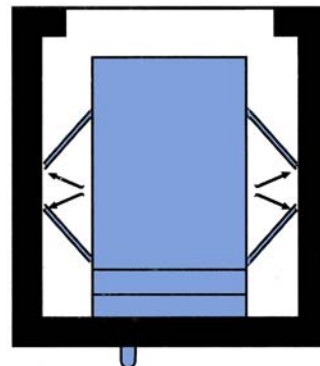
Ground too uneven or soft.
Set incorrectly positioned



Reduced access



Fuel filling impossible



Opening cover doors impossible

4. ROAD TRAILER

4.1 Trailer linkage

Before attaching the trailer, check the trailer hook on the tow vehicle; it should fit the trailer ring perfectly.

WARNING – DANGER

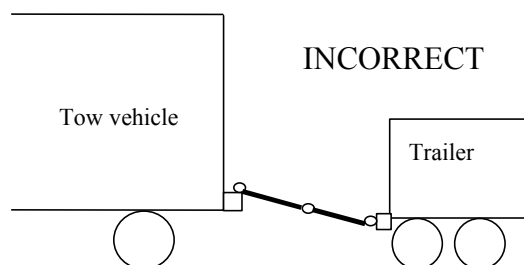
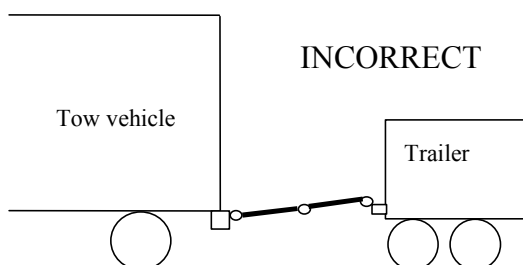
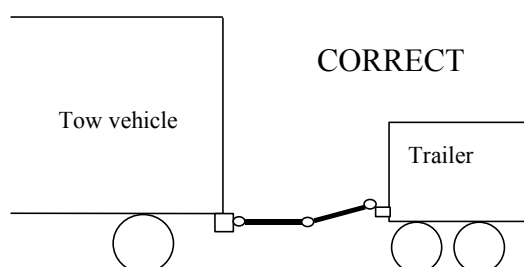
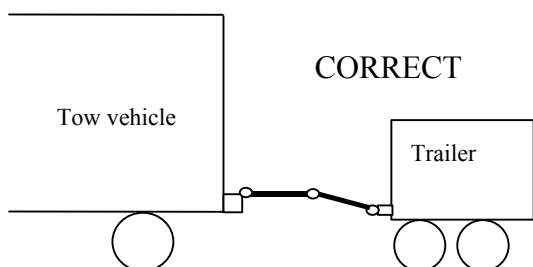
Trying to tow a trailer with a non-matching device (bar, wires, cords, etc.) could lead to serious accidents.

Also check:

- no incipient fractures or excessive wear on the hitching system.
- locking system is operating properly

To hitch the trailer, proceed as follows:

- lock the wheels to stop the trailer from moving
- lift up the rear trailer supports and lock them
- release the parking brake
- release the locking levers for the draw bar arms and adjust the ring to the same height as the vehicle hook
- hitch the trailer, remove the locks on each side of the wheels then lift up the front wheel fully using its handle
- connect the electrical circuit of the trailer to that of the tow vehicle
- hook the handbrake safety wire onto the hook on the tow vehicle.



4.2 Check before towing

Before towing carry out the following checks:

- wheel torquing
- lock trailer hook
- tyre pressure
- light signals working
- cover doors closed
- parking brake off
- front wheels and rear supports lifted.
- tightening and fixing the draw bar arms locking levers
- brake test for "road" type trailers
- fitting brake safety cable.

4.3 Driving

- "On-site" type trailer

These trailers are not fitted with a main brake and so cannot brake when operating; the tyres are designed for a speed of 17 mph (27 Km/h). Therefore, it is absolutely forbidden to exceed this speed .

- "Road" type trailer

The driving speed should be adapted to road conditions and the trailer handling.

Driving at sustained speed causes tyres to heat up; therefore it is important to stop from time to time to check them. Excessive heating can lead to a blow out and hence a serious accident. When reversing, do not forget to lock the overrun brake.

NOTE

Particular attention must be paid to wheel torquing on new vehicles. Indeed, during the first few miles, heat build-ups on the wheel hubs and brake drums lead to reduced wheel torquing. It is therefore essential to check the torquing every 6 miles (10 kilometres) until no further loosening is noted.

The torque test should nevertheless be carried out before towing.

4.4 Unhitching the trailer

This operation should be carried out on horizontal, flat, stable ground.

- lock the wheels
- lower the front wheel
- disconnect the road signals wire
- refit the hitch using the wheel to release the hook ring from the tow vehicle,
- release the tow vehicle
- engage the handbrake.

4.5 Implementation for installation

Procedures to be carried out:

- check that the ground is strong enough for the assembly not to sink into it
- using the front wheel, position the set as horizontally as possible
- engage the handbrake.
- lower the rear trailer supports and lock them

5. BATTERY MAINTENANCE

WARNING – DANGER

- install the battery so that it has the correct ventilation
- never place the battery close to a flame or fire
- use only insulated tools
- never use sulphuric acid or acid water to top up the electrolyte level.

PROCEDURE FOR TESTING STARTER BATTERIES

| TEST TYPE | PROCEDURE | RESULT | ACTION |
|---|--------------------|--|--|
| 1 VISUAL INSPECTION STEP 1 | TRAY AND TERMINALS | CHECK THAT THE TRAY IS NOT BROKEN, THAT THERE IS NO ELECTROLYTE LEAK AND CHECK THE CONDITION OF THE TERMINALS (DAMAGED, BLACK) | DAMAGE NOTED → REPLACE THE BATTERY NO DAMAGE → CHECK THE ELECTROLYTE LEVEL |
| | ELECTROLYTE LEVEL | BELOW THE PRESCRIBED LEVEL | ADD WATER UP TO THE PRESCRIBED LEVEL, CHARGE FOR 4-5 HOURS AT 1/10 OF THE NOMINAL CAPACITY THEN CHECK THE ELECTROLYTE DENSITY (step 2) |
| | | PRESCRIBED LEVEL OK | CHECK THE ELECTROLYTE DENSITY (step 2) |
| | | | |
| 2 ELECTROLYTE DENSITY TEST STEP 2 | | < 1.22 kg/l OR VARIATION ABOVE 50 g/l BETWEEN CELLS | REPLACE THE BATTERY |
| | | RECHARGE THE BATTERY FULLY | |
| | | > 1.22 kg/l | CARRY OUT QUICK ELECTRICAL PERFORMANCE TESTS (step 3) |
| | | | |
| 3 TEST OF QUICK ELECTRICAL PERFORMANCES STEP 3 | | CHECK THE BATTERY USING A MIDTRONICS, WEGA OR SIMILAR TYPE OF TESTER | THE TESTER GIVES A POSITIVE RESULT → FIT TO OPERATE THE TESTER GIVES A NEGATIVE RESULT → REPLACE THE BATTERY |
| | | | |
| | | | |
| | | | |

6. FUEL AND CONSUMABLES

All specifications (product features) are given in the engine and alternator maintenance manuals attached to this manual.

6.1 Circuit capacities – Mitsubishi engines

| Engines CIRCUIT AND TANK CAPACITY | S4L2-SD (series SL) | S4Q2 (series SQ) | S4S (series SS) | |
|--|----------------------------|---------------------|--------------------|------|
| | MODEL | G 16 | G 22 | G 33 |
| | LUBRICATION (in litres) | 5.4 | 5.5 | 10 |
| | COOLING (in litres) | 4.9 | 8.1 | 8.9 |
| | FUEL (in litres) | 100 | 100 | 100 |

6.2 Circuit capacities – john Deere engines

| Engines CIRCUIT AND TANK CAPACITY | 3029TF120 | 4045TF120 | 4045HF120 | 6068TF220 | 6068HF120 (153kW@1500rpm) | 6068HF160 (183kW@1500rpm) |
|--|-----------|--------------|-----------|-----------|------------------------------|------------------------------|
| MODEL | G 44 | G 66 G 77 | G 110 | G 130 | G 160 | G 200 |
| LUBRICATION (in litres) | 6 | 13.5 | 13.5 | 21.5 | 21.5 | 31.5 |
| COOLING (in litres) | 16.1 | 23.6 | 20.2 | 27.3 | 25.8 | 25.8 |
| FUEL (in litres) | 100 | 175 | 200 | 410 | 410 | 410 |

6.3 Circuit capacities – Volvo engines

| | | | | | |
|---------------------------------|---------|---------|----------|----------|----------|
| ENGINES | | | | | |
| CIRCUIT AND TANK CAPACITY | TWD 740 | TAD 740 | TAD 1032 | TAD 1242 | TAD 1631 |
| MODEL | G 220 | G 270 | G 330 | G 440 | G 550 |
| LUBRICATION (in litres) | 29 | 29 | 36 | 35 | 64 |
| COOLING (in litres) | 41.9 | 36.9 | 37.3 | 44 | 64 |
| FUEL (in litres) | 350 | 700 | 700 | 800 | 800 |

Instructions for use

M 50
M150
A50
X200
INS / ATS

Réf. constructeur :

Réf. GPAO : 33502013301

SAFETY SYMBOLS



Caution : danger



Caution, refer to the publications supplied with the Genset



Caution : risk of electric shock



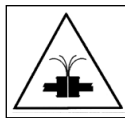
Protective clothing required.



Caution : toxic substances



Eye and hearings protection necessary



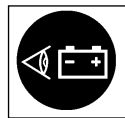
Caution : pressuried fluids



Periodic maintenance required



Caution : high temperature (risk of burning)



Check battery charge



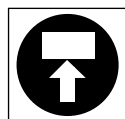
Caution : rotating or moving parts (risk of entanglement)



Recommended Lifting point



Caution : risk of corrosion



Fork lift stacking point



Caution : risk of explosion



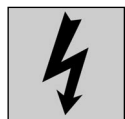
Naked flame and non protected lightning forbidden, no smoking



Authorised personnel only



Do not use water based fire extinguishers



Power



Trailer : link up the earth before starting the generator



Earth

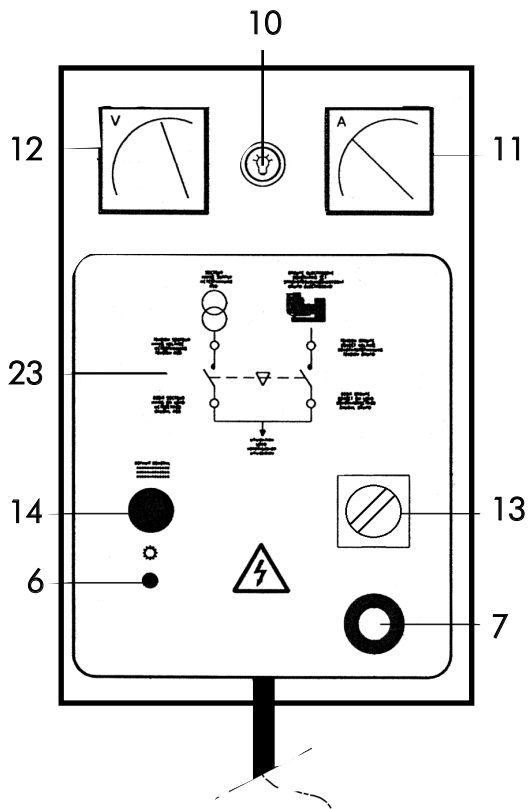


Emergency stop

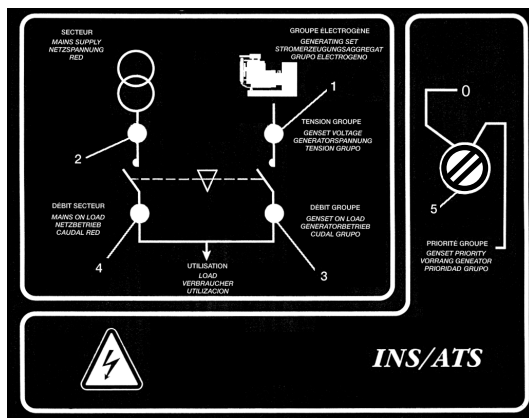
MACHINERY DIRECTIVE 98/37/EC INSTRUCTION FOR GENERATING SETS

- Access prohibited to unauthorized personnel
- Live installation, potential automatic starting.

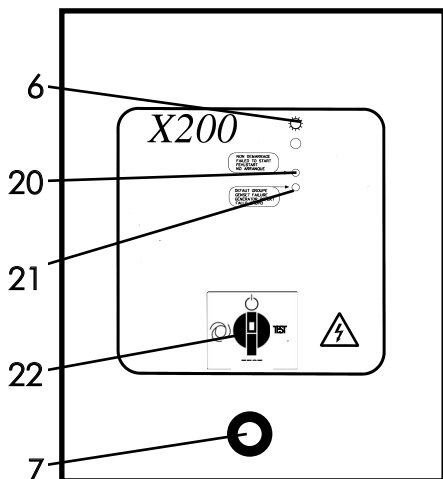
A50



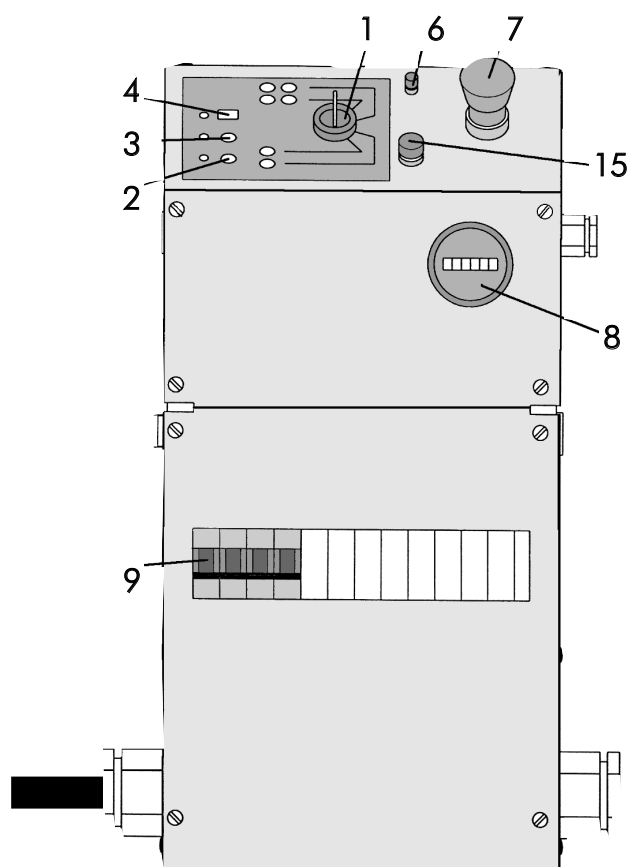
INS/ATS



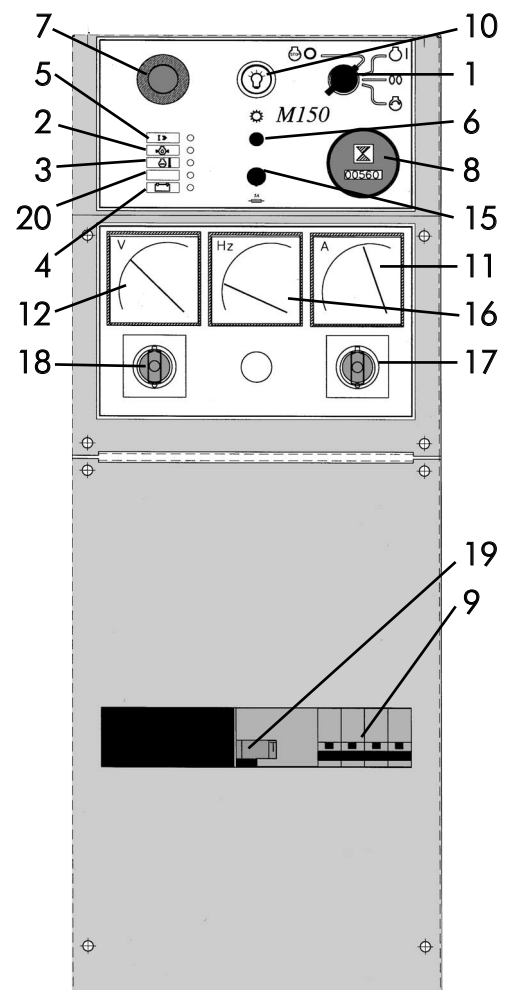
X200



M50






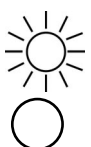


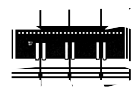

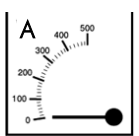


M150



A – DESCRIPTION

The manual control panels and the automatic control boxes are equipped with various switchgear and standard indicators. The following figures define the functions of the different switchgear.

- 1  M50 - STARTING AND STOPPING KEY:
M150
- 2  - OIL PRESSURE WARNING LIGHT (M50-M150):
- 3  - COOLING SYSTEM WARNING LIGHT (M50-M150):
- 4  - VOLTAGE AND CHARGING ALTERNATOR EXCITATION WARNING LIGHT (M50-M150):
- 5  - «OVERCHARGE» WARNING LIGHT (M150):
- 6  - WARNING LIGHTS TEST (M150-A50-X200):
- 7  - EMERGENCY STOP PUSH BUTTON:
- 8  - HOURMETER (M50-M150):
- 9  - CIRCUIT BREAKER (M50 - M150):
- 10  - RACK LIGHTING (A50-M150):
- 11  - AMMETER (M50-M150):

The key has 4 positions :

⊖ :Position of the key when the generator set is not running. It also allows it to be stopped and the clearing of faults.

⊖ I :In this position, the electrical circuit of the generator set is energised (the fuel solenoid valve is energised). The battery charge warning light is on. The battery indicators and voltmeter are energised and indicate the state of the different organs under control.

⊖ II :Certain engines are equipped with cold weather starting aids. The key held on this position for 5 to 20 seconds is necessary before starting.

⊖ III :In this position, the starter is activated ; it turns the motor at a speed allowing starting.

Normally off during running of the generator set, this warning light comes on in the case of an abnormal drop in oil pressure. It indicates an operating incident like lack of oil, a fault with the lubricating system, etc. This fault stops the generating set instantly.

⚠ (The warning light can come on furtively during starting of the generator set.)

Normally off during running of the generator set, this warning light comes on in case of an abnormal rise in engine temperature. It indicates an operating incident like disturbance of airflow, etc. This fault stops the generator set instantly.

Normally off, this warning light comes on in case of a charging incident with the battery(ies) during running of the generator set. For generator sets equipped with a charging alternator, it highlights a fault in the system. This fault does not stop the generator set. During starting of the generator set, this warning light goes off as soon as the alternator has reached an excitation speed of 400 rpm..

Normally off, this warning light comes on when the circuit breaker has disconnected on an overcharge or a short circuit, so freeing the generator from its charge. When this fault arises, it is necessary to limit the charge on disconnecting some appliances or by eliminating the short circuit then re-closing the circuit breaker.

⚠ Trip time user adjustable.

By activating the push button, the warning lights which are normally off light up and signal that they are functioning (except for the battery charge light). The warning light test is always active on the A50 and is active only on position : « ⊖ I » of the X200 operating selection switch.« ⊖ I » of the M50 and M150 starting and stopping switch.

To be pressed in the event of an accident or incident, it instantly stops the running of the generator set and should be unlocked when put back into service.

⚠ : Type push/pull or push/turn

It totals the number of generator set running hours as soon as the starting key is in the « ⊖ I » position.

It interrupts output to the installations in the case of a short circuit or an overcharge or manual activation. In the «ON» position, the power circuit is closed and the generator can supply the installations.

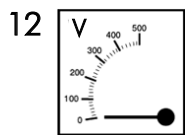
This lights up (if no fault present) :

-the front of box A50 when the operating selection switch is in the auto position and if the order to start is present.

-The front of console M150, when the key is on « ⊖ I ».

It indicates the intensity in amps on a phase.

It indicates the power in Volts supplied by the generator set.



- VOLTAGE METER (A50-M150):

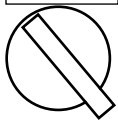


- OPERATING SELECTION SWITCH (A50):

It allows selection of the operating mode :

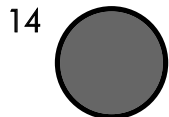
-STOP : manual operation from the console M50

-AUTO : automatic operation on external order or lack of mains supply.



- GENERAL FAULT WARNING LIGHT (A50):

Normally off, this light comes on in case of a fault immobilising the generator set.



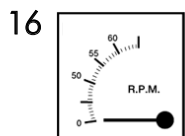
- FUSE (M150):

It protects the remote control circuit against eventual short circuits.



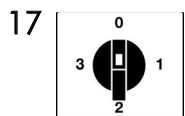
- FREQUENCY METER (M150):

It indicates the frequency in Hertz of the electrical current supplied by the generator set.



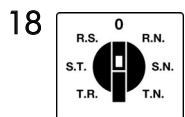
- AMMETER SWITCH (M150):

Its different positions allow reading of the amperage of the current produced by each phase.



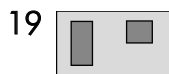
- VOLTAGE SWITCH (M150):

Its different positions allow reading of the voltage on the voltmeter between each phase or between phase and neutral.



- DIFFERENTIAL:

It ensures the safety of people (adjustment 30 mA instantaneous). The neutral rating of the installation should be TT Rating (an adjustment becomes necessary if an adjustable differential relay is used on option).



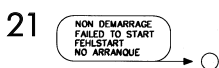
- OPTIONAL WARNING LIGHTS (M150):

These warning lights, normally off, are available for different optional functions.



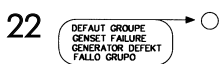
- FAILED TO START WARNING LIGHT (X200):

Normally off, this light comes on, in the case of an operational fault of the generator set.



- GENERATOR FAULT WARNING LIGHT (X200):

Normally off, this warning light comes on in case of the presence of an operating fault with the generator.



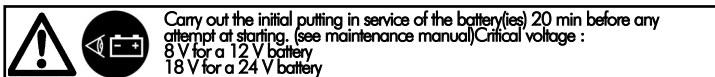
- OPERATING SELECTION SWITCH (X200):

The switch has 3 positions :

⏏ : In this position, the generator set will not start in the event of a mains power cut. The preheating resistance is still energised.

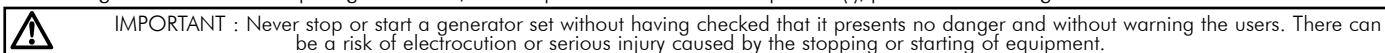
TEST : This operating mode is used for maintenance of the generator set (see manual starting switch).

⏻ : In this operating mode, the generator set is ready to start in the event of a mains power cut and/or an external order. Starting is regulated by a time delay to avoid starting on micro mains power cuts.



B – USE

After having carried out the initial putting into service, and the preventive maintenance operation(s), proceed with starting as follows :



I – M50 AND M150


A) STARTING

- Check that there is no danger of output to installations. I.E. : bare cables in contact, personnel carrying out work on electrical equipment connected to the generator, etc.
- Check that battery voltage is good and that the fuel level is sufficient.
- M50 : Open the circuit breaker in order not to have output to installations.
- M150 : Relieve the equipment without opening the circuit breaker (manual opening of the circuit breaker provokes a fault).
- Turn the switch key clockwise to position « ⏏ ».
- Check that the presence of voltage warning light and excitation of the charging alternator is on.
- Keep turning the key to position « ⏻ » (engine equipped with a starting aid). Remain in this position for 5 to 20 seconds depending on ambient temperature. The lower the temperature, the longer the preheating time (some engines are not equipped with preheating).
- Turn the key to position « ⏻ » and release it as soon as the engine starts ; it automatically returns to the « ⏏ » position.


- Let the generator set run empty for several minutes depending on the ambient temperature.
- M50 : Close the circuit breaker.
- From this moment the generator set is outputting to the installations.

B) NORMAL OPERATION

- During operation of the generator set, carry out a regular inspection to ensure there are no anomalies.
- Do not overload the generator set, its power is indicated on the manufacturer's plate. Any overloading could provoke an incident in the short term.

 Operating empty or on low charge is not advised. In case of doubt, consult our after sales service or our agents.

C) NORMAL STOPPING



- M50 : Open the circuit breaker and let it run empty for 3 minutes.
- M150 : Relieve the installation (manual opening of the circuit breaker provokes immediate stopping of the engine, with indication from the overcharging warning light) and let it run empty for 3 minutes.*
- Stop the generator set by turning the key to the «» position.

D) EMERGENCY STOPPING

- Press the emergency stop push button in the event of an accident or incident. The engine will stop instantly.


 Do not forget to unlock the emergency stop push button when putting back in service.


E) CLEARING FAULTS

- Note the signalled fault and turn the starter switch to «».
- Make repairs and start up in «» mode to check for correct operation.

II – A50 (connected to M50)

A) AUTOMATIC START «AUTO»

- Check that battery charge state is good and that the level of fuel is sufficient.
- Place the starting and stopping switch of the M50 in the «» position.
- Close the M50 circuit breaker.

-  If the circuit breaker closes during operation of the generator set, a general fault will be signalled after 30 seconds (stopping of generator).
- Place the operating selection switch in the «**AUTO**» (A50) position.
- In this position, the generator set is ready to start on shutting down of mains (single phase detection) or on external order. (clock, automaton, etc...).
- Check that the panel light warning light is on with the A50.

B) NORMAL STOPPING «STOP»

This position allows stopping of the generator set and the operation of the INS/ATS system and returning to mains supply.
N.B. : the switch on the mains side will only close if mains power is present again.

C) EMERGENCY STOPPING

- Press the emergency stop push button in the event of an accident or incident. The engine will stop instantly.


 Do not forget to unlock the emergency stop push button when putting back in service.



D) RESTARTING AFTER STOPPING FOR A FAULT

- Note the fault and turn the operating selection switch to «**STOP**».
- Make repairs and start with the starting key of the M50.
- Then replace the operating selection switch to «**AUTO**» (A50).

III – X200 (connected to the M150).

A) AUTOMATIC STARTING «»

- Check that battery charge state is good and that the level of fuel is sufficient.
- Place the starting and stopping switch of the M150 in the «» position.
- Close the M150 circuit breaker.

-  If the circuit breaker closes during operation of the generator set, a general fault will be signalled immediately.
- Place the operation selection switch in the «» position.
- In this position, the generator set is ready to start on shutting down of mains (mains detection) (three phase optional) or on external order. (clock, automaton, etc...).
- On starting check that the presence of mains voltage warning light is on with the M150.

B) OPERATION IN TEST MODE «TEST»

This mode of operation is used for simulating a lack of mains or an external order.

- Place the operating switch in the «**TEST**» position.
- The generator set will start automatically after the preheating plug has had time to operate. (If the preheating plug has been configured on the automatics board).

C) STOP «»



This position allows stopping of the generator set and the operation of the ins/ats system and to return to mains supply.
N.B. : the switch on the «mains» side will only close if mains supply is present again.

D) EMERGENCY STOPPING

- Press the emergency stop push button in the event of an accident or incident. The engine will stop instantly.

 Do not forget to unlock the emergency stop push button when putting back in service.

E) RESTARTING AFTER STOPPING FOR A FAULT

- Note the fault and turn the operating selection switch to «».
- Make repairs and start with the starting key of the M150.
- Then replace the operating selection switch to «».

V – REVERSER OF NORMAL/EMERGENCY SOURCES INS/ATS :

The reverser of normal / emergency sources allows the installation to be supplied by the generator set as soon as mains supply disappears. The synoptic allows the display of the presence of mains and generator voltage as well as mains generator output.

Coupled with the M2/3, it allows also, during a mains breakdown, to select a priority generator (see 5).

1 – Presence of generator voltage warning light (White) :

This warning light, when it is on, signals the operation and the presence of voltage from the generator set, which is ready to supply to the installations.

2 – Presence of mains voltage warning light (White) :

This warning light, when it is on, signals the presence of mains voltage.

3 – Generator output warning light (green) :

This warning light, when it is on, signals the closed position of the emergency contactor, therefore output is possible to the installations.

4 – Mains output warning light (green) :

This warning light, when it is on, signals the closed position of the normal contactor, therefore output is possible from the mains to the installation.

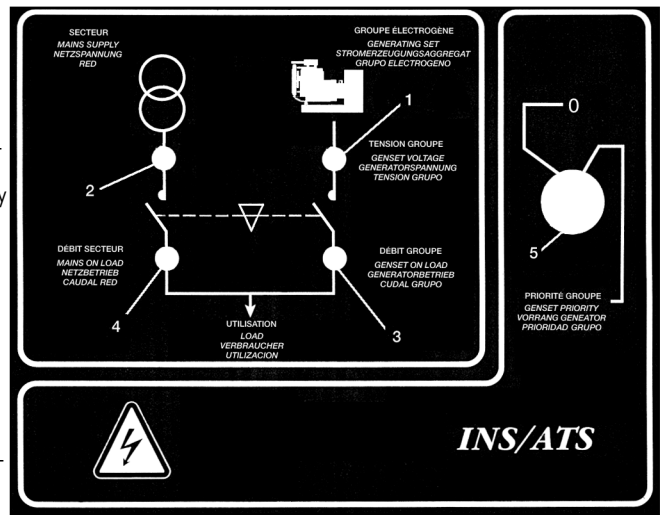
5 – Key switch :

This switch allows the selection of 2 modes :

- In the position «priority generator», to force the operation and the output of the generator set to the installations, and that, despite the return of the presence of mains voltage.

i.e. : This manoeuvre is used in the case of frequent and inopportune mains power cuts.

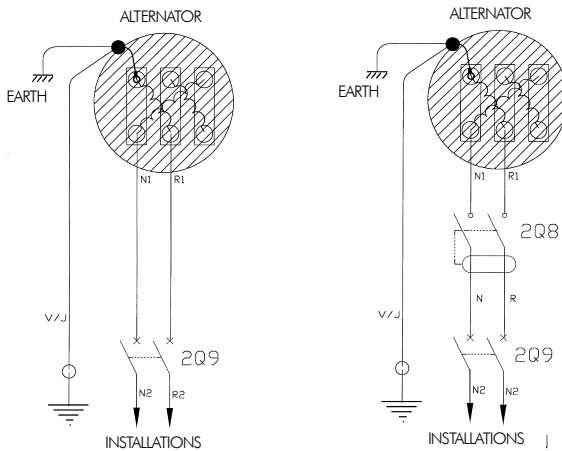
- In the «O» position the output is cut and the operation of the generating set is stopped as soon as mains voltage is restored.



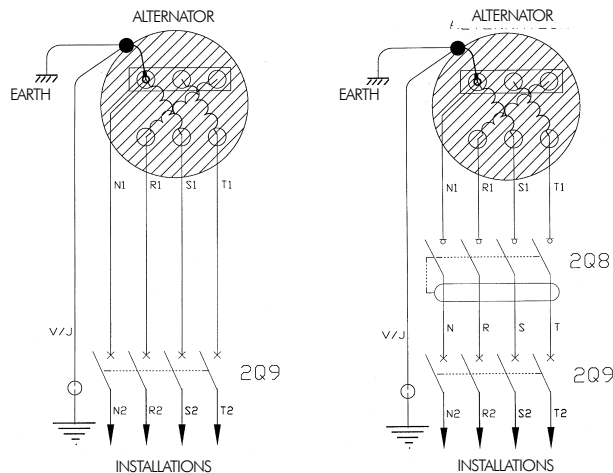
C) M50 WIRING DIAGRAM

I – POWER

SINGLE PHASE – TNS RATING SINGLE PHASE – TT RATING



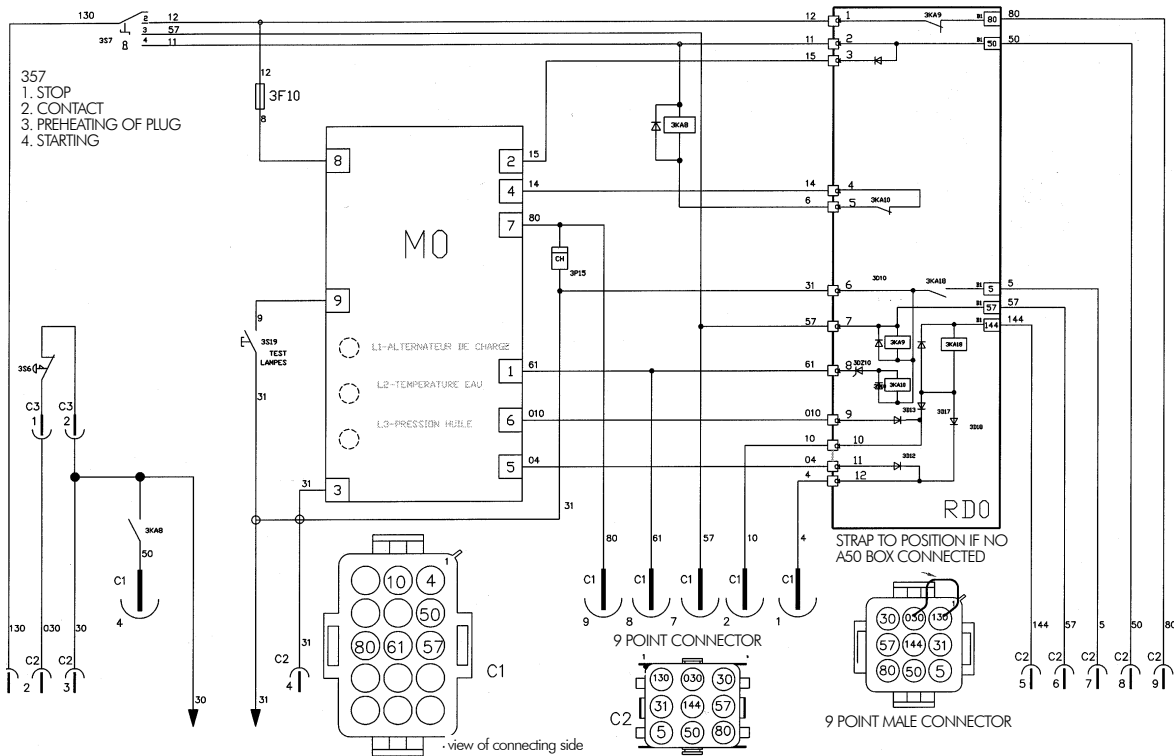
THREE PHASE – TNS RATING THREE PHASE – TT RATING



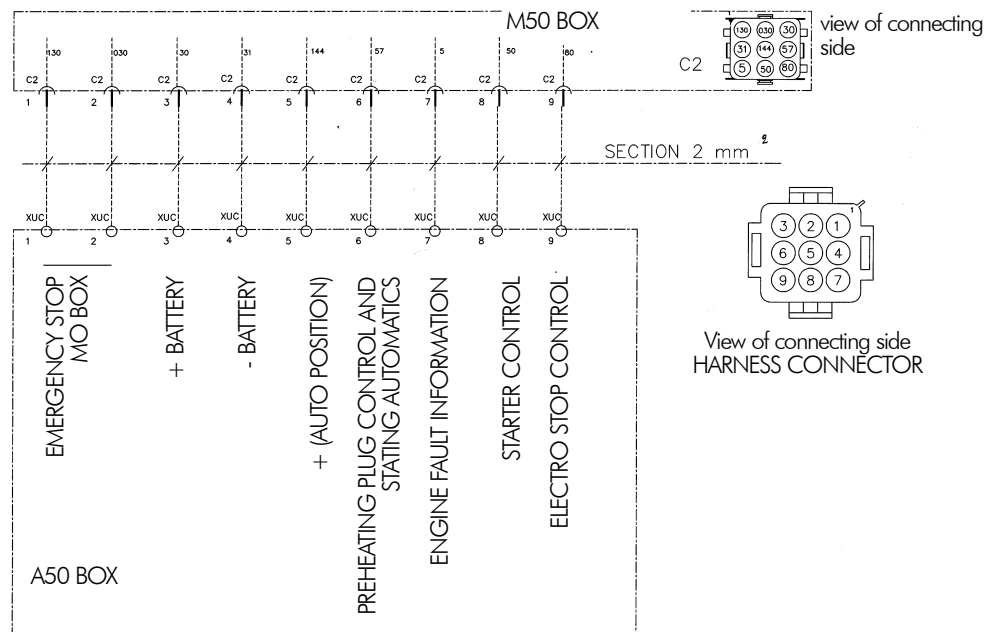
| MARK | DESCRIPTION | REFERENCE |
|------|----------------------------|-------------|
| 209 | CIRCUIT BREAKER 2 X 20A | 31613020703 |
| | CIRCUIT BREAKER 2 X 25A | 31613020704 |
| | CIRCUIT BREAKER 2 X 32A | 31613020705 |
| | CIRCUIT BREAKER 2 X 40A | 31613020706 |
| | CIRCUIT BREAKER 2 X 50A | 31613020707 |
| | CIRCUIT BREAKER 2 X 63A | 31613020708 |
| | CIRCUIT BREAKER 2 X 80A | 31613020709 |
| | CIRCUIT BREAKER 2 X 100A | 31613020710 |
| 208 | INTER-DIF 2 x 25A - 30mA | 31613043001 |
| | INTER-DIF 2 x 25A - 300mA | 31613061601 |
| | INTER-DIF 2 x 40A - 30mA | 31613043101 |
| | INTER-DIF 2 x 40A - 300mA | 31613021701 |
| | INTER-DIF 2 x 63A - 30mA | 31613043201 |
| | INTER-DIF 2 x 63A - 300mA | 31613061801 |
| | INTER-DIF 2 x 100A - 30mA | 31613043302 |
| | INTER-DIF 2 x 100A - 300mA | 31613061901 |

| MARK | DESCRIPTION | REFERENCE |
|------|----------------------------|-------------|
| 209 | CIRCUIT BREAKER 4 X 10A | 31613020711 |
| | CIRCUIT BREAKER 4 X 16A | 31613020712 |
| | CIRCUIT BREAKER 4 X 20A | 31613020713 |
| | CIRCUIT BREAKER 4 X 25A | 31613020714 |
| | CIRCUIT BREAKER 4 X 32A | 31613020715 |
| | CIRCUIT BREAKER 4 X 40A | 31613020716 |
| | CIRCUIT BREAKER 4 X 50A | 31613020717 |
| | CIRCUIT BREAKER 4 X 63A | 31613020718 |
| | CIRCUIT BREAKER 4 X 80A | 31613020719 |
| | CIRCUIT BREAKER 4 X 100A | 31613020720 |
| 208 | CIRCUIT BREAKER 4 X 125A | 31613020721 |
| | INTER-DIF 4 x 25A - 30mA | 31613043401 |
| | INTER-DIF 4 x 25A - 300mA | 31613062001 |
| | INTER-DIF 4 x 40A - 30mA | 31613043501 |
| | INTER-DIF 4 x 40A - 300mA | 31613062101 |
| | INTER-DIF 4 x 63A - 30mA | 31613043601 |
| | INTER-DIF 4 x 63A - 300mA | 31613062201 |
| | INTER-DIF 4 x 100A - 30mA | |
| | INTER-DIF 4 x 100A - 300mA | 31613043701 |
| | INTER-DIF 4 x 125A - 30mA | |
| | INTER-DIF 4 x 125A - 300mA | 31613050701 |

II - AUTOMATICS



III – TERMINAL BLOCK A50 CABINET



IV - NOMENCLATURE

| MARK | DESCRIPTION | Qty | REFERENCE |
|------|------------------------------------|-----|---------------|
| RDO | RELAY BOARD 12VCC | 1 | 3163044701 |
| MO | SAFETY CARD 12VCC | 1 | 3163003801 |
| 3S7 | STARTING SWITCH | 1 | 30702001301NE |
| 3KA8 | RELAYS 12VCC / 30A AUTOMOBILE TYPE | 1 | 3163014401 |
| | RELAY SOCKET | 1 | 3163055901 |
| 3P15 | HOURLMETER 12VCC | 1 | 3163042801 |
| 3S6 | EMERGENCY STOP BUTTON | 1 | 3163042701 |
| 3S19 | LIGHTS TEST BUTTON | 1 | 3163042901 |
| 3F10 | CUT-OUT 5 X 20 – MOUNTED ON PANEL | 1 | 3163004001 |
| | FUSE CARTRIDGE 5X20 - 5A | 1 | 3163004101 |
| C1 | MALE CONNECTOR – 15 WAY | 1 | 3163060101 |
| C2 | FEMALE CONNECTOR – 9 WAY | 1 | 3163057201 |
| C2 | MALE CONNECTOR – 9 WAY | 1 | 3163057301 |
| C3 | FEMALE CONNECTOR – 2 WAY | 1 | 163048501 |
| C3 | MALE CONNECTOR – 2 WAY | 1 | 3163048601 |

V - WIRING


| | | |
|--|---------|--|
| CIRCUIT POWER | NEUTRAL | COLOUR LIGHT BLUE |
| | PHASE 1 | BROWN |
| | PHASE 2 | BLACK |
| | PHASE 3 | BLACK |
| ALTERNATING REMOTE CONTROL | NEUTRAL | COLOUR LIGHT BLUE |
| | PHASE 1 | BROWN |
| | PHASE 2 | BLACK |
| | PHASE 3 | BLACK |
| INSULATED ALTERNATING REMOTE CONTROL CIRCUITS NOT CUT-OFF BY BREAKING DEVICE | | BLACK COLOUR IDENTICAL TO DOWN-STREAM CIRCUIT OF THE SWITCH + PREVENTION LABEL |
| DIRECT REMOTE CONTROL | MINUS | BLUE |
| | PLUS | RED |
| EXCITATION OF CHARGING ALTERNATOR TRANSMITTER SIGNAL INTENSIVE CIRCUIT | | RED BLUE ORANGE |

D) WIRING DIAGRAM M150-A50-X200-INS/ATS

SCHEMA ELECTRIQUE
ELECTRICAL DRAWING
ESQUEMA ELECTRICO
ESQUEMA ELECTRICO

M150

<=125A

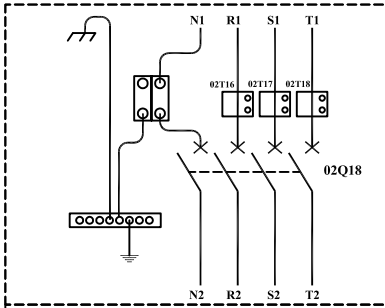
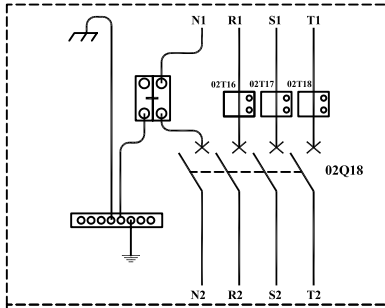
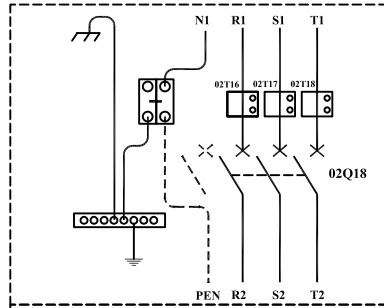
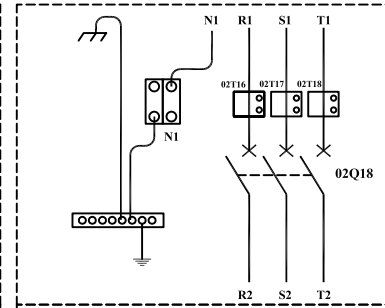
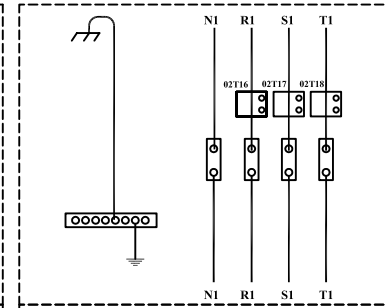
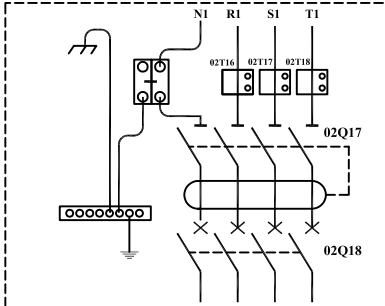
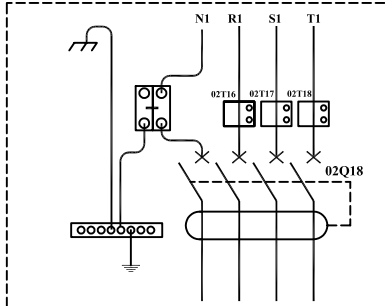
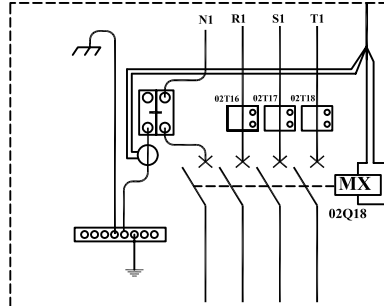
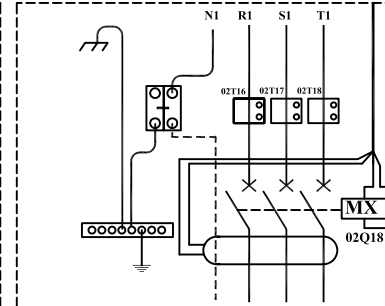
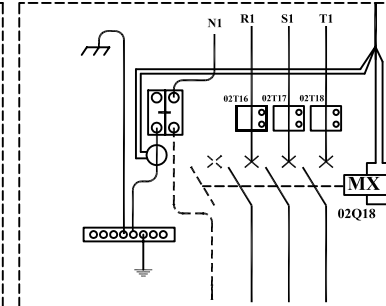
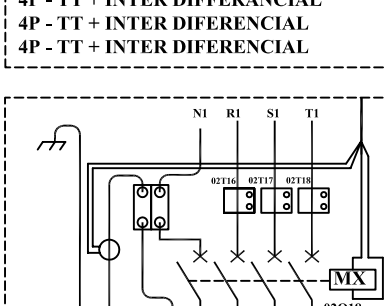
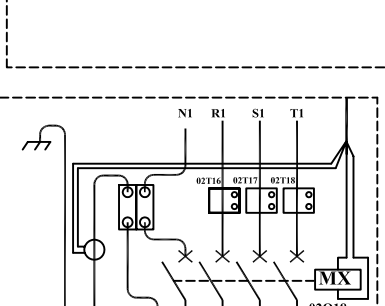
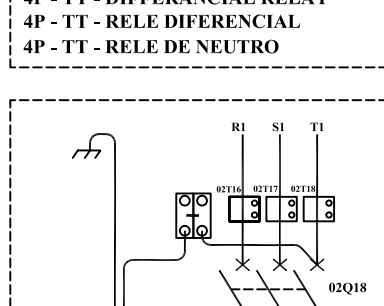
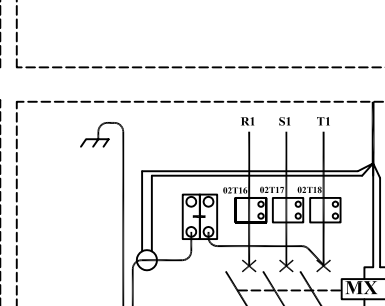
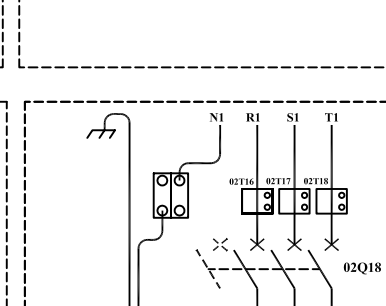
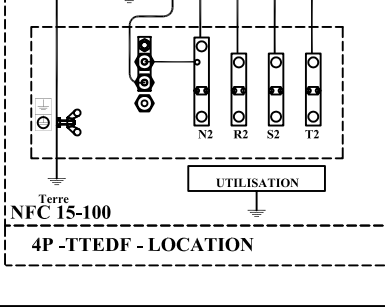
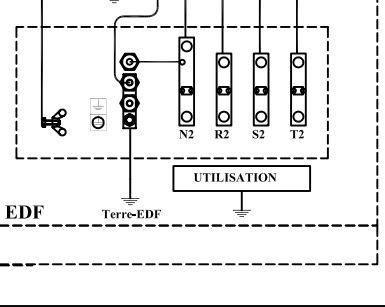
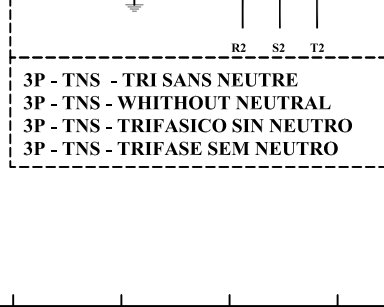
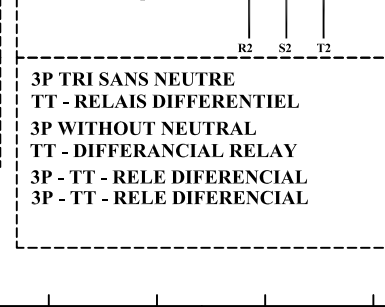
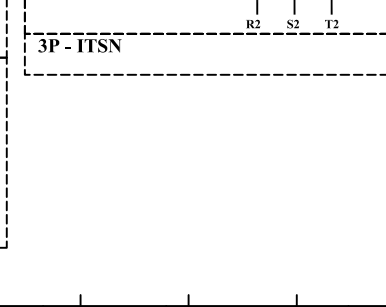
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|--|---|----------|---------------|--------------------------|---|
| | | | | | |
| B | EVOLUTION...02/10G-02/11F-11/02B-26/01C-26/02C-26/02G44C-26/04C-25/05C-26/06C-26/06G44C-26/08C-26/09C-26/09G44C | 14/04/03 | BG | 14/04/03 | BG |
| A | FIRST ISSUE | 19-09-02 | BERGOT Gilles | 19-11-02 | BERGOT Gilles |
| IND. | DESIGNATION DE LA MODIFICATION | DATE | VISA | DATE | VISA |
| | | DESSINE | | VERIFIE | |
| MATIERE : | | | | FORMAT : 4 | |
| REVETEMENT : | | | | ECHELLE : 1 | |
| TOLERANCE : JS13/Js13 sauf Indication Particulière | | | | FOLIO : | |
| DESIGNATION : ELECTRICAL DRAWING PEDESTAL M150 <= 125A INGERSOLL-RAND | | | | MASSE (Vide/Plein) kg | |
| 33513001701 | | | | |  |
| 12 bis, rue de la Villeneuve 29272 BREST - Tel : 02.98.41.41.41 - Telex : 940757F - Telecopie : 02.98.41.63.07 CE PLAN EST LA PROPRIETE DE LA SOCIETE ; IL NE PEUT ETRE REPRODUIT , UTILISE OU COMMUNIQUE SANS SON AUTORISATION | | | | | |

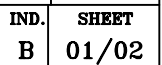
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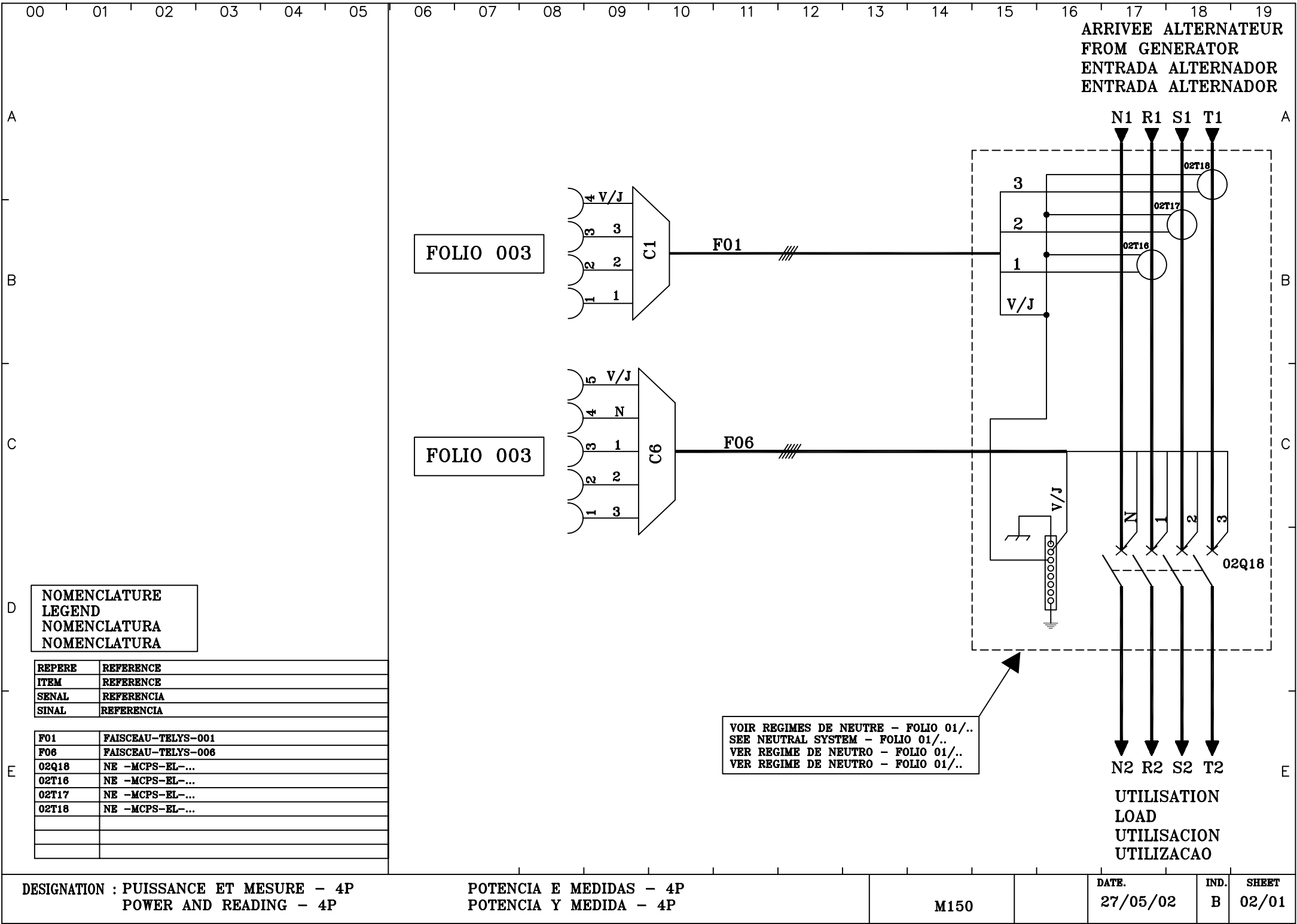
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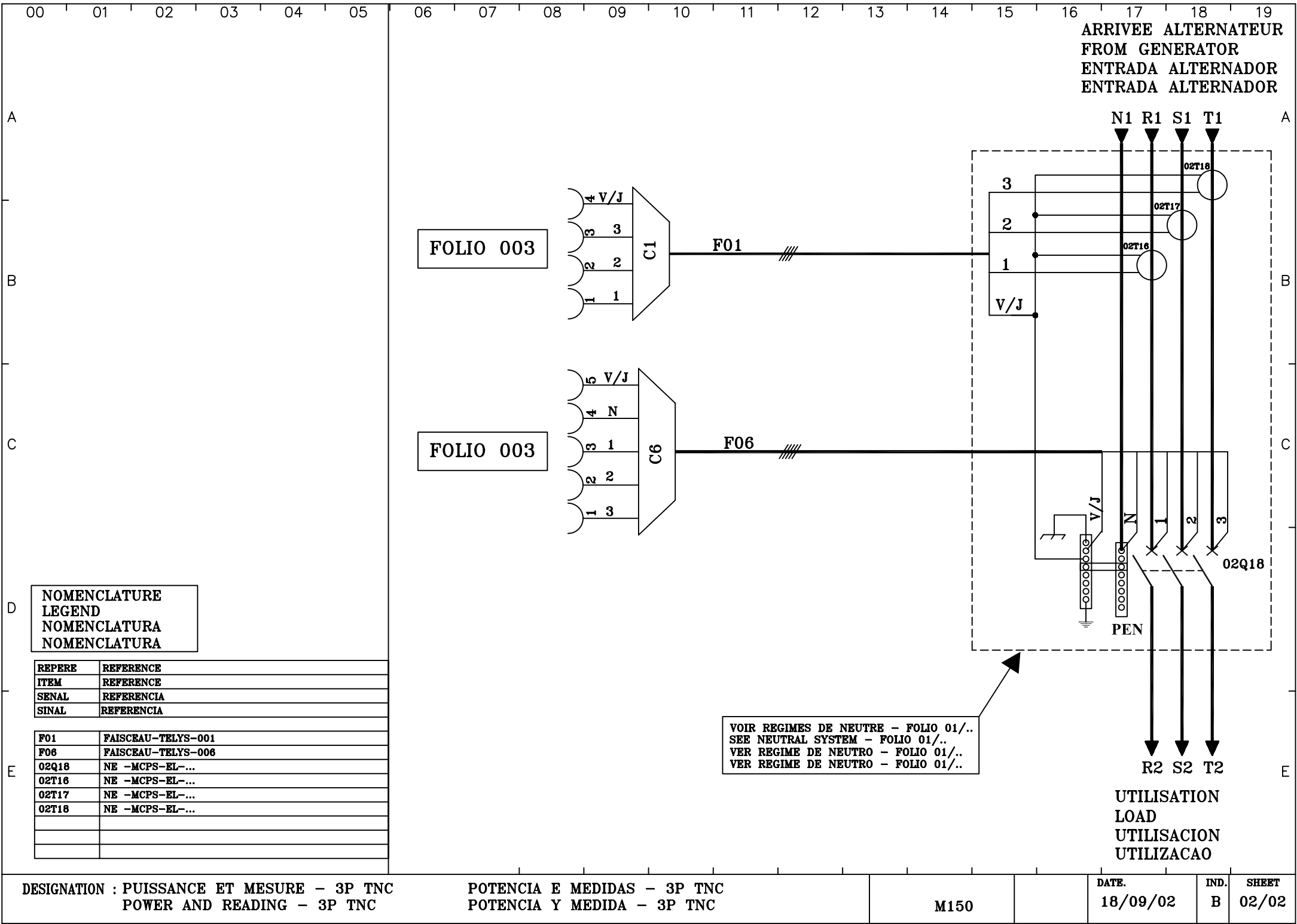
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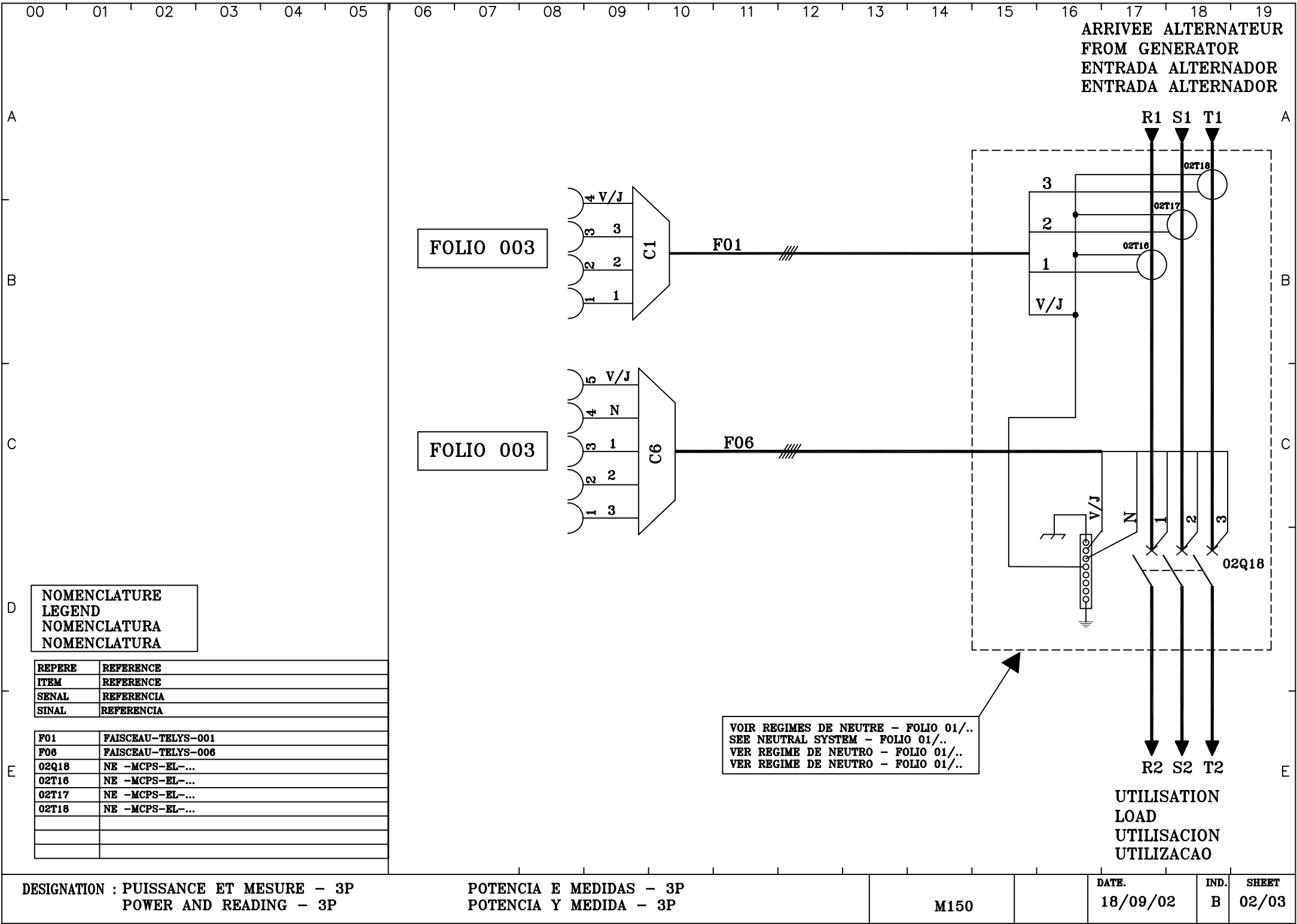
EE |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|----|--------------------|---|----|----|------------|---|--|----|------------------|---|----|----|----|---|----|----|---------|---|-------------------|--|-----------|--|----------------|--|
| | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | | | | | | | |
| A |  | | | |  | | | |  | | | |  | | | |  | | | | A | | | | | | |
| B |  | | | |  | | | |  | | | |  | | | |  | | | | B | | | | | | |
| C | <p>4P - TT + INTER DIFFERENTIEL 4P - TT + INTER DIFFERENCIAL 4P - TT + INTER DIFERENCIAL 4P - TT + INTER DIFERENCIAL</p> | | | | <p>4P - TT + VIGI</p> | | | | <p>4P - TT - RELAIS DIFFERENTIEL 4P - TT - DIFFERENCIAL RELAY 4P - TT - RELE DIFERENCIAL 4P - TT - RELE DE NEUTRO</p> | | | | <p>3P - TNC - RESTRICTED</p> | | | | <p>3P -TNC UNRESTRICTED</p> | | | | C | | | | | | |
| D |  | | | |  | | | |  | | | |  | | | |  | | | | D | | | | | | |
| E |  | | | |  | | | |  | | | |  | | | |  | | | | E | | | | | | |
| <p>Terre NFC 15-100</p> | | | | <p>UTILISATION</p> | | | | <p>EDF</p> | | | | <p>Terre-EDF</p> | | | | | | | | | | | | | | | |
| <p>4P -TTEDF - LOCATION</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DESIGNATION : NEUTRAL.SYSTEM..3P/4P REGIME.DE.NEUTRE..3P/4P | | | | | | | | | | REGIME.DE.NEUTRO..3P/4P REGIME.DE.NEUTRO..3P/4P | | | | | | | | | | <= 125A | | DATE. 18/09/02 | | IND. B | | SHEET 01/01 | |



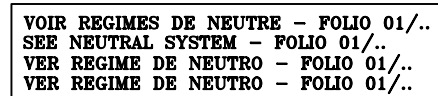






N1 R1 S1 A

A red line starts horizontally from the left, then turns diagonally down and to the right. A dashed rectangular box is drawn around the lower part of this line. Inside the box, there is a wavy line and the number 3.



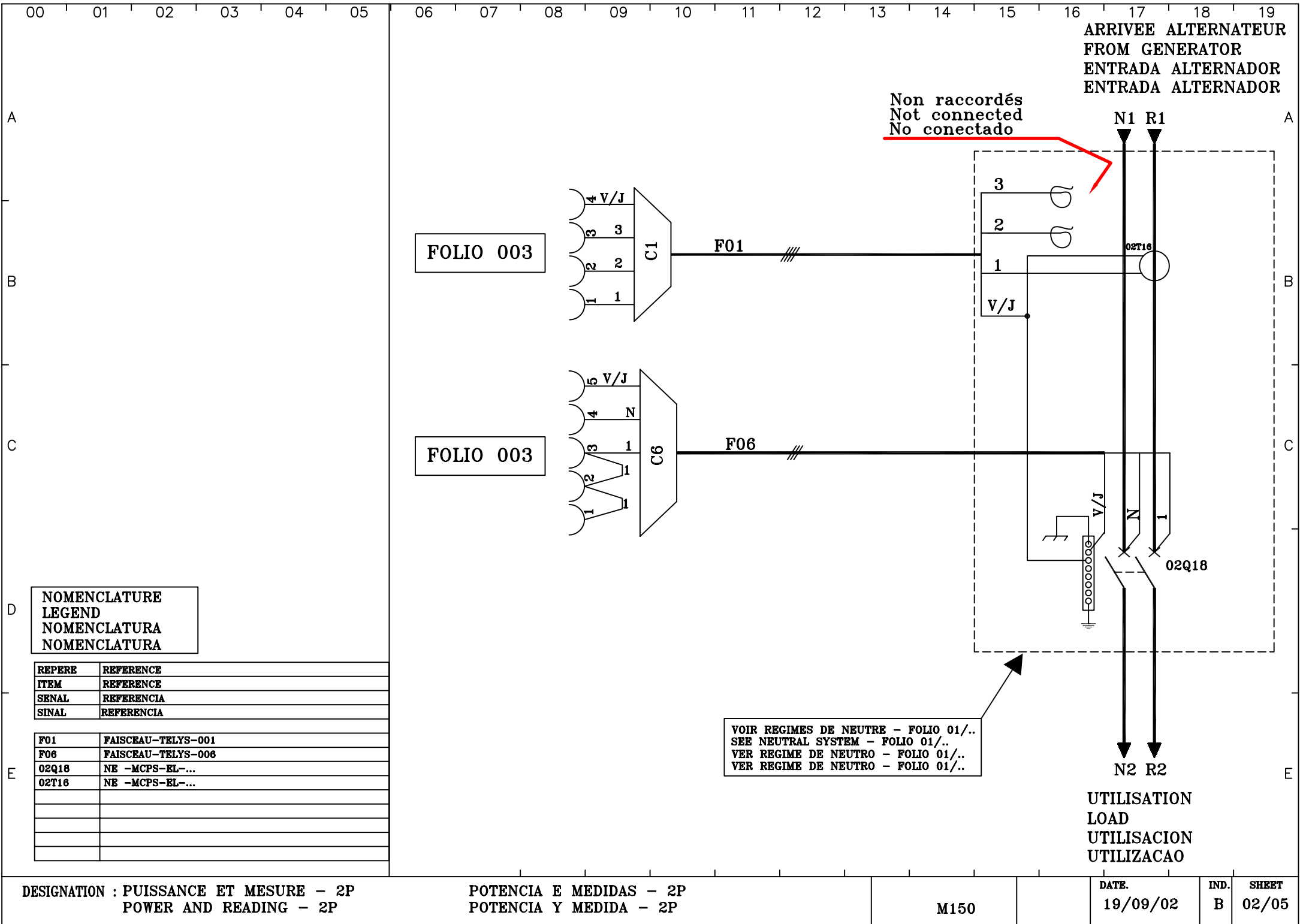
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| DATE. | IND. |
| 18/09/02 | B |

| REPERE | REFERENCE |
|--------|--------------------|
| ITEM | REFERENCE |
| SENAL | REFERENCIA |
| SINAL | REFERENCIA |
| F01 | FAISCEAU-TELYS-001 |
| F06 | FAISCEAU-TELYS-006 |
| 02Q18 | NE -MCPS-EL-... |
| 02T16 | NE -MCPS-EL-... |
| 02T17 | NE -MCPS-EL-... |
| | |
| | |
| | |

POTENCIA E MEDIDAS - BI TNC
 POTENCIA Y MEDIDA - BI TNC

| | |
|-------|----------|
| DATE. | 18/09/02 |
|-------|----------|

| | |
|------|-------|
| IND. | SHEET |
| B | 02/04 |



E

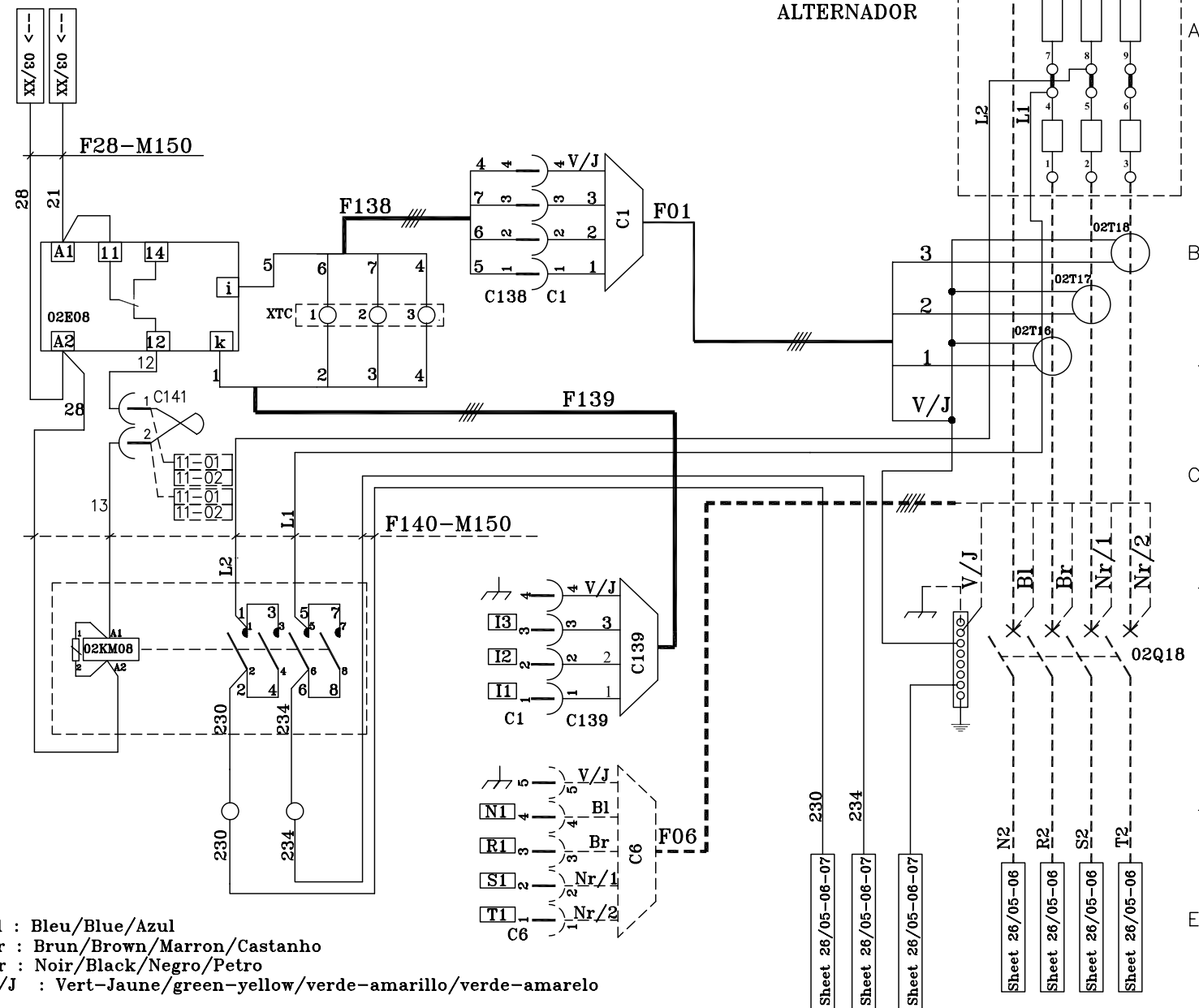


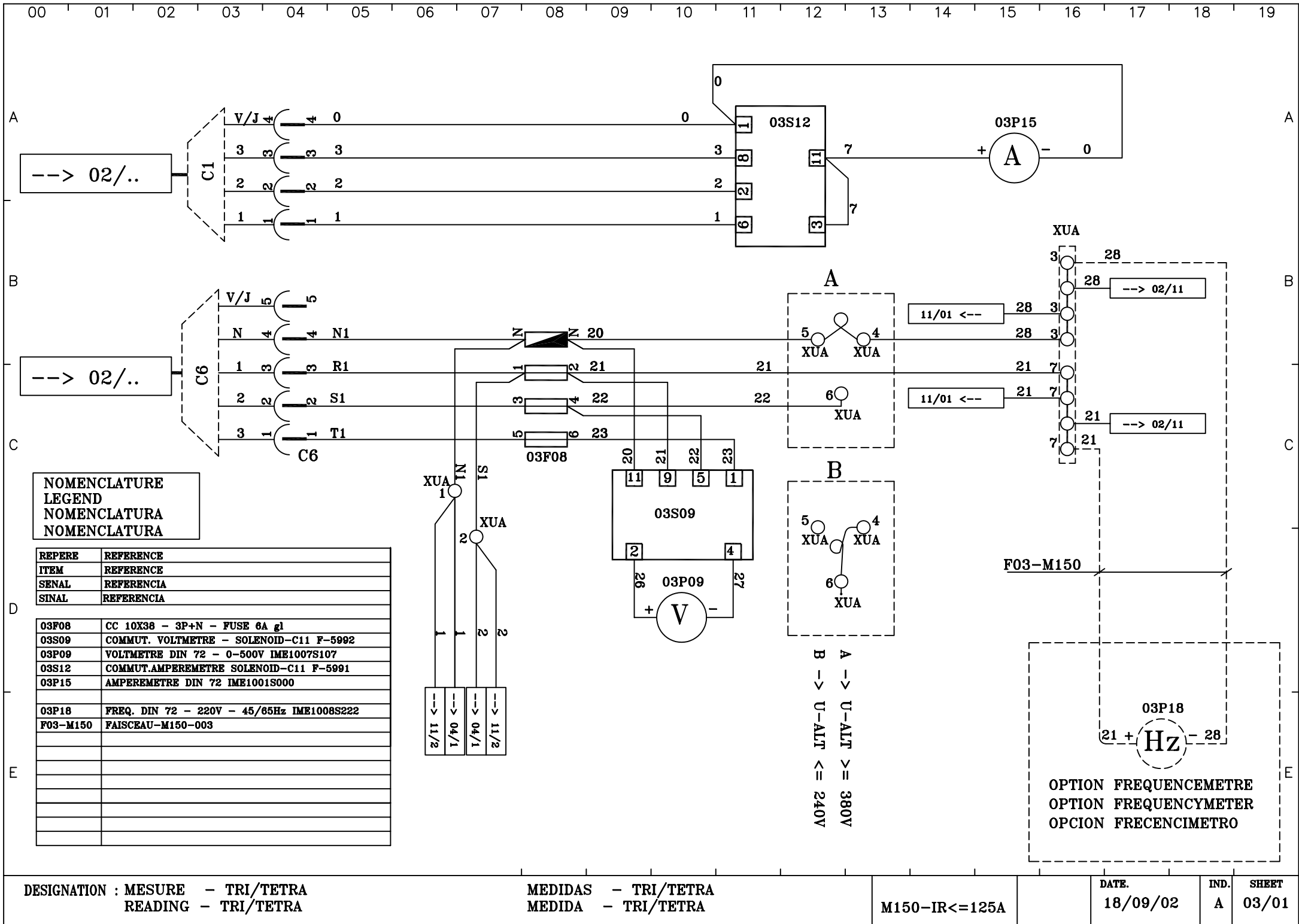
Bl : Bleu/Blue/Azul
Br : Brun/Brown/Marron/Castanho
Nr : Noir/Black/Negro/Petro
V/J : Vert-Jaune/green-yellow/verde-amarillo/verde-amarelo

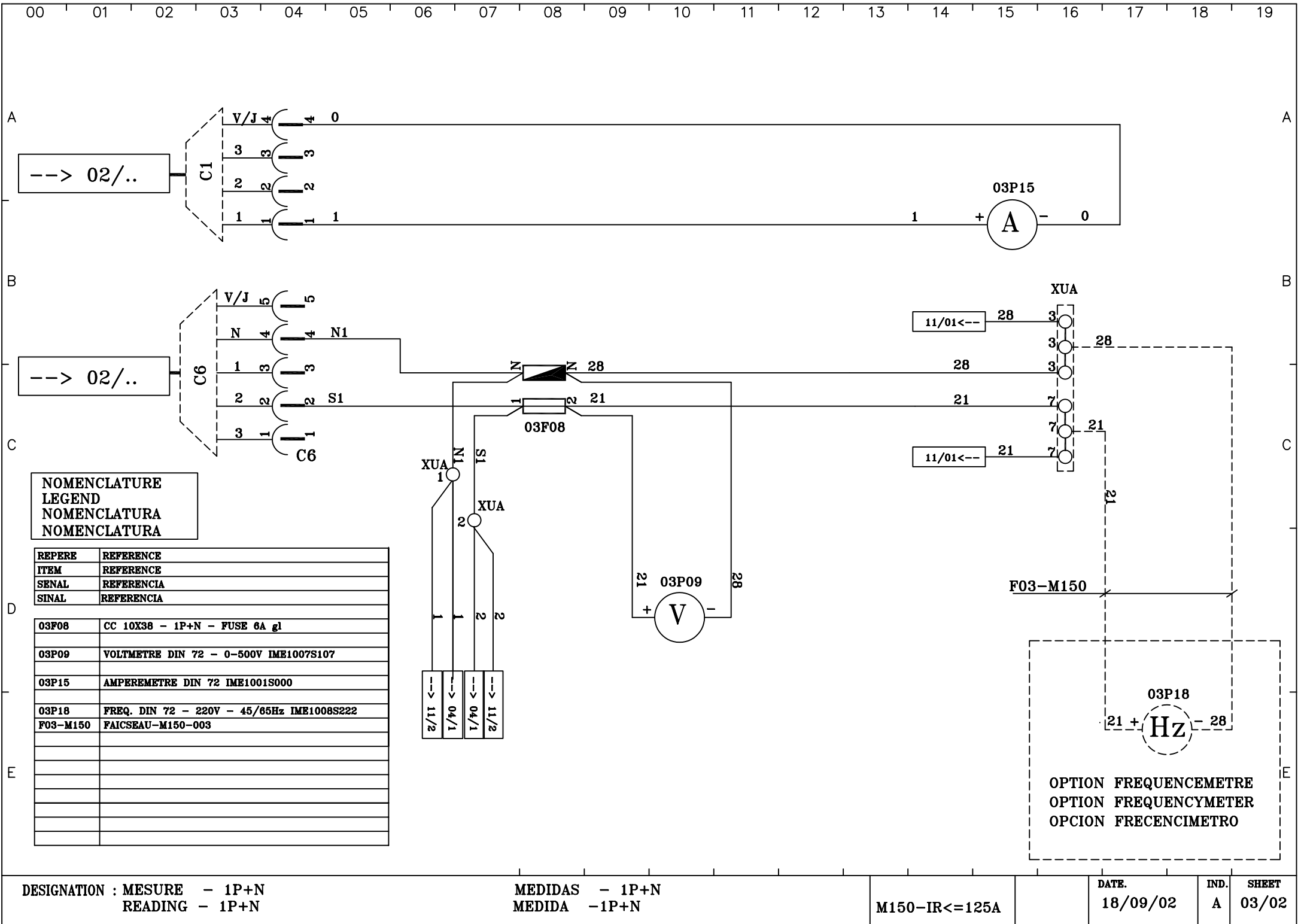
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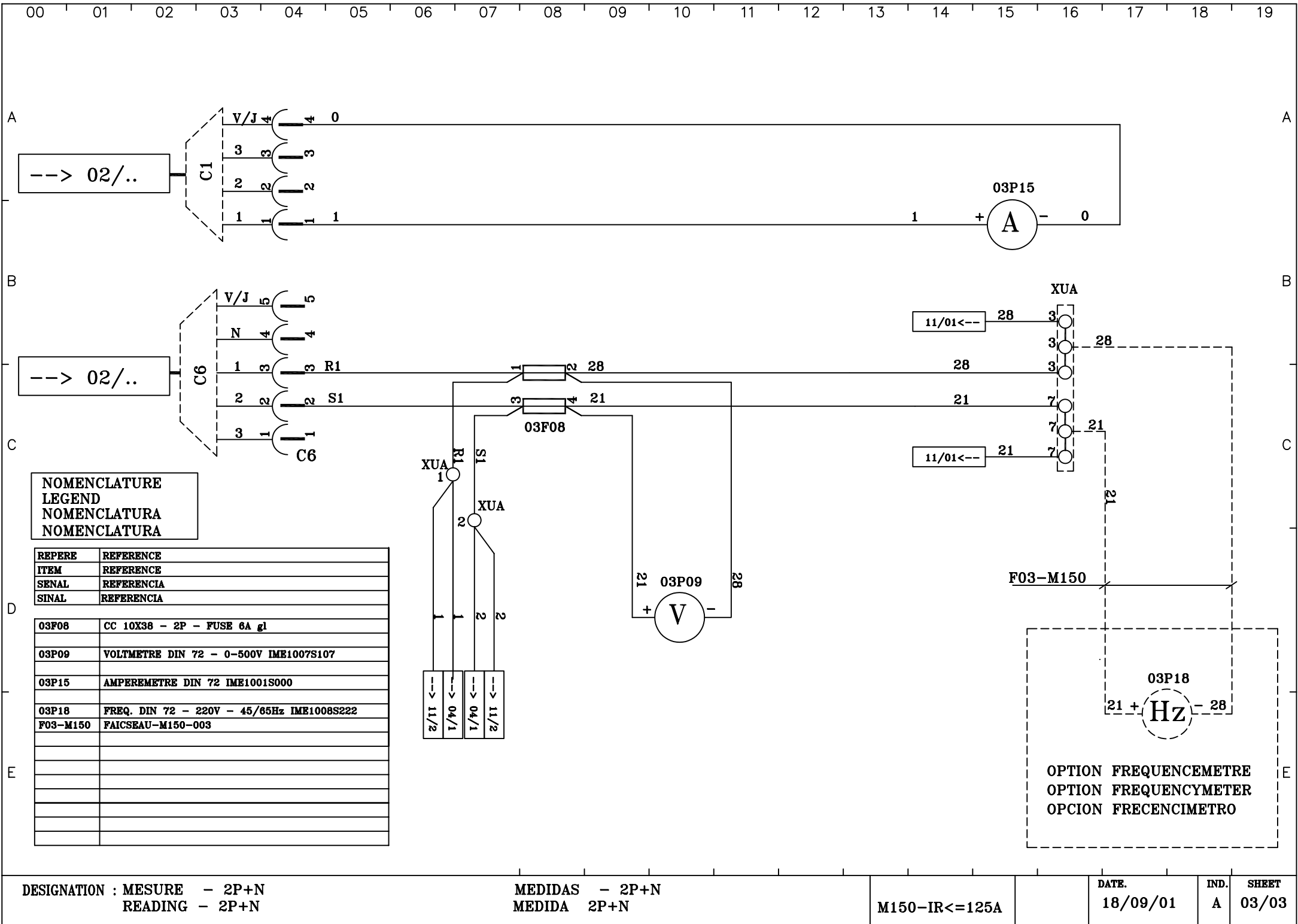
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|-------------|------------------------------------|
| F01 | FAISCEAU-TELYS-001 |
| F06 | FAISCEAU-TELYS-006 |
| F138 | FAISCEAU-TELYS-138 |
| F139 | FAISCEAU-TELYS-139 |
| F140-M150 | FAISCEAU-M150-140 |
| 2Q18 | NE-MCPS-EL... |
| 02T16.17.18 | NE-MCPS-EL... |
| 02E08 | DOLD IK9270.11/010 |
| 02KM08 | (LC1K09004P7-230Vac) + TEL LA4KA1U |
| F28-M150 | FAISCEAU-M150-028 |

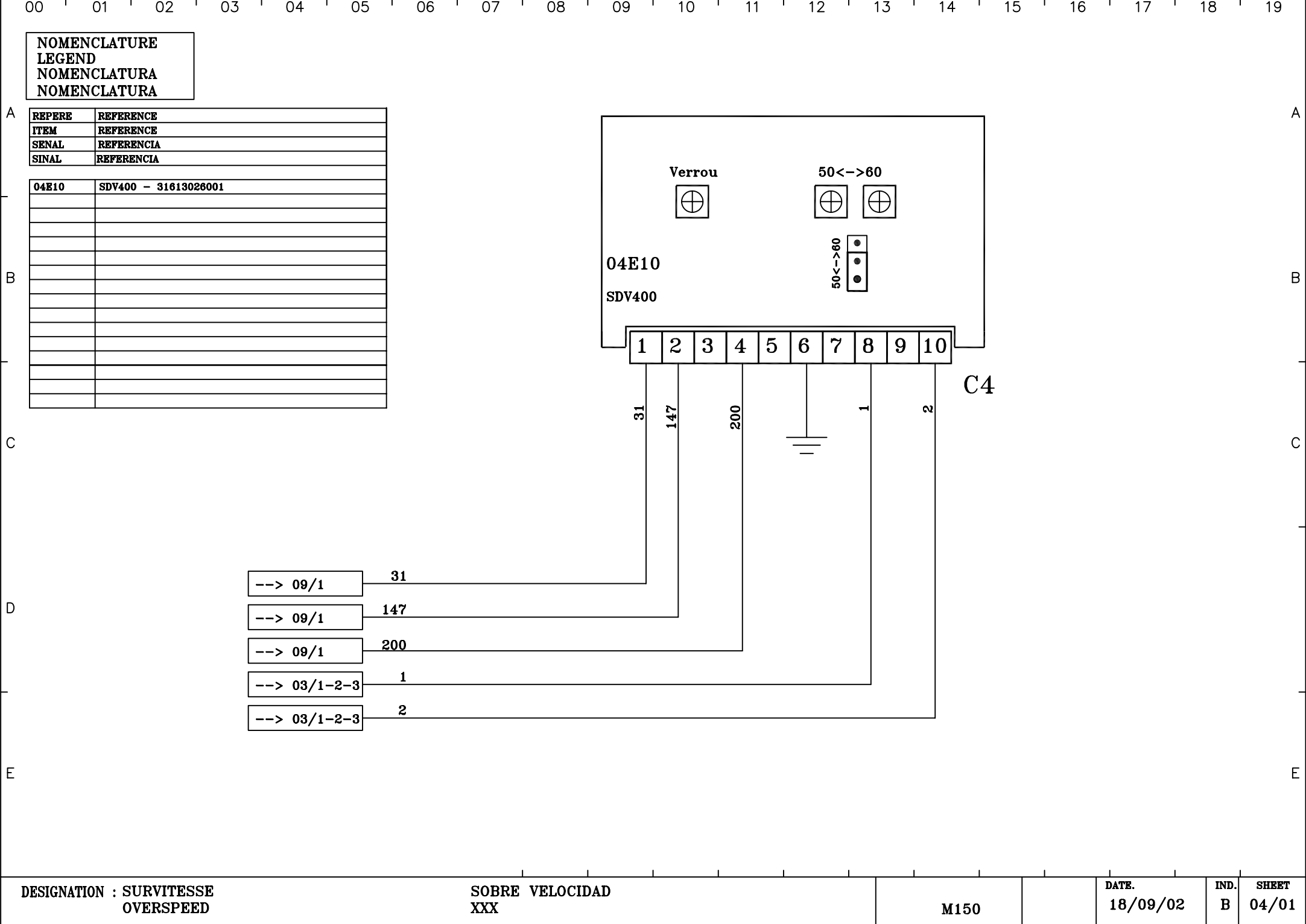
ALTERNATEUR
GENERATOR
ALTERNADOR
ALTERNADOR

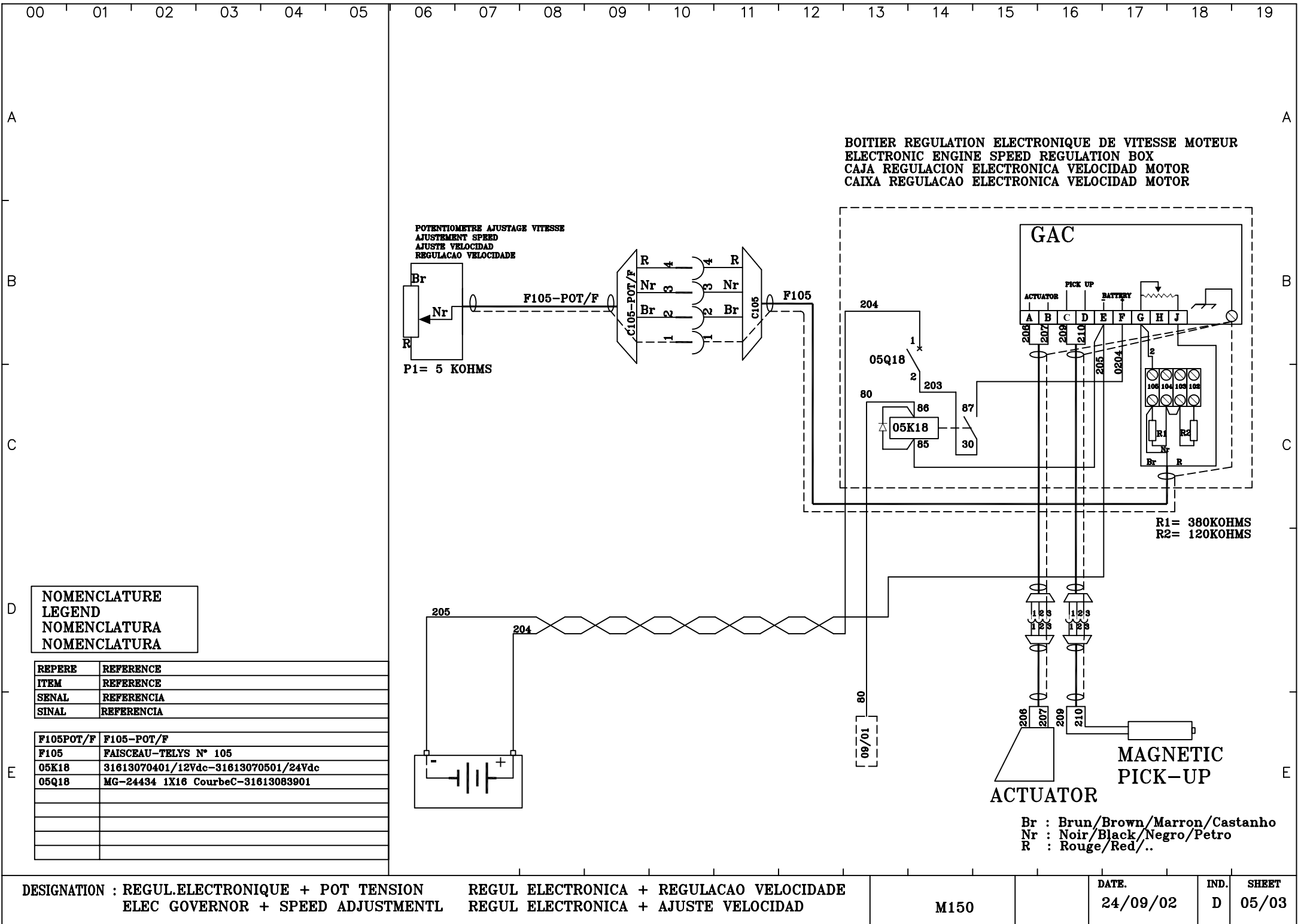


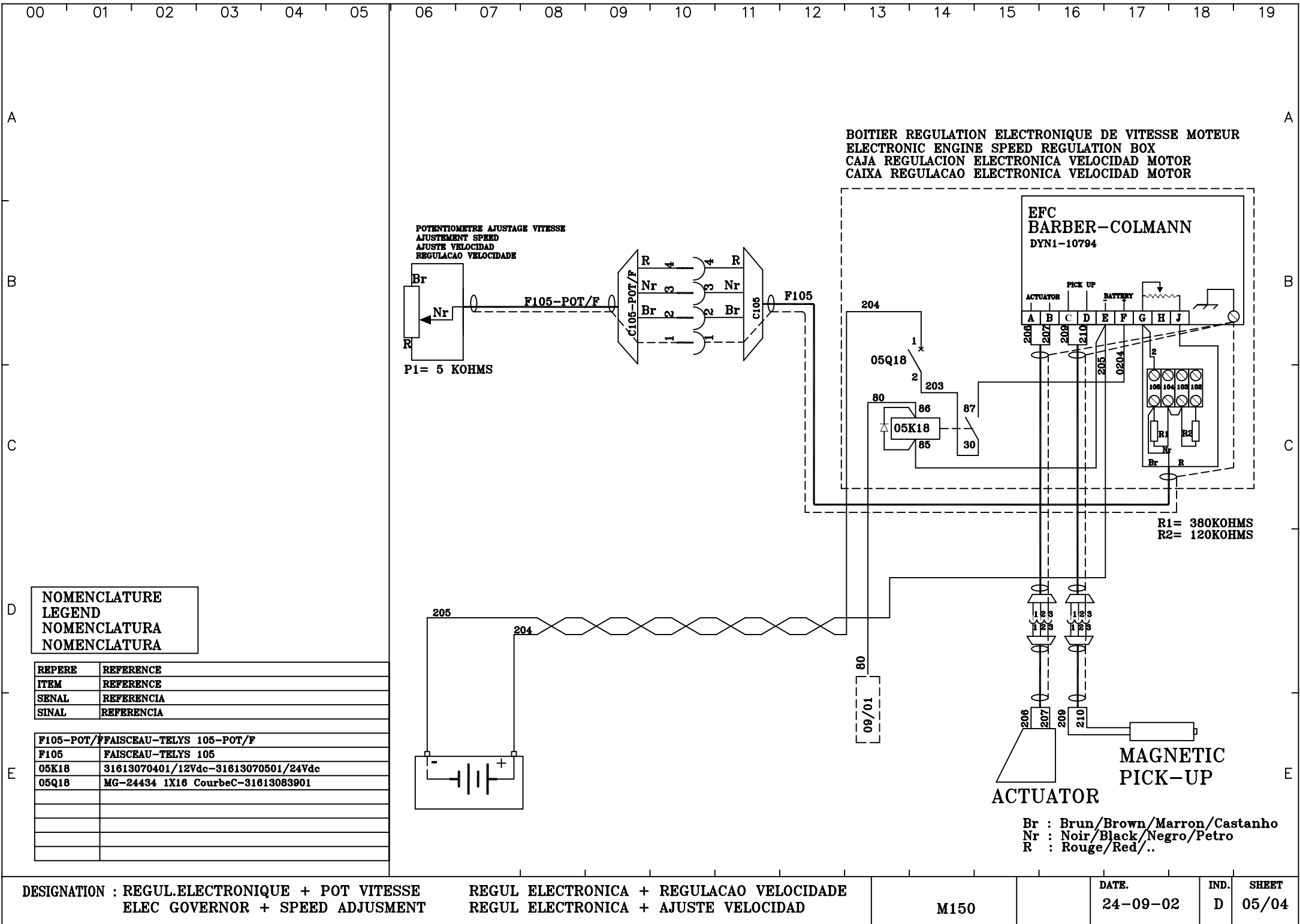


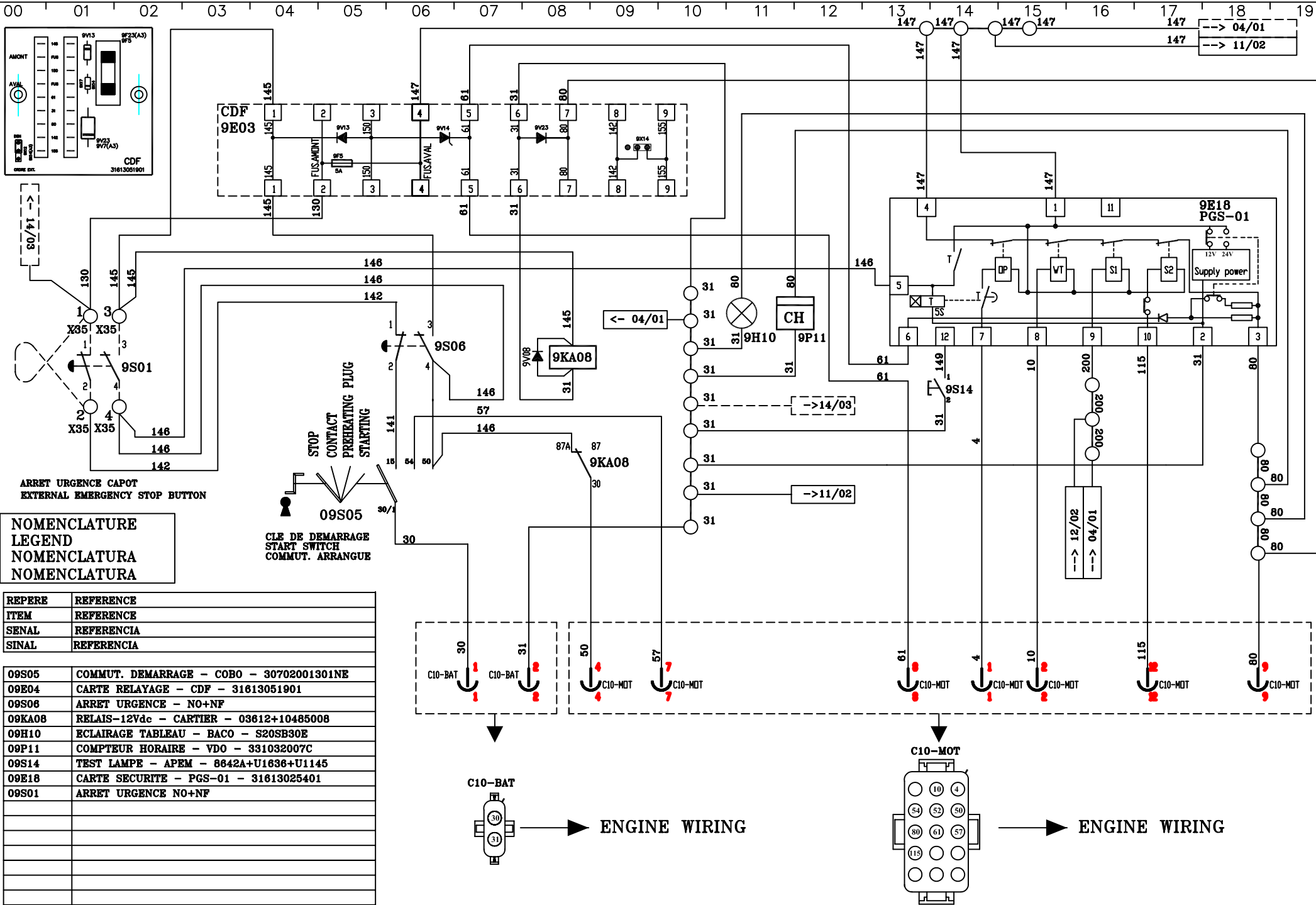


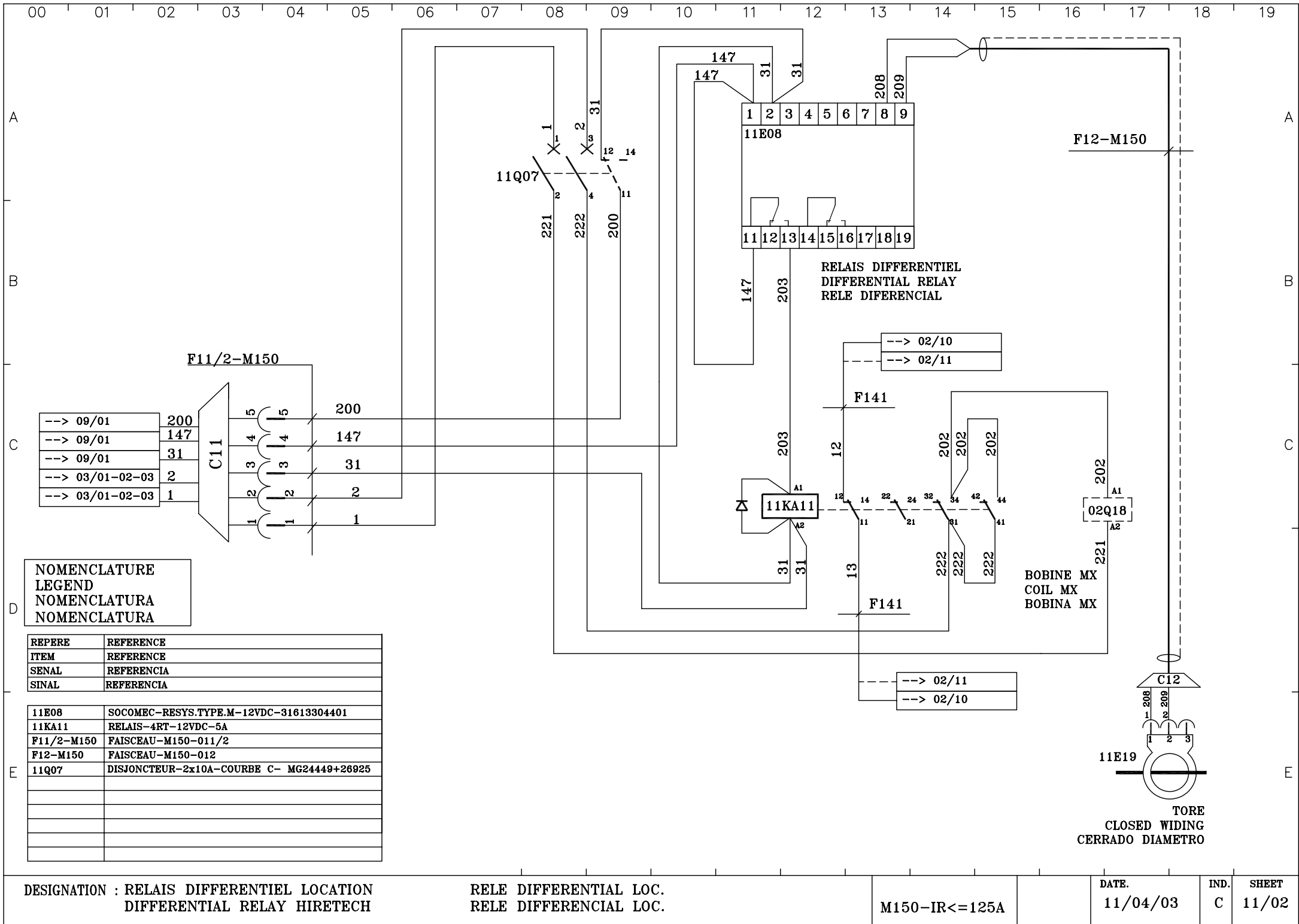


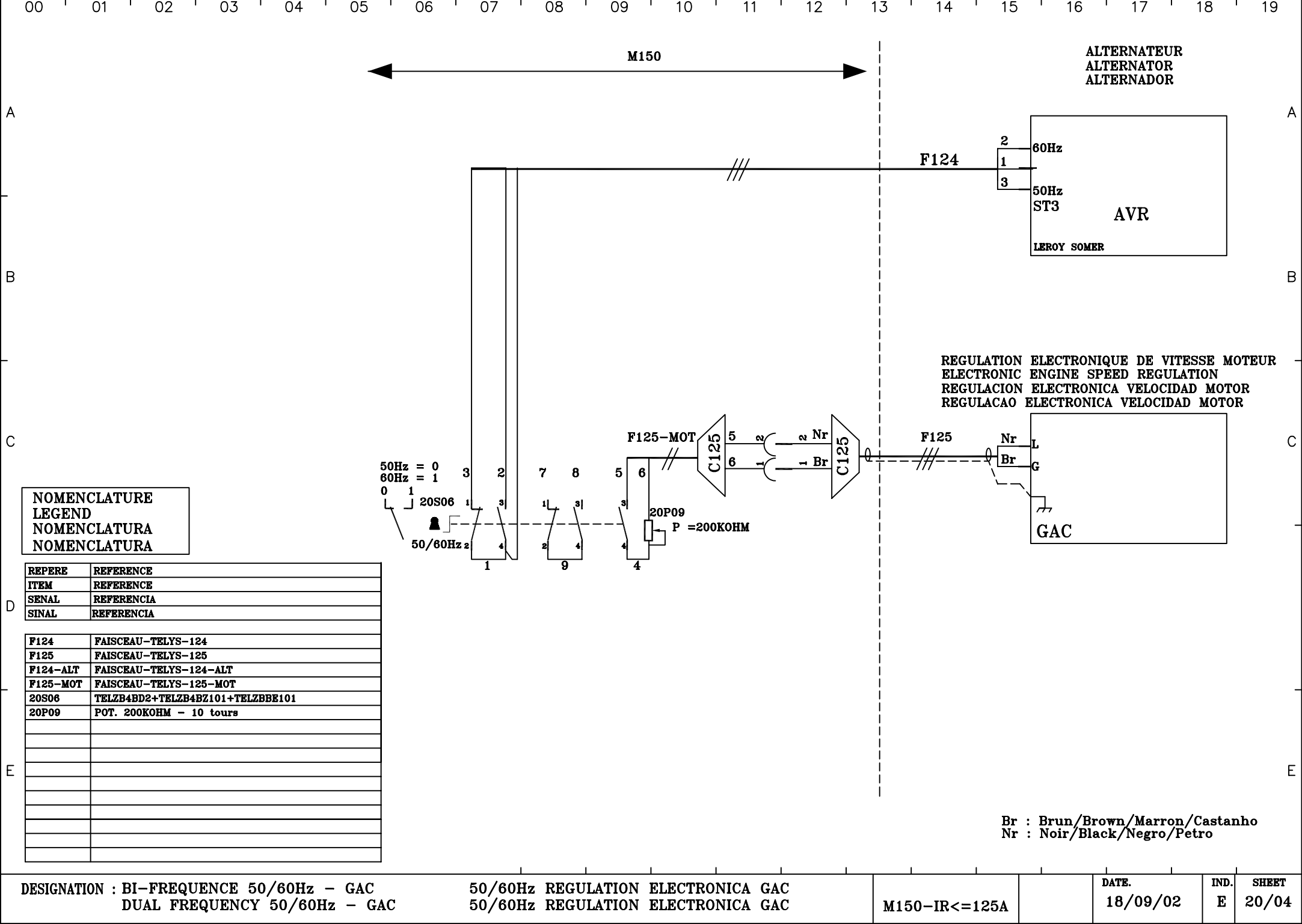


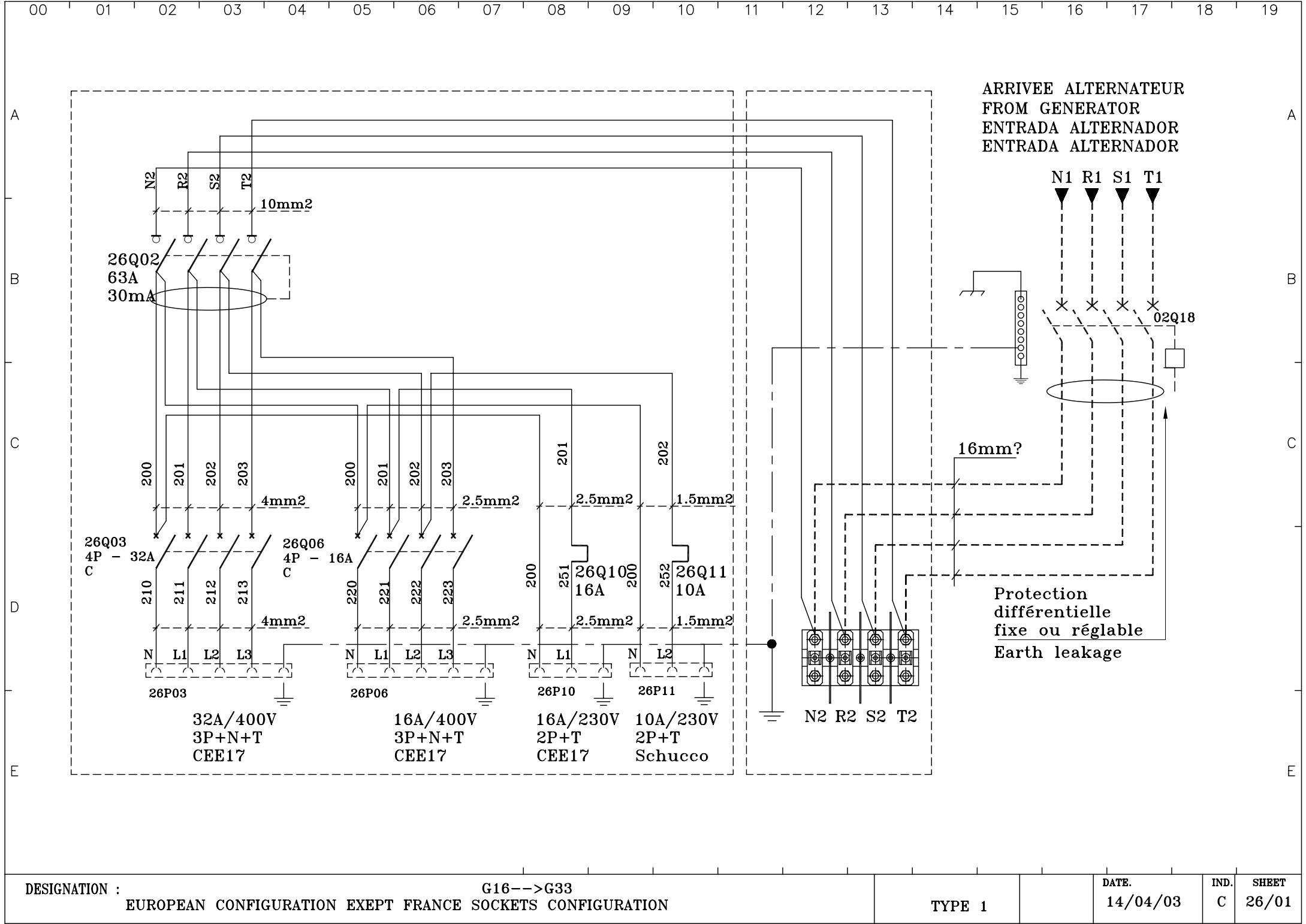


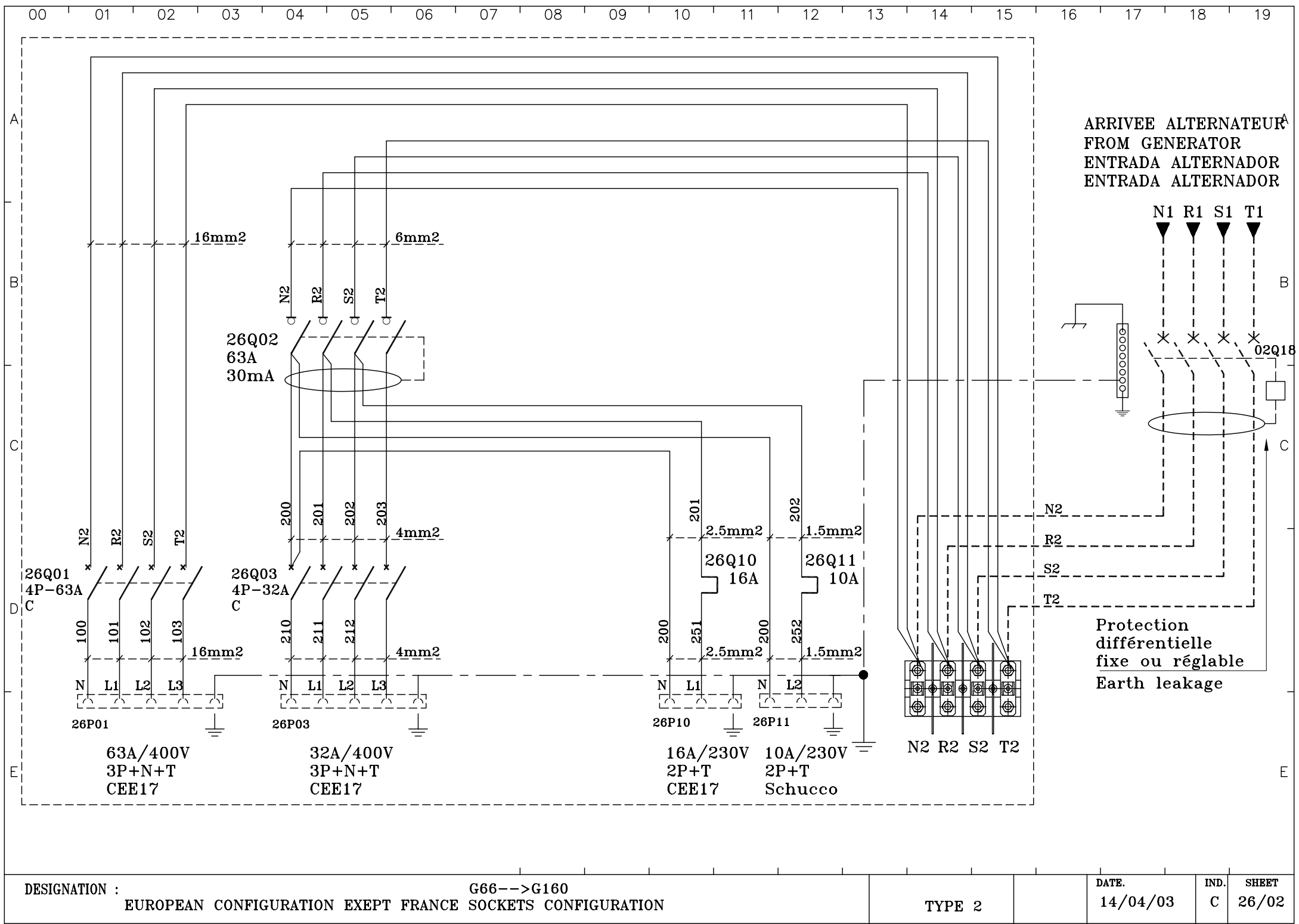








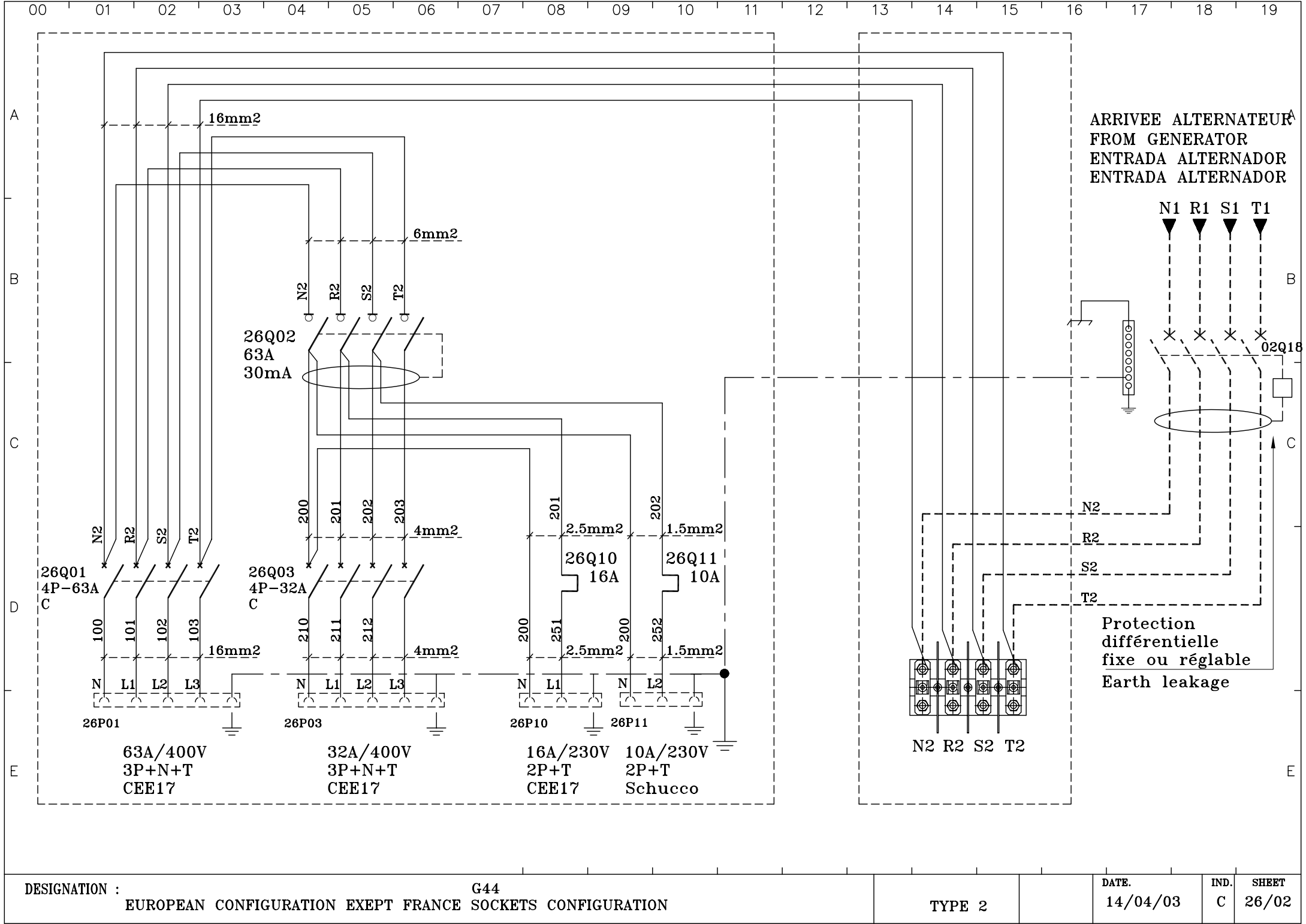




DESIGNATION : G66-->G160
EUROPEAN CONFIGURATION EXEPT FRANCE SOCKETS CONFIGURATION

TYPE 2

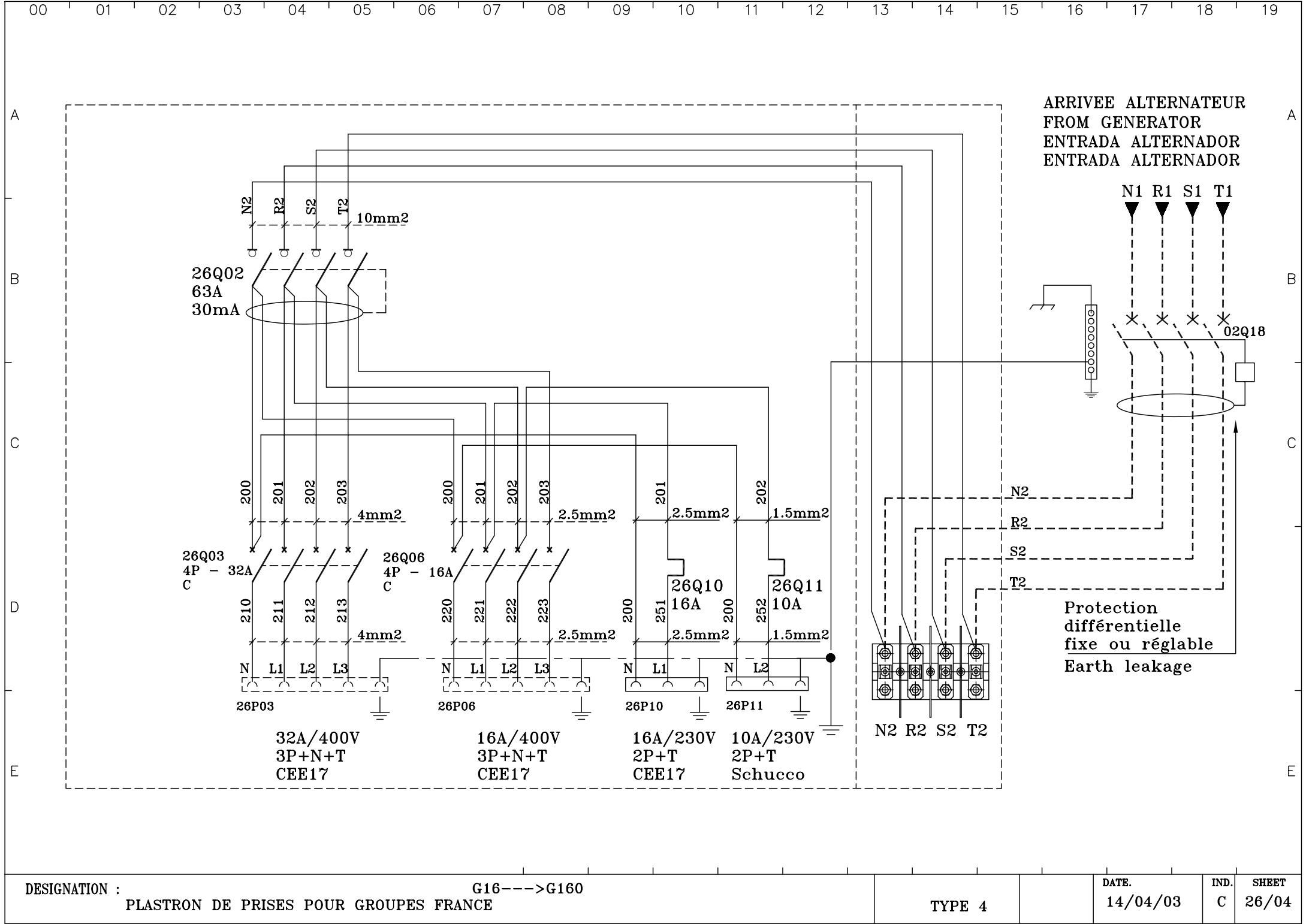
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|-------------------|-----------|----------------|
| DATE. 14/04/03 | IND. C | SHEET 26/02 |
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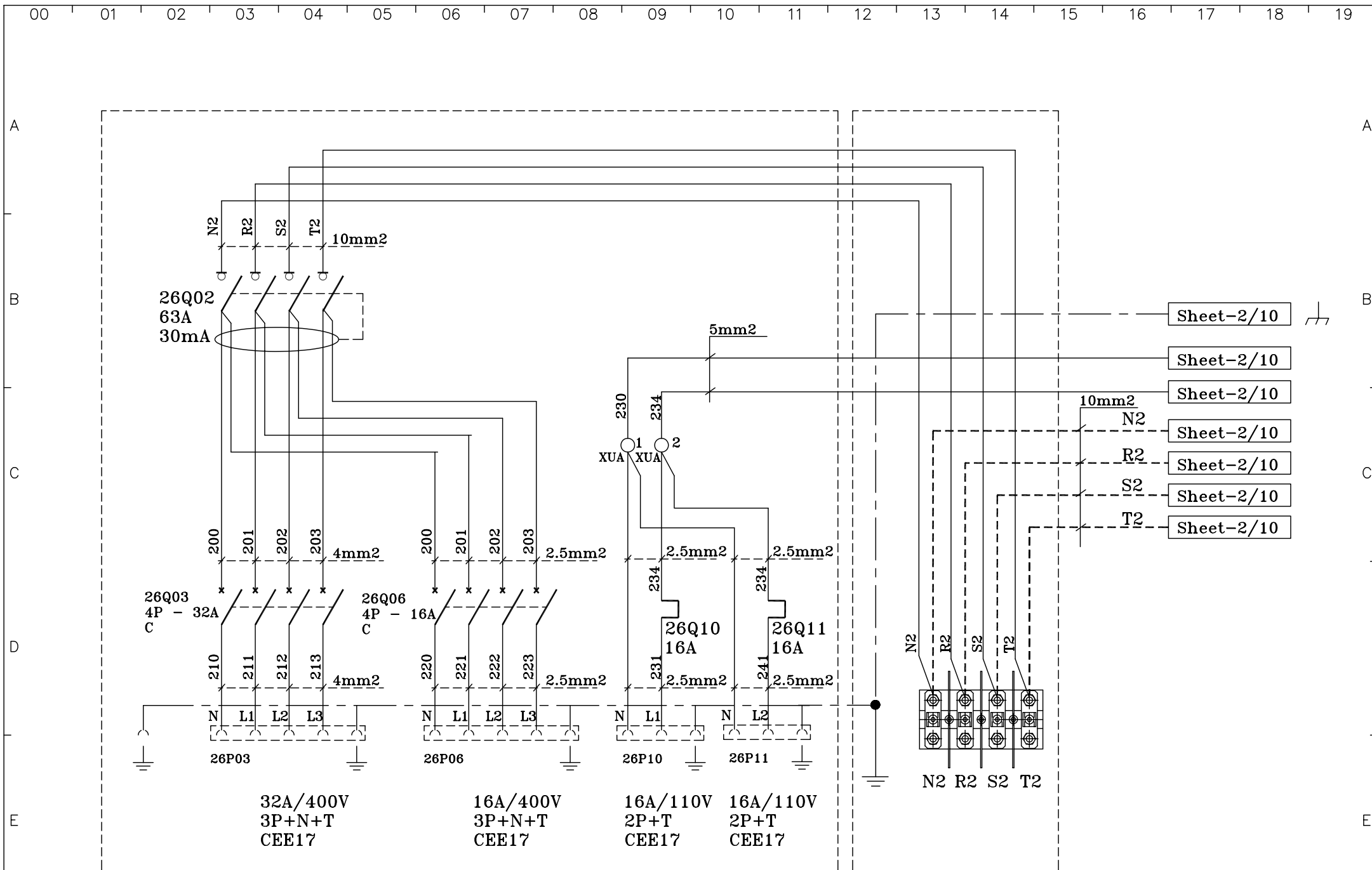


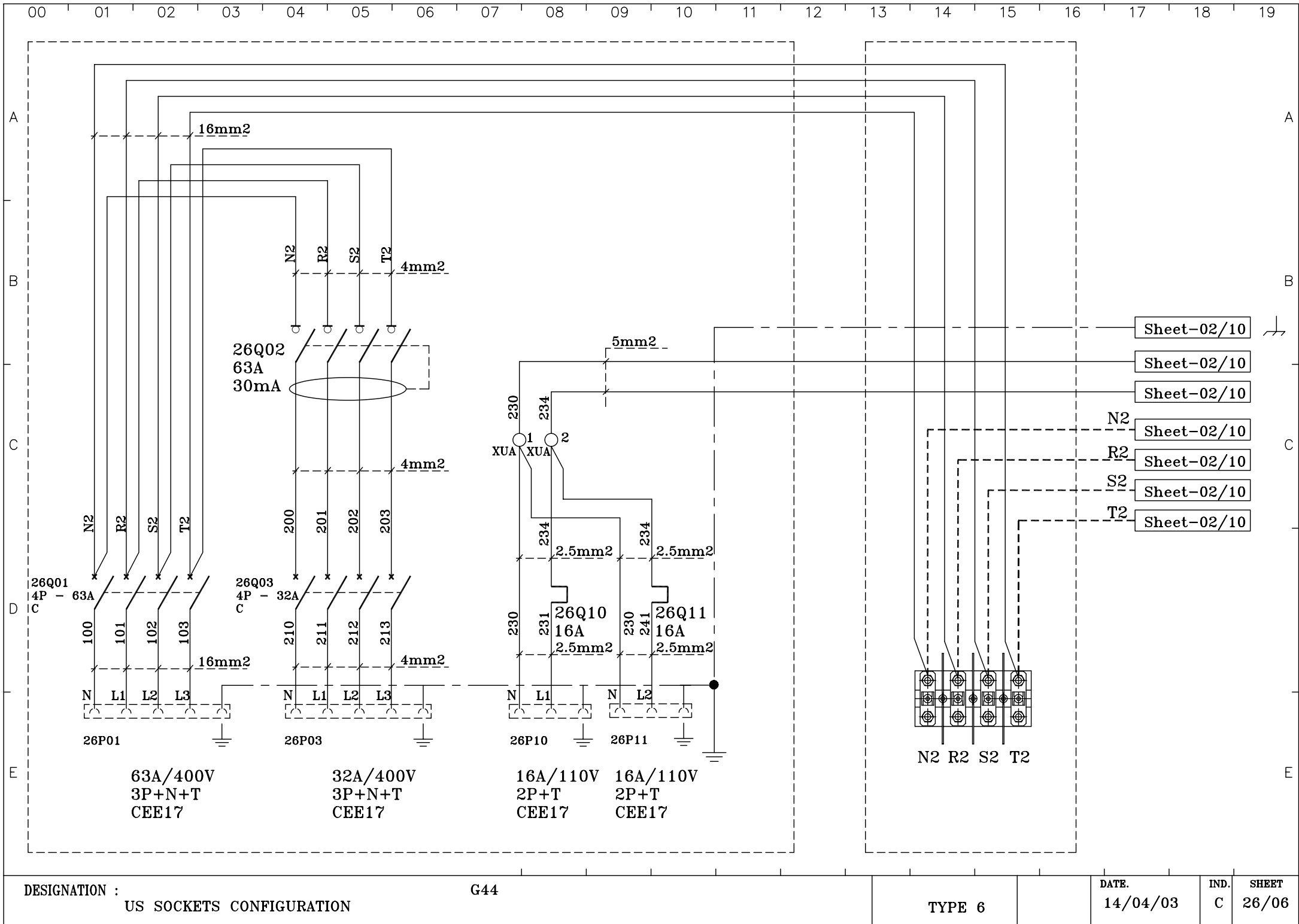
DESIGNATION : G44
EUROPEAN CONFIGURATION EXEPT FRANCE SOCKETS CONFIGURATION

TYPE 2

| | | |
|-------------------|-----------|----------------|
| DATE. 14/04/03 | IND. C | SHEET 26/02 |
|-------------------|-----------|----------------|







DESIGNATION :
US SOCKETS CONFIGURATION

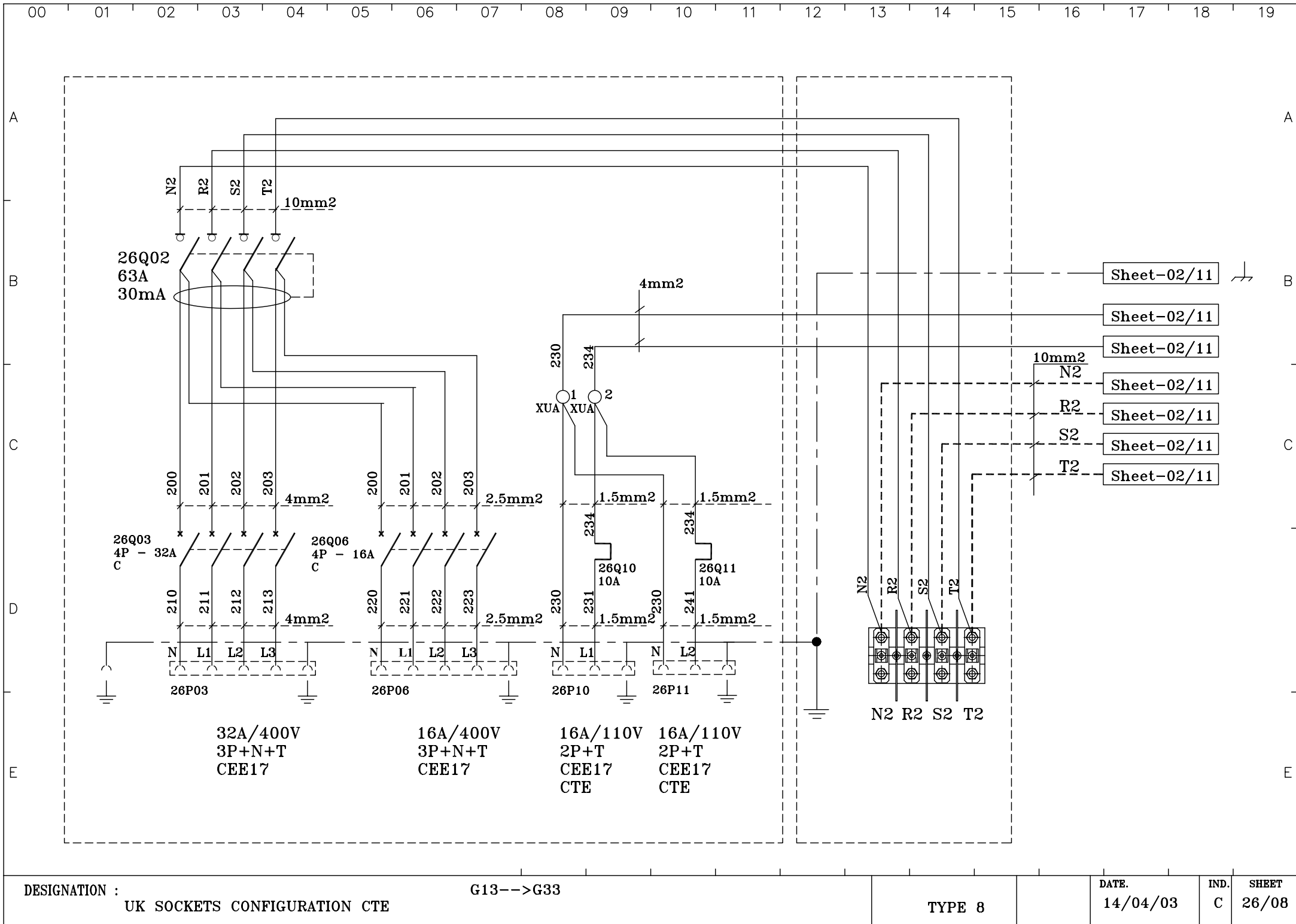
G44

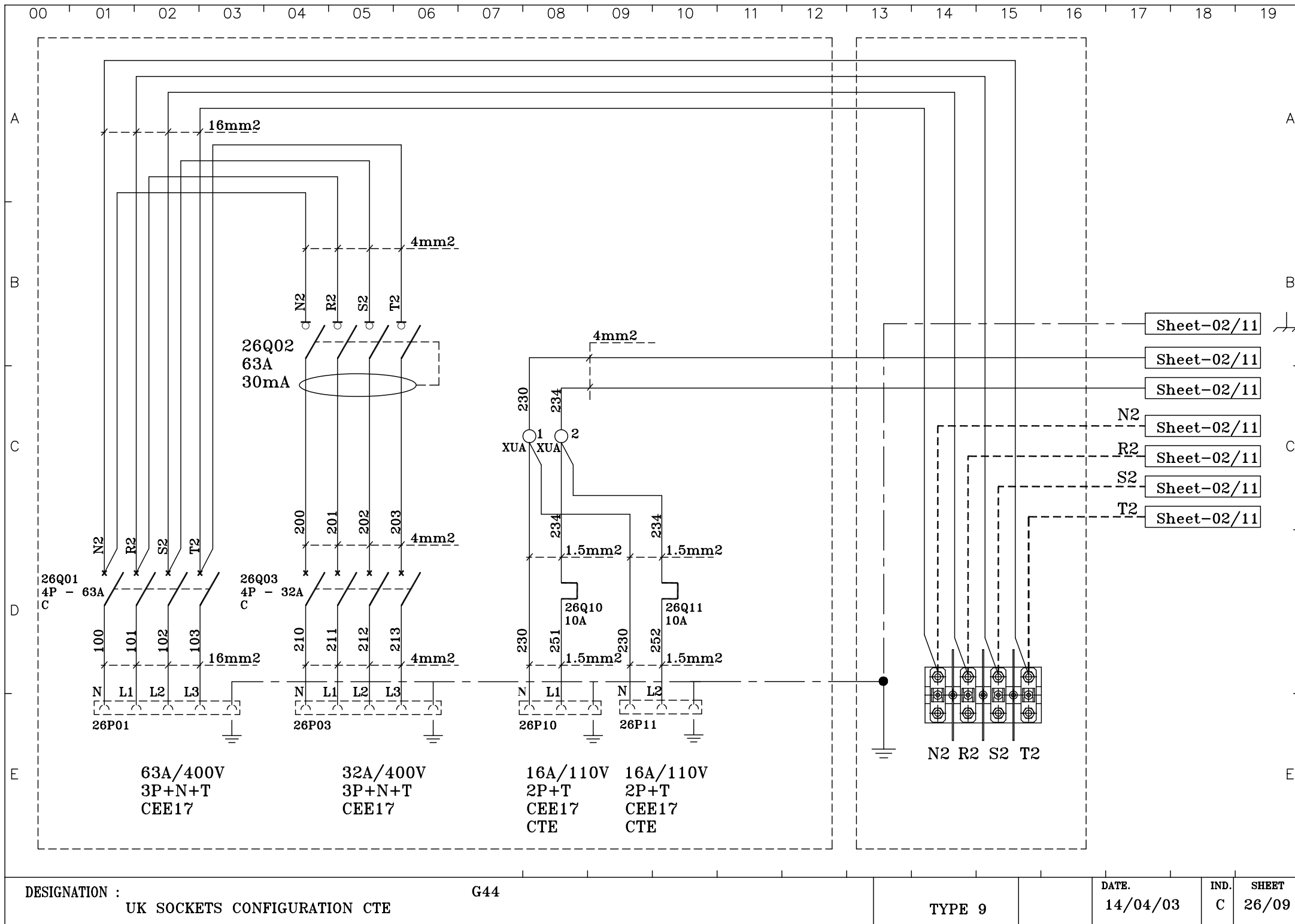
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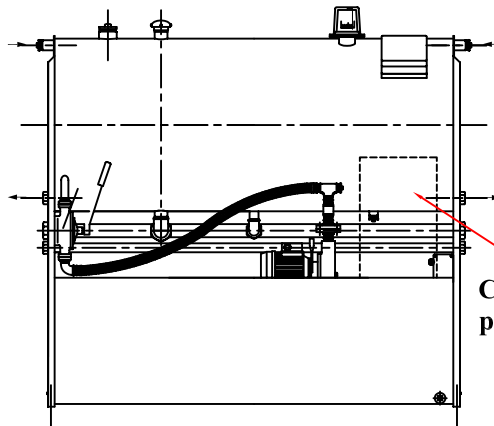
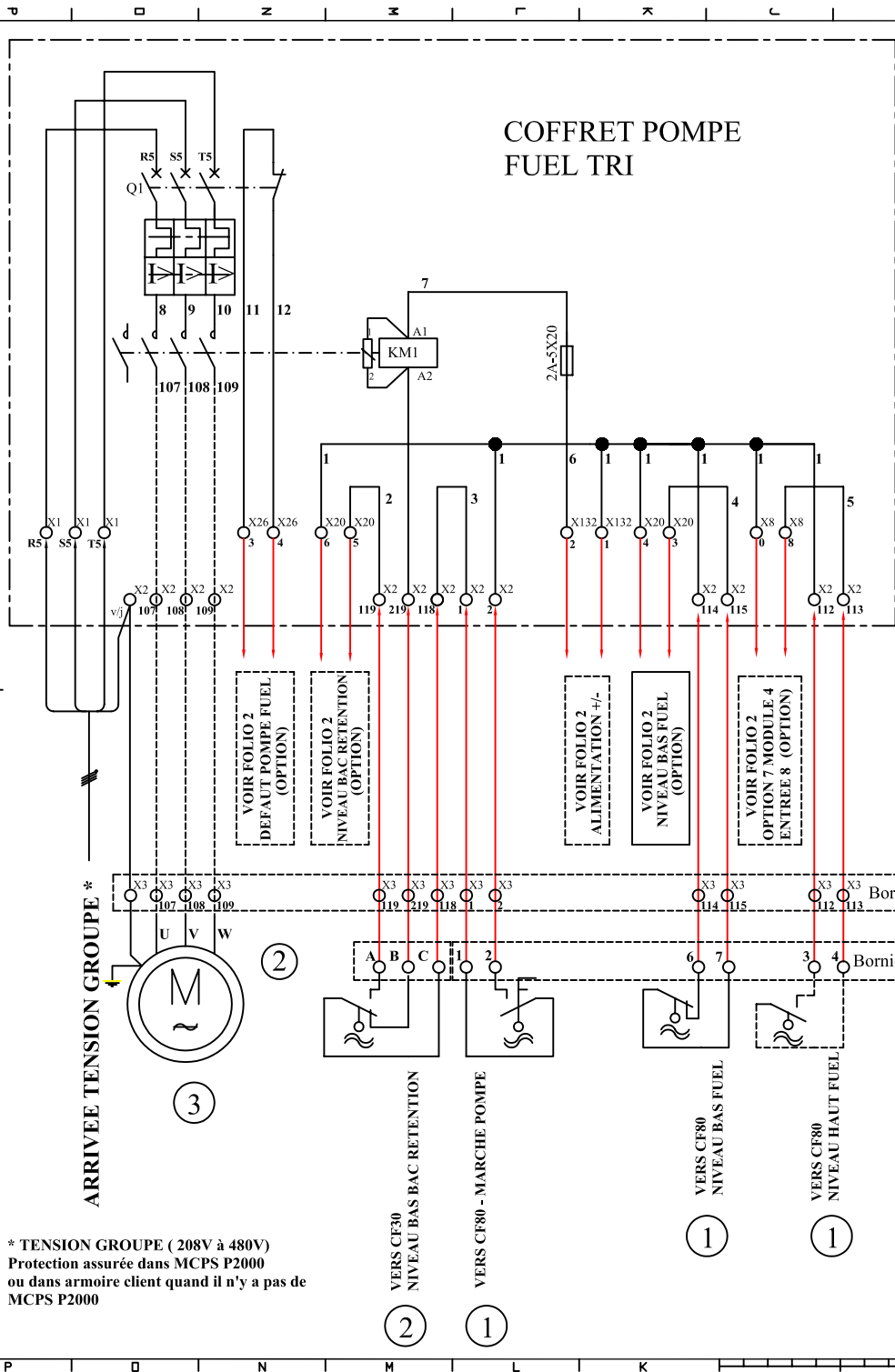
DATE.
14/04/03

IND.
C

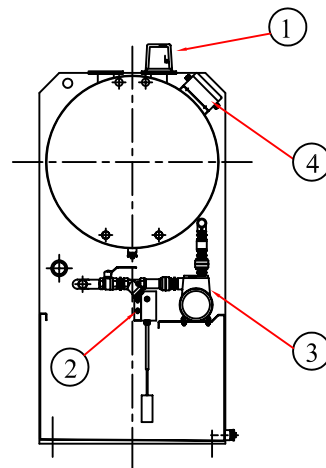
SHEET
26/06







Coffret pompe fuel tri

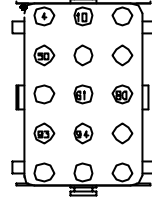


| | | | | | |
|---------------------------------------|--|----------|---------------|-----------------------|------|
| D | AJOUT DIODE ROUE LIBRE SUR KM1 | 28/03/02 | CALVEZ G. | | |
| C | AJOUT CONTACT SUR Q1-MODIFICATION NUMEROTATION BORNIER | 05/03/02 | CALVEZ G. | | |
| B | MISE EN CONFORMITE NUMEROS | 22/05/01 | BERGOT Gilles | | |
| A | CREATION DOCUMENT | 30/11/98 | BERGOT.G | | |
| IND. | DESIGNATION DE LA MODIFICATION | DATE | VISA | DATE | VISA |
| | | DESSINE | | VERIFIE | |
| MATERIE : | | | | FORMAT : | |
| REVETEMENT : | | | | ECHELLE : | |
| TOLERANCE : | | | | FOLIO : 1/2 | |
| DESIGNATION : | | | | MASSE (Vide/Plein) kg | |
| NOTICE RACCORDEMENT - FOLIO1 | | | | | |
| COFFRET POMPE FUEL SIMPLE- 1 ou 4m3/h | | | | | |
| 3-35-03-0037-01-D | | | | | |

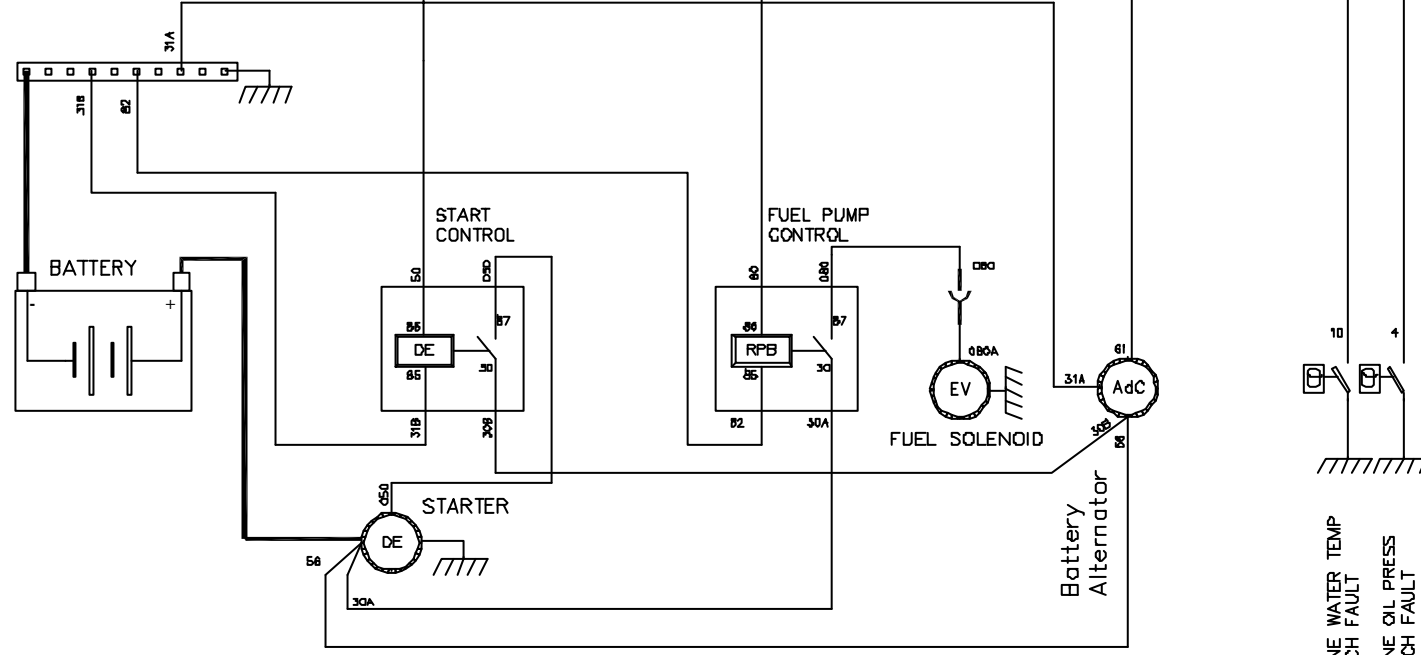
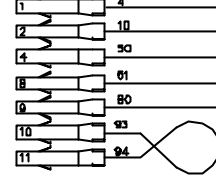


12 bis, rue de la Villeneuve 29272 BREST - Tel : 02.98.41.41.41 - Telex : 940757F - Telecopie : 02.98.41.63.07
CE PLAN EST LA PROPRIETE DE LA SOCIETE ; IL NE PEUT ETRE REPRODUIT, UTILISE OU COMMUNIQUE SANS SON AUTORISATION

C10-MOT

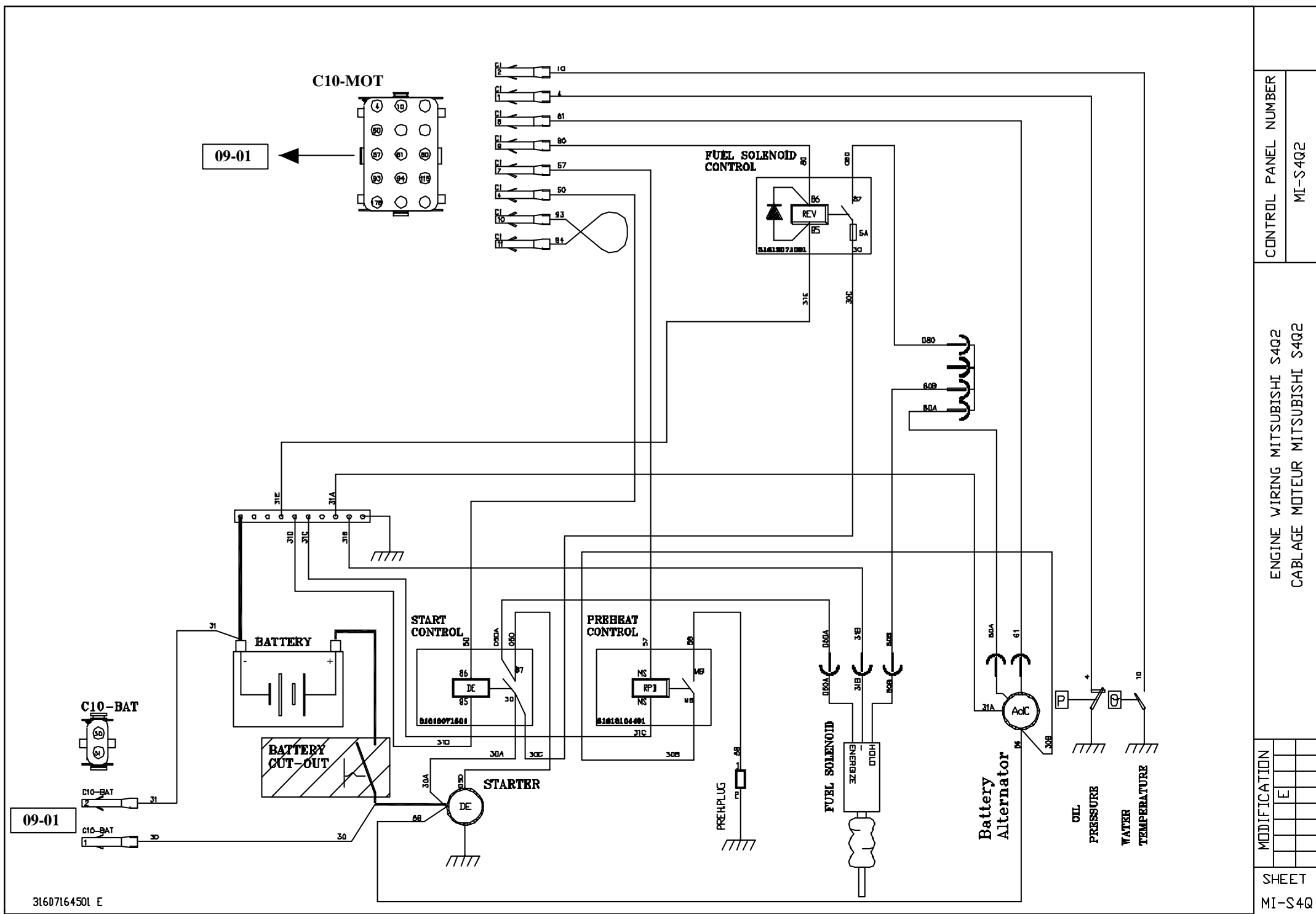


C 10-MOT

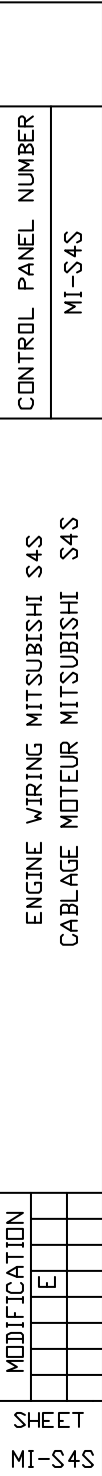


| MODIFICATION | | CONTROL PANEL NUMBER | |
|--------------|--|-------------------------------------|--|
| A | | JD 3029 | |
| SHEET | | ENGINE WIRING JOHN DEERE 3029 BASE | |
| JD 3029 | | CABLAGE MOTEUR JOHN DEERE 3029 BASE | |





| CONTROL PANEL NUMBER | |
|---|--|
| MI-S4Q2 | |
| ENGINE WIRING MITSUBISHI S4Q2 CABLAGE MOTEUR MITSUBISHI S4Q2 | |
| MODIFICATION | |
| E | |
| SHEET | |
| MI-S4Q | |



Use and maintenance manual

John - Deere POWERTECH 4.5L & 6.8L 4045 and 6068 OEM Diesel Engines

Réf. constructeur : OMRG25204

Réf. GPAO : 33522039401

Introduction

Foreword

READ THIS MANUAL carefully to learn how to operate and service your engine correctly. Failure to do so could result in personal injury or equipment damage.

THIS MANUAL SHOULD BE CONSIDERED a permanent part of your engine and should remain with the engine when you sell it.

MEASUREMENTS IN THIS MANUAL are given in both metric and customary U.S. unit equivalents. Use only correct replacement parts and fasteners. Metric and inch fasteners may require a specific metric or inch wrench.

RIGHT-HAND AND LEFT-HAND sides are determined by standing at the drive or flywheel end (rear) of the engine and facing toward the front of the engine.

WRITE ENGINE SERIAL NUMBERS and option codes in the spaces indicated in the Record Keeping Section.

Accurately record all the numbers. Your dealer also needs these numbers when you order parts. File the identification numbers in a secure place off the engine.

SETTING FUEL DELIVERY beyond published factory specifications or otherwise overpowering will result in loss of warranty protection for this engine.

CERTAIN ENGINE ACCESSORIES such as radiator, air cleaner, and instruments are optional equipment on John Deere OEM Engines. These accessories may be provided by the equipment manufacturer instead of John Deere. This operator's manual applies only to the engine and those options available through the John Deere distribution network.

CALIFORNIA PROPOSITION 65 WARNING: Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

OMRGOEM,IFC -19-12JAN99-1/1

John Deere Engine Owner:

Don't wait until you need warranty or other service to meet your local John Deere Engine Distributor or Service Dealer.

Learn who he is and where he is. At your first convenience, go meet him. He'll want to get to know you and to learn what your needs might be.

Utilisateurs De Moteurs John Deere:

N'attendez pas d'être obligé d'avoir recours a votre Concessionnaire ou Point de Service le plus proche pour vous adresser a lui.

Renseignez-vous des que possible pour l'identifier et le localiser. A la premiere occasion, prenez contact avec lui et faites-vous connaître. Il sera lui aussi heureux de faire votre connaissance et de savoir que vous pourrez compter sur lui le moment venu.

An Den Besitzer Des John Deere Motors:

Warten Sie nicht auf einen evt. Reparaturfall um den nächstgelegenen John Deere Händler kennen zu lernen.

Machen Sie sich bei ihm bekannt und nutzen Sie sein "Service Angebot".

Proprietario Del Motore John Deere:

Non aspetti fino a quando ha bisogno della garanzia o di un altro tipo di assistenza per incontrarsi con il Suo Concessionario che fornisce l'assistenza tecnica.

Impari a conoscere chi è e dove si trova. Alla Sua prima occasione cerchi d'incontrarlo. Egli desidera farsi conoscere e conoscere le Sue necessità.

Propietario De Equipo John Deere:

No espere hasta necesitar servicio de garantía o de otro tipo para conocer a su Distribuidor de Motores John Deere o al Concesionario de Servicio.

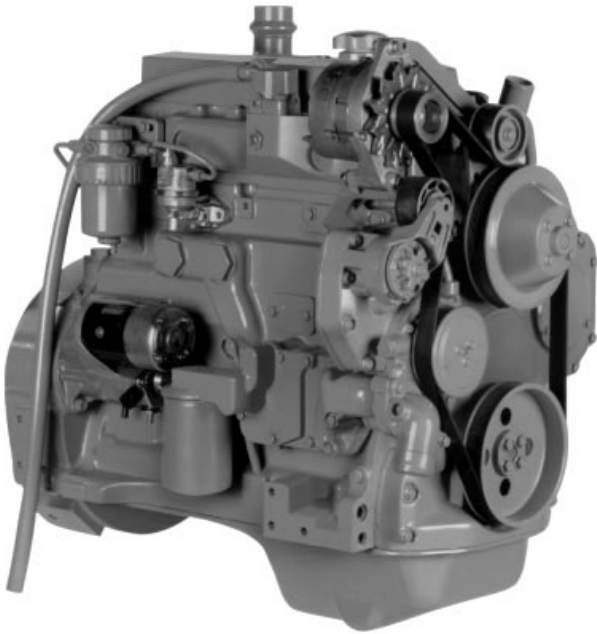
Entérese de quién es, y dónde está situado. Cuando tenga un momento, vaya a visitarlo. A él le gustará conocerlo, y saber cuáles podrían ser sus necesidades.

John Deere MotorÄgare:

Vänta inte med att besöka Din John Deere återförsäljare till dess att Du behöver service eller garanti reparation.

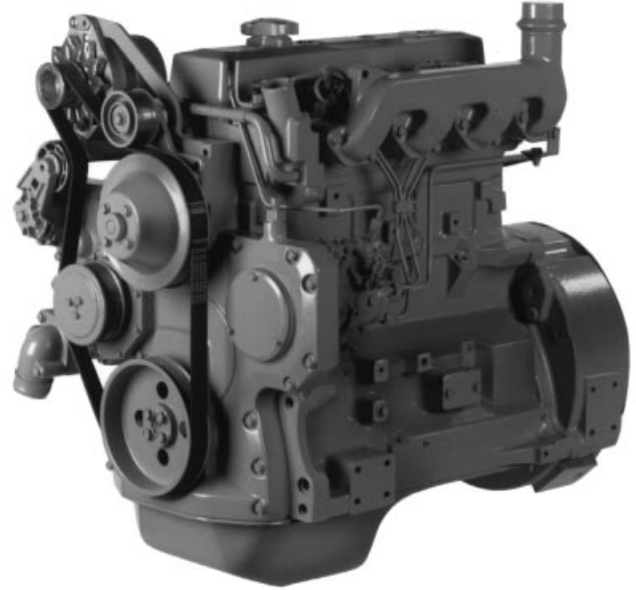
Bekanta Dig med var han är och vem han är. Tag första tillfälle att besöka honom. Han vill också träffa Dig för att få veta vad Du behöver och hur han kan hjälpa Dig.

POWERTECH® 4.5 L Engines



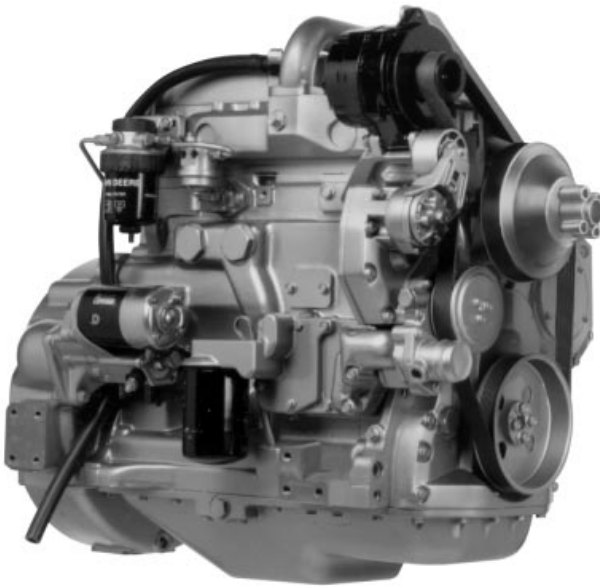
4045D Engine

RG7999 -UN-19JUN00



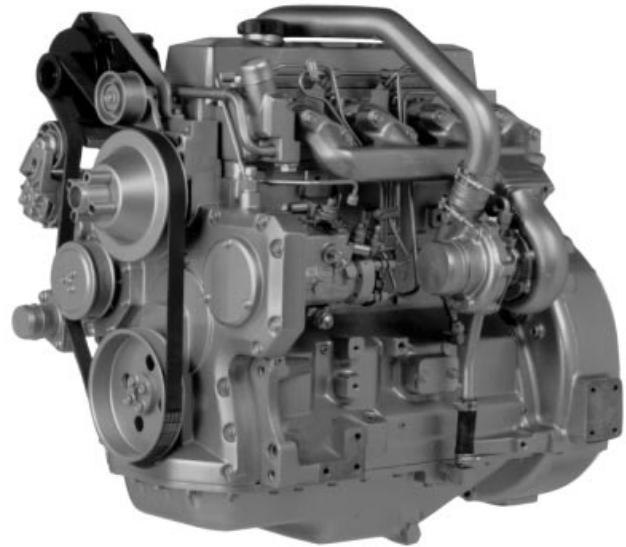
4045D Engine

RG7998 -UN-19JUN00



4045T Engine

RG7996 -UN-19JUN00



4045T Engine

RG7997 -UN-19JUN00

POWERTECH is a trademark of Deere & Company

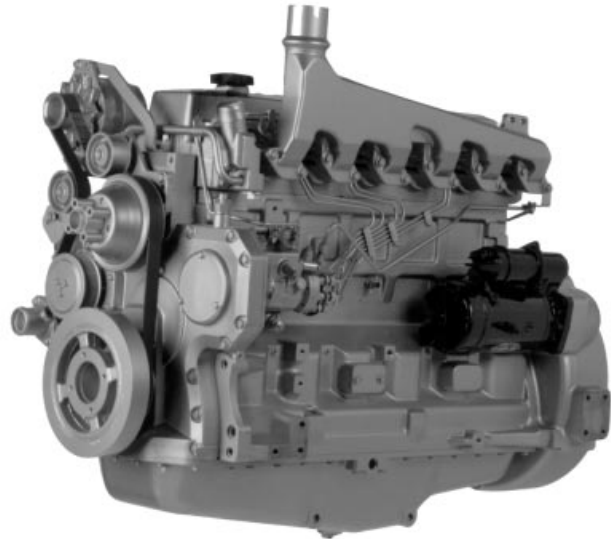
RG, RG34710, 5501 -19-20MAY96-1/1

POWERTECH® 6.8 L Engines



6068D Engine

RG8003 -UN-19JUN00



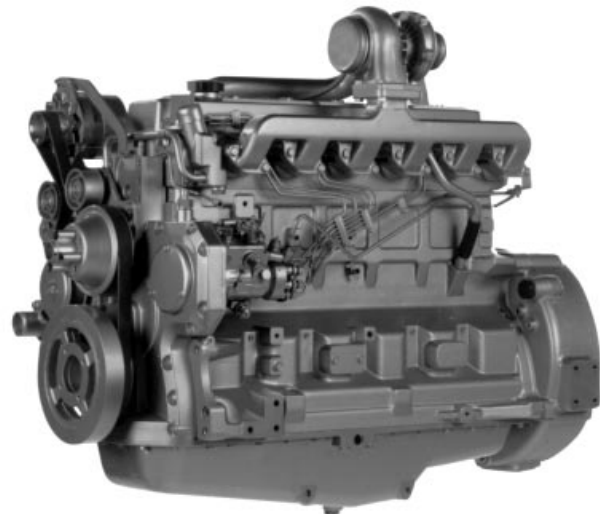
6068D Engine

RG8002 -UN-19JUN00



6068T Engine

RG8001 -UN-19JUN00



6068T Engine

RG8000 -UN-19JUN00

POWERTECH is a trademark of Deere & Company

RG, RG34710, 5503 -19-20MAY96-1/1

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All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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Previous Editions
Copyright © 1996

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Lubrication & Maint./2000 Hour/24 Month

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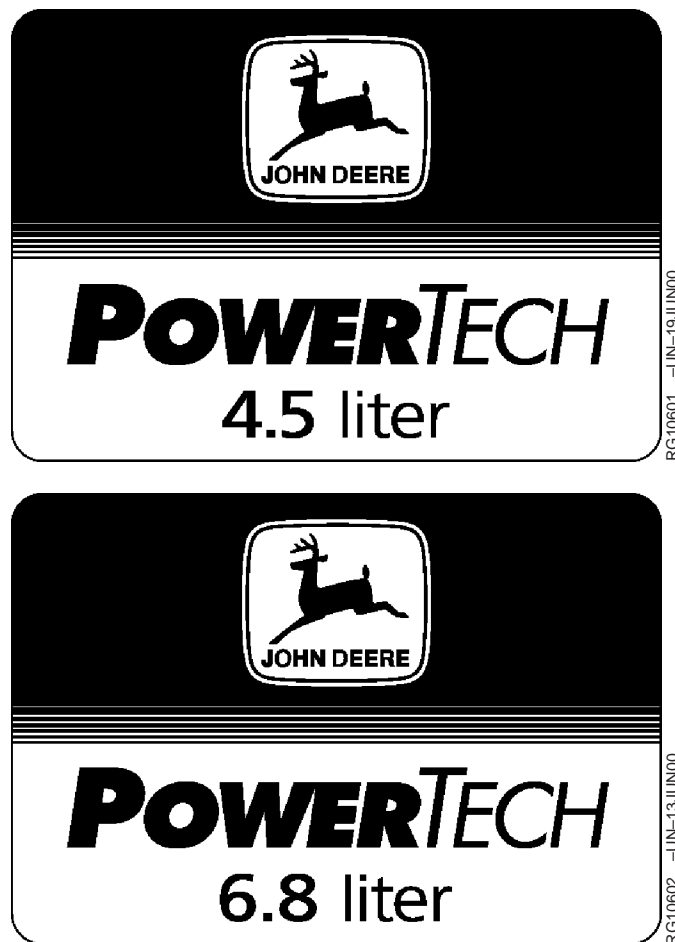
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Record Keeping

POWERTECH[®] Medallion

A medallion is located on the rocker arm cover which identifies each engine as a John Deere *POWERTECH*[®] engine.



POWERTECH is a trademark of Deere & Company.

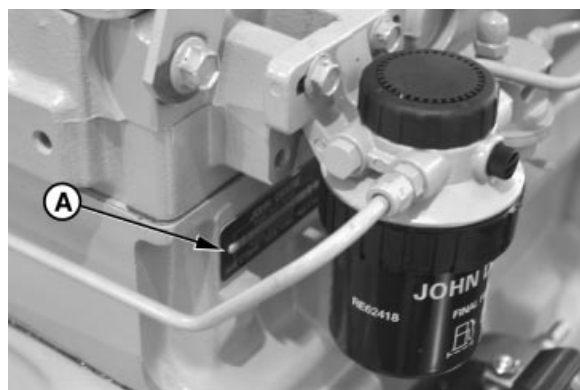
RG, RG34710, 5505 -19-20MAY96-1/1

Engine Serial Number Plate

Each engine has a 13-digit John Deere engine serial number. The first two digits identify the factory that produced the engine:

- “T0” indicates the engine was built in Dubuque, Iowa
- “CD” indicates the engine was built in Saran, France
- “PE” indicates the engine was built in Torreon, Mexico

Your engine’s serial number plate (A) is located on the right-hand side of cylinder block behind the fuel filter.



RG, RG34710, 5506 -19-20MAY96-1/1

Record Engine Serial Number

Record all of the numbers and letters found on your engine serial number plate in the spaces provided below.

This information is very important for repair parts or warranty information.

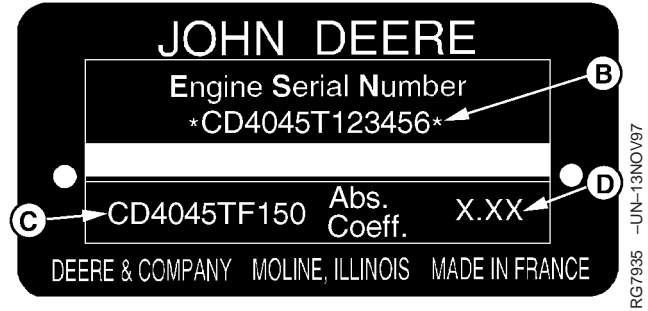
Engine Serial Number (B)

Engine Model Number(C)

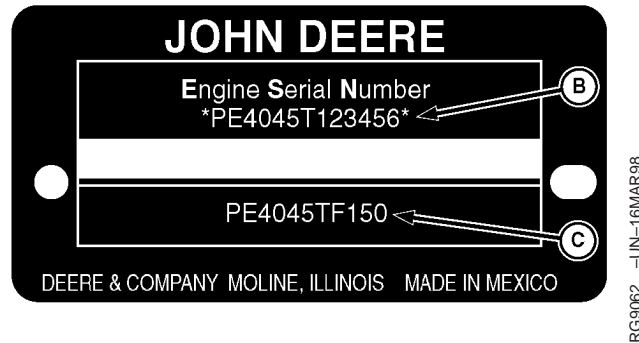
Coefficient of Absorption Value (D)
(Saran Engines Only)



Dubuque Engine Serial Number Plate



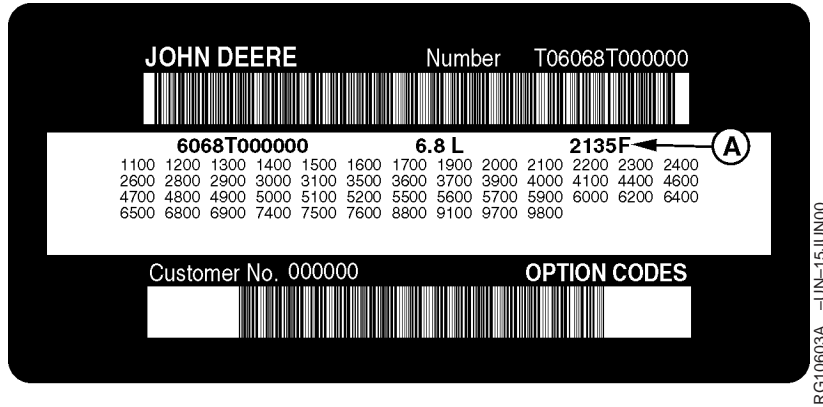
Saran Engine Serial Number Plate



Torreon Engine Serial Number Plate

RG, RG34710, 5507 -19-20MAY96-1/1

Engine Option Codes



In addition to the serial number plate, OEM engines have an engine option code label affixed to the rocker arm cover. These codes indicate which of the engine options were installed on your engine at the factory. When in need of parts or service, furnish your authorized servicing dealer or engine distributor with these numbers.

NOTE: Your engine option code label may not contain all option codes if an option has been added after the engine left the producing factory.

If option code label is lost or destroyed, consult your servicing dealer or engine distributor selling the engine for a replacement.

The engine option code label includes an engine base code (A). This base code must also be recorded along with the option codes.

Engine Base Code: _____

The first two digits of each code identify a specific group, such as alternators. The last two digits of each code identify one specific option provided on your engine, such as a 12-volt, 55-amp alternator.

NOTE: These option codes are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

If an engine is ordered without a particular component, the last two digits of that functional group option code will be 99, 00, or XX. The list on the next page shows only the first two digits of the code numbers. For future reference such as ordering repair parts, it is important to have these code numbers available. To ensure this availability, enter the third and fourth digits shown on your engine option code label in the spaces provided on the following page.

Record Keeping

| Option Codes | Description | Option Codes | Description |
|--------------|-----------------------------------|--------------|---|
| 11_____ | Rocker Arm Cover | 45_____ | Balancer Shaft |
| 12_____ | Oil Fill Inlet | 46_____ | Cylinder Block With Liners and Camshaft |
| 13_____ | Crankshaft Pulley | 47_____ | Crankshaft and Bearings |
| 14_____ | Flywheel Housing | 48_____ | Connecting Rods and Pistons |
| 15_____ | Flywheel | 49_____ | Valve Actuating Mechanism |
| 16_____ | Fuel Injection Pump | 50_____ | Oil Pump |
| 17_____ | Air Inlet | 51_____ | Cylinder Head With Valves |
| 18_____ | Air Cleaner | 52_____ | Auxiliary Gear Drive |
| 19_____ | Oil Pan | 55_____ | Shipping Stand |
| 20_____ | Water Pump | 56_____ | Paint Option |
| 21_____ | Thermostat Cover | 57_____ | Water Pump Inlet |
| 22_____ | Thermostat | 59_____ | Oil Cooler |
| 23_____ | Fan Drive | 60_____ | Add-on Auxiliary Drive Pulley |
| 24_____ | Fan Belt | 62_____ | Alternator Mounting Bracket |
| 25_____ | Fan | 64_____ | Exhaust Elbow |
| 26_____ | Engine Coolant Heater | 65_____ | Turbocharger |
| 27_____ | Radiator | 66_____ | Temperature Switch |
| 28_____ | Exhaust Manifold | 67_____ | Electronic Tachometer Sensor |
| 29_____ | Ventilator System | 68_____ | Damper |
| 30_____ | Starting Motor | 69_____ | Engine Serial Number Plate |
| 31_____ | Alternator | 74_____ | Air Conditioner Compressor Mounting |
| 32_____ | Instrument Panel | 75_____ | Air Restriction Indicator |
| 33_____ | Tachometer | 76_____ | Oil Pressure Switch |
| 35_____ | Fuel Filter | 78_____ | Air Compressor |
| 36_____ | Front Plate | 81_____ | Water Separator |
| 37_____ | Fuel Transfer Pump | 86_____ | Fan Pulley |
| 39_____ | Thermostat Housing | 87_____ | Belt Tensioner |
| 40_____ | Oil Dipstick | 88_____ | Oil Filter |
| 41_____ | Belt-Driven Front Auxiliary Drive | 95_____ | Special Equipment (Factory Installed) |

Continued on next page

RG, RG34710, 5508 -19-20MAY96-2/3

Record Keeping

| Option Codes | Description | Option Codes | Description |
|--------------|------------------------------|--------------|-------------------------------------|
| 43_____ | Starting Aid | 97_____ | Special Equipment (Field Installed) |
| 44_____ | Timing Gear Cover With Gears | 98_____ | Shipping |

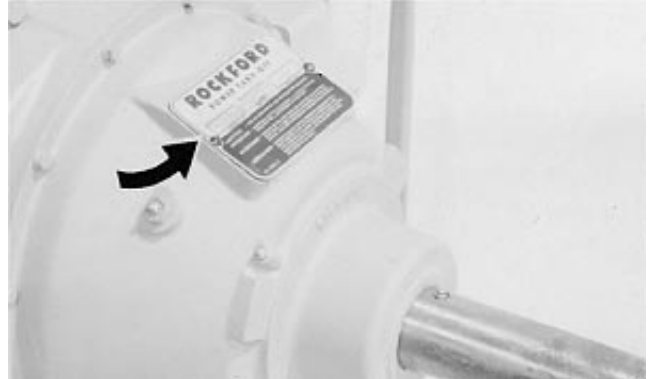
RG, RG34710, 5508 -19-20MAY96-3/3

Record PTO Serial Number

Serial number and model number are located on cover plate (arrow) of PTO housing. Record the numbers in the following spaces:

Serial Number

Model Number



RG, RG34710, 5510 -19-20MAY96-1/1

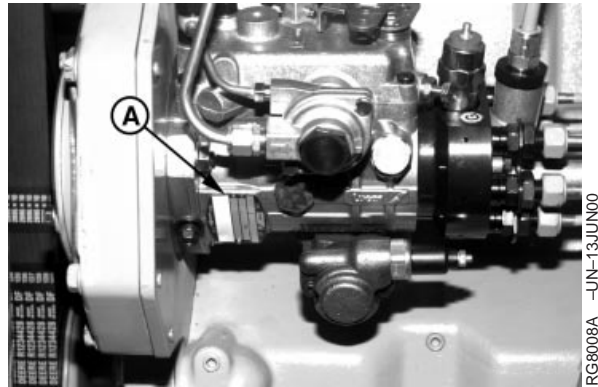
Record Fuel Injection Pump Model Number

Record the fuel injection pump model and serial information found on the serial number plate (A).

Model No. _____ RPM _____

Manufacturer's No. _____

Serial No. _____



RG, RG34710, 5511 -19-20MAY96-1/1

Safety

Recognize Safety Information

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.



DX,ALERT -19-29SEP98-1/1

TS1389 -UN-07DEC88

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.



DX,SIGNAL -19-03MAR93-1/1

TS187 -19-30SEP88

Follow Safety Instructions

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.



DX,READ -19-03MAR93-1/1

TS201 -UN-23AUG88

Replace Safety Signs

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



DX,SIGNS1 -19-04JUN90-1/1

TS201 -UN-23AUG88

Prevent Bypass Starting

Avoid possible injury or death from engine runaway.

Do not start engine by shorting across starter terminal. Engine will start with PTO engaged if normal circuitry is bypassed.

Start engine only from operator's station with PTO disengaged or in neutral.



RG,RG34710,7508 -19-30JUN97-1/1

RG5419 -UN-28FEB89

Handle Fuel Safely—Avoid Fires

Handle fuel with care: it is highly flammable. Do not refuel the machine while smoking or when near open flame or sparks.

Always stop engine before refueling machine. Fill fuel tank outdoors.

Prevent fires by keeping machine clean of accumulated trash, grease, and debris. Always clean up spilled fuel.



DX,FIRE1 -19-03MAR93-1/1

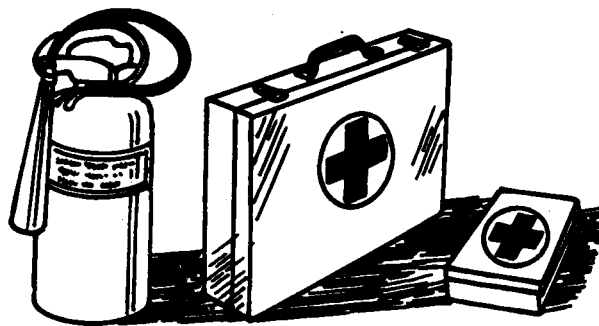
TS202 -UN-23AUG88

Prepare for Emergencies

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



TS291 -UN-23AUG88

DX,FIRE2 -19-03MAR93-1/1

Handle Starting Fluid Safely

Starting fluid is highly flammable.

Keep all sparks and flame away when using it. Keep starting fluid away from batteries and cables.

To prevent accidental discharge when storing the pressurized can, keep the cap on the container, and store in a cool, protected location.

Do not incinerate or puncture a starting fluid container.



TS1356 -UN-18MAR92

DX,FIRE3 -19-16APR92-1/1

Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure engine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



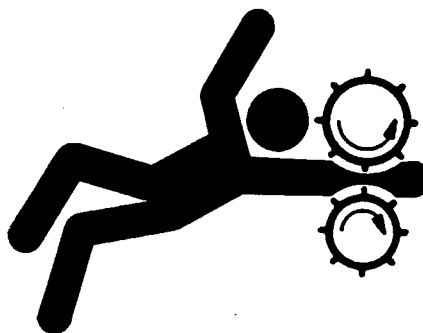
TS227 -UN-23AUG88

DX,FLAME -19-29SEP98-1/1

Service Engines Safely

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near engine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



TS228 -UN-23AUG88

DX,LOOSE -19-04JUN90-1/1

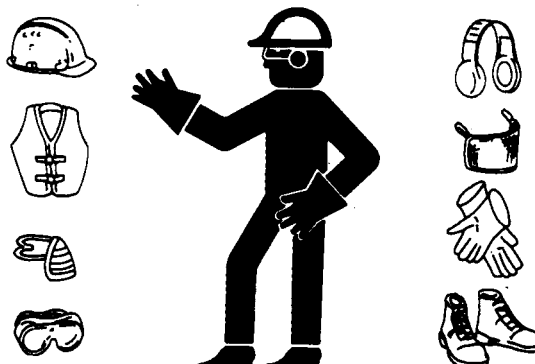
Wear Protective Clothing

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



TS206 -UN-23AUG88

DX,WEAR -19-10SEP90-1/1

Protect Against Noise

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



TS207 -UN-23AUG88

DX,NOISE -19-03MAR93-1/1

Handle Chemical Products Safely

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)



TS1132 -UN-26NOV90

DX,MSDS,NA -19-03MAR93-1/1

Stay Clear of Rotating Drivelines

Entanglement in rotating driveline can cause serious injury or death.

Keep master shield and driveline shields in place at all times. Make sure rotating shields turn freely.

Wear close fitting clothing. Stop the engine and be sure PTO driveline is stopped before making adjustments, connections, or cleaning out PTO driven equipment.



TS1644 -UN-22AUG95

DX,PTO -19-12SEP95-1/1

Practice Safe Maintenance

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

On self-propelled equipment, disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.



TS218 -UN-23AUG88

DX,SERV -19-17FEB99-1/1

Work In Ventilated Area

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area



TS220 -UN-23AUG88

DX,AIR -19-17FEB99-1/1

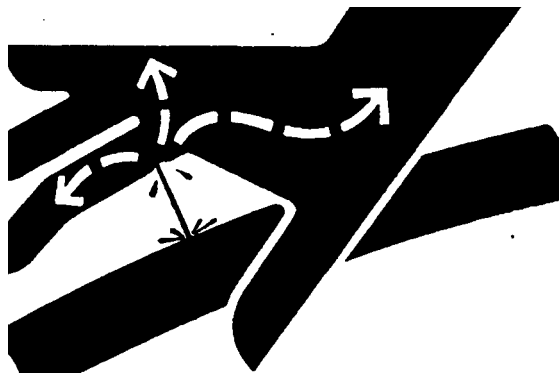
Avoid High-Pressure Fluids

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.



X9811 -UN-23AUG88

DX,FLUID -19-03MAR93-1/1

Avoid Heating Near Pressurized Fluid Lines

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area.



TS953 -UN-15MAY90

DX,TORCH -19-03MAR93-1/1

Remove Paint Before Welding or Heating

Avoid potentially toxic fumes and dust.

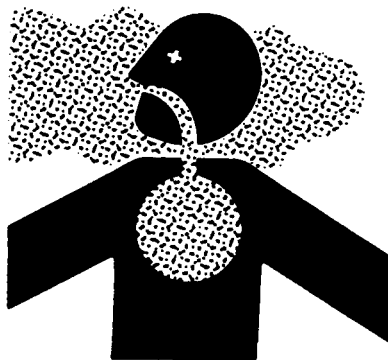
Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Remove paint before heating:

- Remove paint a minimum of 76 mm (3 in.) from area to be affected by heating.
- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

Do all work in an area that is ventilated to carry toxic fumes and dust away.

Dispose of paint and solvent properly.



TS220 -JUN-23AUG88

DX,PAINT -19-22OCT99-1/1

Service Cooling System Safely

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



TS281 -JUN-23AUG88

DX,RCAP -19-04JUN90-1/1

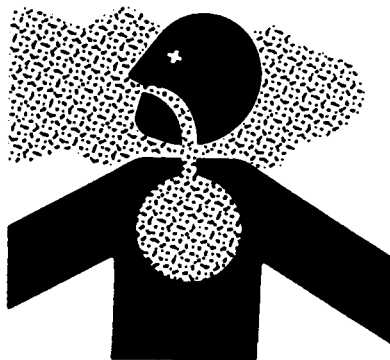
Avoid Harmful Asbestos Dust

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates, and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos.

Keep bystanders away from the area.



TS220 -JUN-23AUG88

DX,DUST -19-15MAR91-1/1

Prevent Battery Explosions

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).



TS204 -JUN-23AUG88

DX,SPARKS -19-03MAR93-1/1

Prevent Acid Burns

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

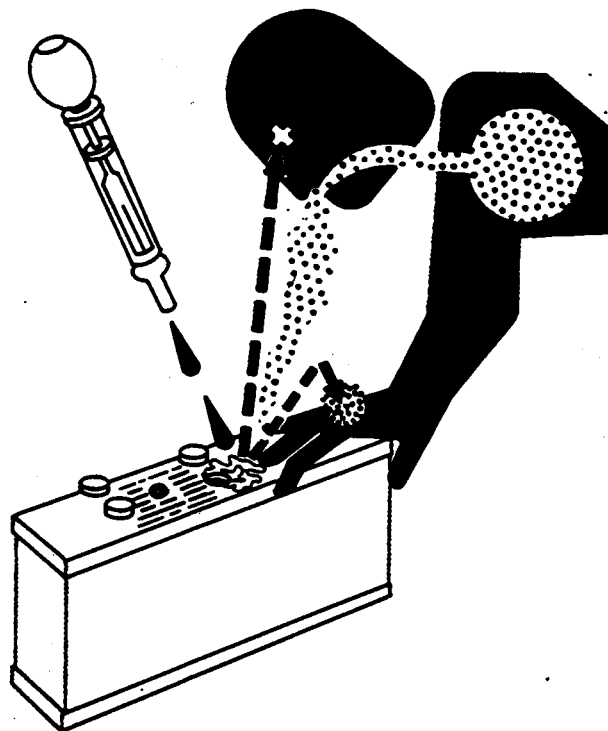
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 quarts).
3. Get medical attention immediately.



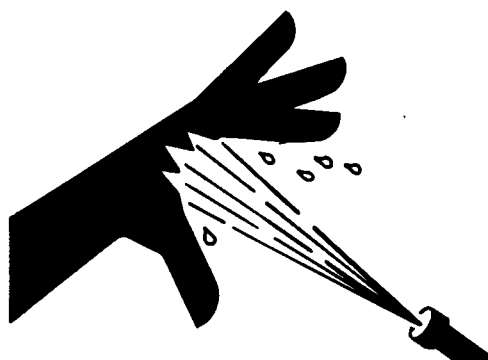
TS203 -UN-23AUG88

DX,POISON -19-21APR93-1/1

Protect Against High Pressure Spray

Spray from high pressure nozzles can penetrate the skin and cause serious injury. Keep spray from contacting hands or body.

If an accident occurs, see a doctor immediately. Any high pressure spray injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.



TS1343 -UN-18MAR92

DX,SPRAY -19-16APR92-1/1

Dispose of Waste Properly

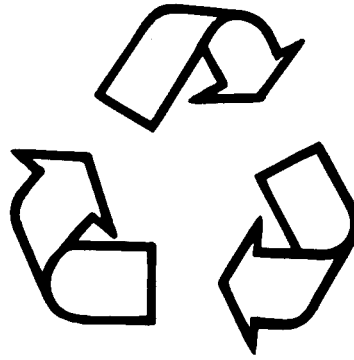
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.



TS1133 -UN-26NOV90

DX,DRAIN -19-03MAR93-1/1

Fuels, Lubricants, and Coolant

Diesel Fuel

Consult your local fuel distributor for properties of the diesel fuel available in your area.

In general, diesel fuels are blended to satisfy the low temperature requirements of the geographical area in which they are marketed.

Diesel fuels specified to EN 590 or ASTM D975 are recommended.

In all cases, the fuel shall meet the following properties:

Cetane number of 40 minimum. Cetane number greater than 50 is preferred, especially for temperatures below -20°C (-4°F) or elevations above 1500 m (5000 ft).

Cold Filter Plugging Point (CFPP) below the expected low temperature OR **Cloud Point** at least 5°C (9°F) below the expected low temperature.

Fuel lubricity should pass a minimum of 3100 gram load level as measured by the BOCLE scuffing test.

Sulfur content:

- Sulfur content should not exceed 0.5%. Sulfur content less than 0.05% is preferred.
- If diesel fuel with sulfur content greater than 0.5% sulfur content is used, reduce the service interval for engine oil and filter by 50%.
- DO NOT use diesel fuel with sulfur content greater than 1.0%.

Bio-diesel fuels may be used ONLY if the fuel properties meet DIN 51606 or equivalent specification.

DO NOT mix used engine oil or any other type of lubricant with diesel fuel.

DX,FUEL1 -19-24JAN00-1/1

Lubricity of Diesel Fuel

Diesel fuel must have adequate lubricity to ensure proper operation and durability of fuel injection system components.

Diesel fuels for highway use in the United States and Canada require sulfur content less than 0.05%.

Diesel fuel in the European Union requires sulfur content less than 0.05%.

Experience shows that some low sulfur diesel fuels may have inadequate lubricity and their use may reduce performance in fuel injection systems due to inadequate lubrication of injection pump components. The lower concentration of aromatic compounds in these fuels also adversely affects injection pump seals and may result in leaks.

Use of low lubricity diesel fuels may also cause accelerated wear, injection nozzle erosion or corrosion, engine speed instability, hard starting, low power, and engine smoke.

Fuel lubricity should pass a minimum of 3100 gram load level as measured by the BOCLE scuffing test.

ASTM D975 and EN 590 specifications do not require fuels to pass a fuel lubricity test.

If fuel of low or unknown lubricity is used, add John Deere PREMIUM DIESEL FUEL CONDITIONER (or equivalent) at the specified concentration.

DX,FUEL5 -19-24JAN00-1/1

Diesel Fuel Storage

Proper fuel storage is critically important. Use clean storage and transfer tanks. Periodically drain water and sediment from bottom of tank. Store fuel in a convenient place away from buildings.

IMPORTANT: DO NOT store diesel fuel in galvanized containers. Diesel fuel stored in galvanized containers reacts with zinc coating on container to form zinc flakes. If fuel contains water, a zinc gel will also form. The gel and flakes will quickly plug fuel filters, damage injection nozzles and injection pump.

DO NOT use brass-coated containers for fuel storage. Brass is an alloy of copper and zinc.

Store diesel fuel in plastic, aluminum, and steel containers specially coated for diesel fuel storage.

Avoid storing fuel over long periods of time. If fuel is stored for more than a month prior to use, or there is a slow turnover in fuel tank or supply tank, add a fuel conditioner such as John Deere PREMIUM DIESEL FUEL CONDITIONER or equivalent to stabilize the fuel and prevent water condensation. John Deere PREMIUM DIESEL FUEL CONDITIONER is available in winter and summer formulas. Fuel conditioner also reduces fuel gelling and controls wax separation during cold weather.

Consult your John Deere engine distributor or servicing dealer for recommendations and local availability. Always follow manufacturer's directions on label.

RG, RG34710, 7526 -19-30JUN97-1/1

Filling Fuel Tank



CAUTION: Handle fuel carefully. Do not fill the fuel tank when engine is running.

DO NOT smoke while filling fuel tank or servicing fuel system.

IMPORTANT: The fuel tank is vented through the filler cap. If a new filler cap is required, always replace it with an original vented cap.

Fill fuel tank at the end of each day's operation to prevent condensation in tank. As moist air cools, condensation may form and freeze during cold weather.



TS202 -UN-23AUG88

RG, RG34710, 7527 -19-30JUN97-1/1

Minimizing the Effect of Cold Weather on Diesel Engines

John Deere diesel engines are designed to operate effectively in cold weather.

However, for effective starting and cold weather operation, a little extra care is necessary. The information below outlines steps that can minimize the effect that cold weather may have on starting and operation of your engine. See your authorized engine distributor or servicing dealer for additional information and local availability of cold weather aids.

Use Grade No. 1-D Fuel

When temperatures fall below 5°C (40°F), Grade No. 1-D fuel is best suited for cold weather operation. Grade No. 1-D fuel has a lower cloud point and a lower pour point.

Cloud point is the temperature at which wax will begin to form in the fuel and this wax causes fuel filters to plug. **Pour point** is the temperature at which fuel begins to thicken and becomes more resistant to flow through fuel pumps and lines.

NOTE: On an average, Grade No. 1-D fuel has a lower BTU (heat content) rating than Grade No. 2-D fuel. When using Grade No. 1-D fuel you may notice a drop in power and fuel efficiency, but should not experience any other engine performance effects. Check the grade of fuel being used before troubleshooting for low power complaints in cold weather operation.

Coolant Heaters

Engine block heaters (coolant) are an available option to aid cold weather starting.

Seasonal Viscosity Oil and Proper Coolant Concentration

Use seasonal grade viscosity engine oil based on expected air temperature range between oil changes

and a proper concentration of low silicate antifreeze as recommended. (See DIESEL ENGINE OIL and ENGINE COOLANT REQUIREMENTS later in this section).

Diesel Fuel Flow Additive

IMPORTANT: Treat fuel when outside temperature drops below 0°C (32°F). For best results, use with untreated fuel. Follow all recommended instructions on label.

Use John Deere Premium Diesel Fuel Conditioner (Winter) or equivalent to treat fuel during the cold weather season. This winter formulation is a combination diesel fuel conditioner and anti-gel additive.

Winterfronts

Use of fabric, cardboard, or solid winterfronts is not recommended with any John Deere engine. Their use can result in excessive engine coolant, oil, and charge air temperatures. This can lead to reduced engine life, loss of power and poor fuel economy. Winterfronts may also put abnormal stress on fan and fan drive components potentially causing premature failures.

If winterfronts are used, they should never totally close off the grill frontal area. Approximately 25% area in the center of the grill should remain open at all times. At no time should the air blockage device be applied directly to the radiator core.

Radiator Shutters

If equipped with a thermostatically controlled radiator shutter system, this system should be regulated in such a way that the shutters are completely open by the time the coolant reaches 93°C (200°F) to prevent excessive intake manifold temperatures. Manually controlled systems are not recommended.

If air-to-air aftercooling is used, the shutters must be completely open by the time the intake manifold air temperature reaches the maximum allowable temperature out of the charge air cooler.

For more information, see your John Deere engine distributor or servicing dealer.

RG, RG34710, 7529 -19-30JUN97-2/2

Diesel Engine Break-In Oil

New engines are filled at the factory with John Deere ENGINE BREAK-IN OIL. During the break-in period, add John Deere ENGINE BREAK-IN OIL as needed to maintain the specified oil level.

Change the oil and filter after the first 100 hours of operation of a new or rebuilt engine.

After engine overhaul, fill the engine with John Deere ENGINE BREAK-IN OIL.

If John Deere ENGINE BREAK-IN OIL is not available, use a diesel engine oil meeting one of the following during the first 100 hours of operation:

- API Service Classification CE

- ACEA Specification E1

After the break-in period, use John Deere PLUS-50® or other diesel engine oil as recommended in this manual.

IMPORTANT: Do not use PLUS-50 oil or engine oils meeting API CH-4, API CG4, API CF4, ACEA E3, or ACEA E2 performance levels during the first 100 hours of operation of a new or rebuilt engine. These oils will not allow the engine to break-in properly.

PLUS-50 is a registered trademark of Deere & Company.

DX, ENOIL4 -19-24JAN00-1/1

Diesel Engine Oil

Use oil viscosity based on the expected air temperature range during the period between oil changes.

The following oil is preferred:

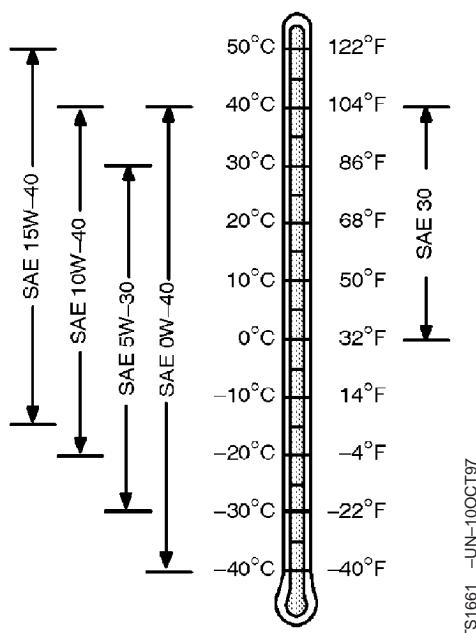
- John Deere PLUS-50®

The following oil is also recommended:

- John Deere TORQ-GARD SUPREME®

Other oils may be used if they meet one or more of the following:

- API Service Classification CH-4
- API Service Classification CG-4
- API Service Classification CF-4
- ACEA Specification E3
- ACEA Specification E2



Multi-viscosity diesel engine oils are preferred.

If diesel fuel with sulfur content greater than 0.5% is used, reduce the service interval by 50%.

Extended service intervals may apply when John Deere preferred engine oils are used. Consult your John Deere dealer for more information.

PLUS-50 is a registered trademark of Deere & Company.

TORQ-GARD SUPREME is a registered trademark of Deere & Company

DX,ENOIL -19-24JAN00-1/1

Extended Diesel Engine Oil Service Intervals

When John Deere PLUS-50® oil and the specified John Deere filter are used, the service interval for engine oil and filter changes may be increased by 50%.

If other than PLUS-50® oil and the specified John Deere filter are used, change the engine oil and filter at the normal service interval.

PLUS-50 is a trademark of Deere & Company

DX,ENOIL6 -19-10OCT97-1/1

Mixing of Lubricants

In general, avoid mixing different brands or types of oil. Oil manufacturers blend additives in their oils to meet certain specifications and performance requirements.

Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

Consult your John Deere engine distributor or servicing dealer to obtain specific information and recommendations.

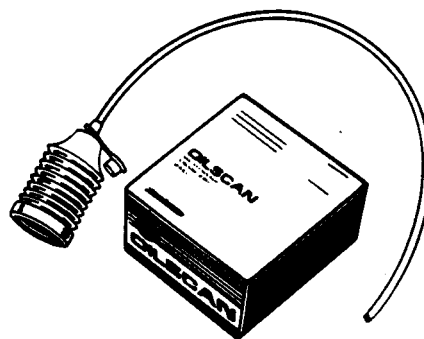
DX,LUBMIX -19-18MAR96-1/1

OILSCAN® and COOLSCAN™

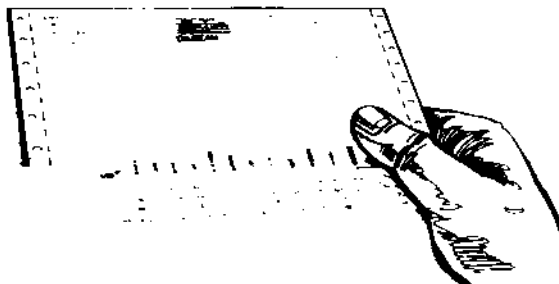
OILSCAN®, OILSCAN PLUS®, and COOLSCAN™ are John Deere sampling programs to help you monitor machine performance and identify potential problems before they cause serious damage.

Oil and coolant samples should be taken from each system prior to its recommended change interval.

Check with your John Deere engine distributor or servicing dealer for the availability of OILSCAN®, OILSCAN PLUS®, and COOLSCAN™ kits.



T6828AB -UN-15JUN89



T6829AB -UN-18OCT88

*OILSCAN is a registered trademark of Deere & Company.
COOLSCAN is a trademark of Deere & Company.
OILSCAN PLUS is a registered trademark of Deere & Company.*

DX,OILSCAN -19-16APR92-1/1

Alternative and Synthetic Lubricants

Conditions in certain geographical areas may require lubricant recommendations different from those printed in this manual.

Some John Deere brand coolants and lubricants may not be available in your location.

Consult your John Deere dealer to obtain information and recommendations.

Synthetic lubricants may be used if they meet the performance requirements as shown in this manual.

The temperature limits and service intervals shown in this manual apply to both conventional and synthetic oils.

Re-refined base stock products may be used if the finished lubricant meets the performance requirements.

DX,ALTER -19-15JUN00-1/1

Lubricant Storage

Your equipment can operate at top efficiency only when clean lubricants are used.

Use clean containers to handle all lubricants.

Whenever possible, store lubricants and containers in an area protected from dust, moisture, and other contamination. Store containers on their side to avoid water and dirt accumulation.

Make certain that all containers are properly marked to identify their contents.

Properly dispose of all old containers and any residual lubricant they may contain.

DX,LUBST -19-18MAR96-1/1

Grease

Use grease based on NLGI consistency numbers and the expected air temperature range during the service interval.

The following greases are preferred:

- John Deere SD POLYUREA GREASE

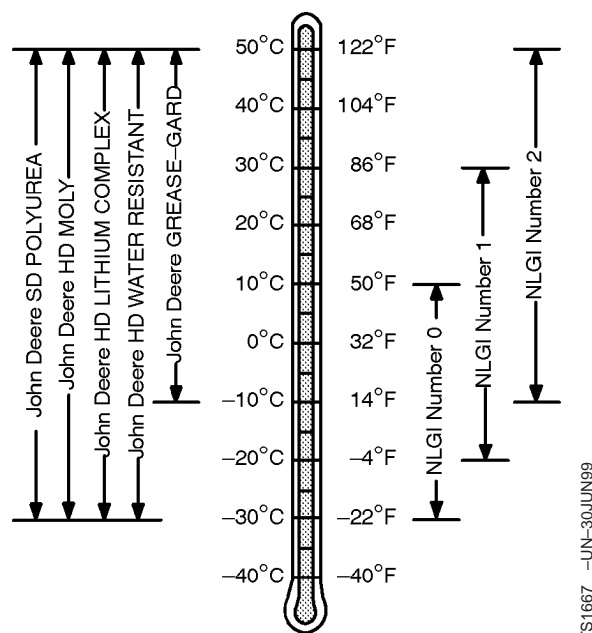
The following greases are also recommended:

- John Deere HD MOLY GREASE
- John Deere HD LITHIUM COMPLEX GREASE
- John Deere HD WATER RESISTANT GREASE
- John Deere GREASE-GARD

Other greases may be used if they meet the following:

- NLGI Performance Classification GC-LB

IMPORTANT: Some types of grease thickener are not compatible with others. Consult your grease supplier before mixing different types of grease.



DX, GREAS1 -19-24JAN00-1/1

Diesel Engine Coolant

The engine cooling system is filled to provide year-round protection against corrosion and cylinder liner pitting, and winter freeze protection to -37°C (-34°F).

The following engine coolant is preferred for service:

- John Deere COOL-GARD Prediluted Coolant

The following engine coolant is also recommended:

- John Deere COOL-GARD Coolant Concentrate in a 40 to 60% mixture of concentrate with quality water.

Other low silicate ethylene glycol base coolants for heavy-duty engines may be used if they meet one of the following specifications:

- ASTM D5345 (prediluted coolant)
- ASTM D4985 (coolant concentrate) in a 40 to 60% mixture of concentrate with quality water

Coolants meeting these specifications require use of supplemental coolant additives, formulated for heavy-duty diesel engines, for protection against corrosion and cylinder liner erosion and pitting.

A 50% mixture of ethylene glycol engine coolant in water provides freeze protection to -37°C (-34°F). If

protection at lower temperatures is required, consult your John Deere dealer for recommendations.

Water quality is important to the performance of the cooling system. Distilled, deionized, or demineralized water is recommended for mixing with ethylene glycol base engine coolant concentrate.

IMPORTANT: Do not use cooling system sealing additives or antifreeze that contains sealing additives.

Coolant Drain Intervals

Drain the factory fill engine coolant, flush the cooling system, and refill with new coolant after the first 3 years or 3000 hours of operation. Subsequent drain intervals are determined by the coolant used for service. At each interval, drain the coolant, flush the cooling system, and refill with new coolant.

When John Deere COOL-GARD is used, the drain interval may be extended to 5 years or 5000 hours of operation, provided that the coolant is tested annually AND additives are replenished, as needed, by adding a supplemental coolant additive.

If COOL-GARD is not used, the drain interval is reduced to 2 years or 2000 hours of operation.

DX,COOL3 -19-05FEB99-1/1

Diesel Engine Coolants, Supplemental Additive Information

Engine coolants are a combination of three chemical components: ethylene glycol (antifreeze), inhibiting coolant additives, and quality water.

Coolant Specifications

Some products, including John Deere COOL-GARD Prediluted Coolant, are fully formulated coolants that contain all three components in their correct concentrations. Do not add an initial charge of supplemental coolant additives to these fully formulated products.

Some coolant concentrates, including John Deere COOL-GARD Coolant Concentrate, contain both ethylene glycol antifreeze and inhibiting coolant additives. Mix these products and quality water, but do not add an initial charge of supplemental coolant additives.

Coolants meeting ASTM D5345 (prediluted coolant) or ASTM D4985 (coolant concentrate) require an initial charge of supplemental coolant additives.

Replenish Coolant Additives

The concentration of coolant additives is gradually depleted during engine operation. Periodic replenishment of inhibitors is required, even when John Deere COOL-GARD is used. Follow the recommendations in this manual for the use of supplemental coolant additives.

Why Use Supplemental Coolant Additives?

Operating without proper coolant additives will result in increased corrosion, cylinder liner erosion and pitting, and other damage to the engine and cooling system. A simple mixture of ethylene glycol and water will not give adequate protection.

Use of supplemental coolant additives reduces corrosion, erosion, and pitting. These chemicals reduce the number of vapor bubbles in the coolant and

help form a protective film on cylinder liner surfaces. This film acts as a barrier against the harmful effects of collapsing vapor bubbles.

Avoid Automotive-Type Coolants

Never use automotive-type coolants (such as those meeting ASTM D3306 or ASTM D4656). These coolants do not contain the correct additives to protect heavy-duty diesel engines. They often contain a high concentration of silicates and may damage the engine or cooling system.

Water Quality

Water quality is important to the performance of the cooling system. Distilled, deionized, or demineralized water is recommended for mixing with ethylene glycol base engine coolant concentrate. All water used in the cooling system should meet the following minimum specifications for quality:

| | |
|------------------------|------------|
| Chlorides | <40 mg/L |
| Sulfates | <100 mg/L |
| Total Dissolved Solids | <340 mg/L |
| Total Hardness | <170 mg/L |
| pH | 5.5 to 9.0 |

Freeze Protection

The relative concentrations of ethylene glycol and water in the engine coolant determine its freeze protection limit.

| Ethylene Glycol | Freeze Protection Limit |
|-----------------|-------------------------|
| 40% | -24°C (-12°F) |
| 50% | -37°C (-34°F) |
| 60% | -52°C (-62°F) |

DO NOT use a coolant-water mixture greater than 60% ethylene glycol.

Testing Diesel Engine Coolant

Maintaining adequate concentrations of glycol and inhibiting additives in the coolant is critical to protect the engine and cooling system against freezing, corrosion, and cylinder liner erosion and pitting.

Test the coolant solution at 600 hours or 12 month intervals or less and whenever excessive coolant is lost through leaks or overheating.

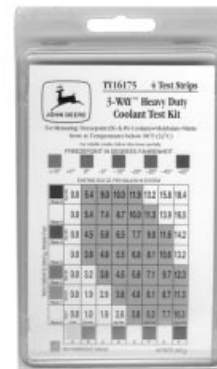
Coolant Test Strips

Coolant test strips are available from your John Deere engine distributor or servicing dealer. These test strips provide a simple, effective method to check the freeze point and additive levels of your engine coolant.

Compare the results to the supplemental coolant additive (SCA) chart to determine the amount of inhibiting additives in your coolant and whether more John Deere COOLANT CONDITIONER should be added.

COOLSCAN™

For a more thorough evaluation of your coolant, perform a COOLSCAN analysis. See your John Deere engine distributor or servicing dealer for information about COOLSCAN.



RG7297 -UN-22SEP99

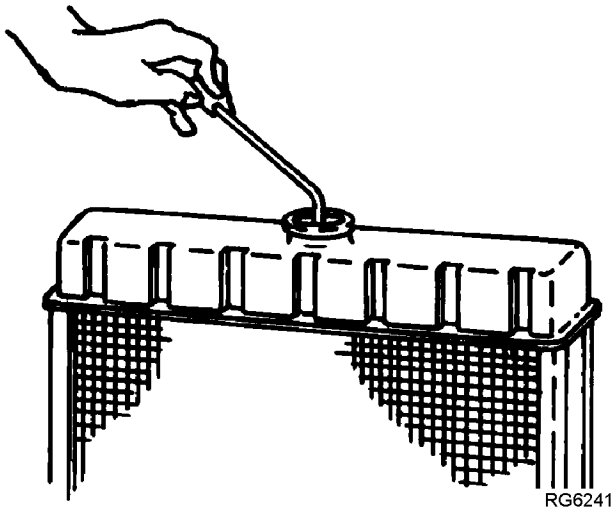


RG7397 -UN-05DEC97

COOLSCAN is a trademark of Deere & Company

DX.COOL9 -19-17FEB99-1/1

Replenishing Supplemental Coolant Additives (SCAs) Between Coolant Changes



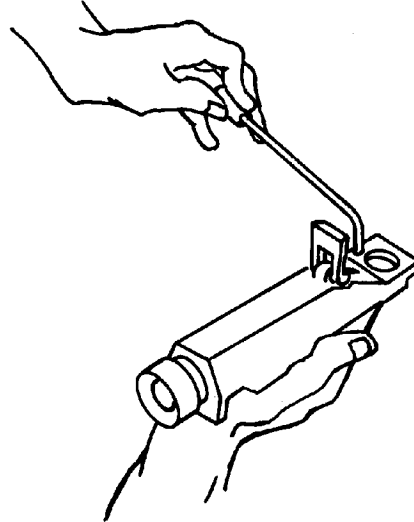
IMPORTANT: Do not add supplemental coolant additives when the cooling system is drained and refilled with John Deere Cool-Gard.

Through time and use, the concentration of coolant additives is gradually depleted during engine operation. Periodic replenishment of inhibitors is required, even when John Deere COOL-GARD is used. The cooling system must be recharged with additional supplemental coolant additives available in the form of liquid coolant conditioner.

Maintaining the correct coolant conditioner concentration (SCAs) and freeze point is essential in your cooling system to protect against rust, liner pitting and corrosion, and freeze-ups due to incorrect coolant dilution.

John Deere COOLANT CONDITIONER is recommended as a supplemental coolant additive in John Deere engines.

Test the coolant solution at 600 hours or 12 months of operation using either John Deere coolant test strips or a COOLSCAN analysis. If a COOLSCAN analysis is not available, recharge system per instructions printed on label of John Deere COOLANT CONDITIONER.



IMPORTANT: ALWAYS maintain coolant at correct level and concentration. DO NOT operate engine without coolant for even a few minutes.

If frequent coolant makeup is required, the glycol concentration should be checked with JT07298 Coolant/Battery to assure that the desired freeze point is maintained. Follow manufacturer's instructions provided with Coolant/Battery.

Add the manufacturer's recommended concentration of supplemental coolant additive. DO NOT add more than the recommended amount.

The use of non-recommended supplemental coolant additives may result in additive drop-out and gelation of the coolant.

If other coolants are used, consult the coolant supplier and follow the manufacturer's recommendation for use of supplemental coolant additives.

See ENGINE COOLANT SPECIFICATIONS earlier in this section for proper mixing of coolant ingredients before adding to the cooling system.

Operating in Warm Temperature Climates

John Deere engines are designed to operate using glycol base engine coolants.

Always use a recommended glycol base engine coolant, even when operating in geographical areas where freeze protection is not required.

IMPORTANT: Water may be used as coolant *in emergency situations only*.

Foaming, hot surface aluminum and iron corrosion, scaling, and cavitation will occur when water is used as the coolant, even when coolant conditioners are added.

Drain cooling system and refill with recommended glycol base engine coolant as soon as possible.

DX,COOL6 -19-18MAR96-1/1

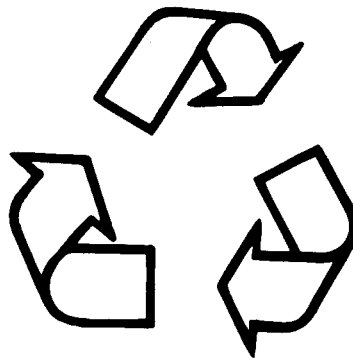
Disposing of Coolant

Improperly disposing of engine coolant can threaten the environment and ecology.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere engine distributor or servicing dealer.



TS1133 -UN-26NOV90

RG,RG34710,7543 -19-30JUN97-1/1

Engine Operating Guidelines

Instrument (Gauge) Panels

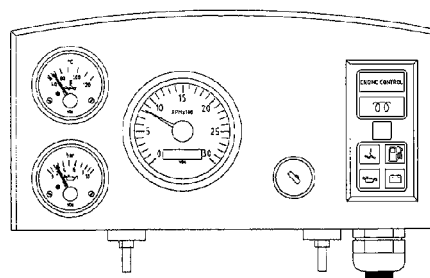
All controls and gauges are optional equipment for John Deere OEM Engines. They may be provided by the equipment manufacturer instead of John Deere. The following information applies only to those controls and gauges provided by John Deere.

IMPORTANT: Any time an electric gauge or meter does not register correctly, replace it with a new one. Do not attempt to repair it.

Two types of instrument panels are offered on 4.5 L and 6.8 L engines, as shown on this page. See following for complete information on each type of instrument panel.



North American Instrument Panel



VDO Instrument Panel (Except North America)

RG11299 -JUN-12SEP00

RG10606A -JUN-19JUN00

DPSG, RG34710, 107 -19-18OCT99-1/1

Instrument (Gauge) Panel (North America)

All controls and gauges are optional equipment for John Deere OEM Engines. They may be provided by the equipment manufacturer instead of John Deere. The following information applies only to those controls and gauges provided by John Deere.

IMPORTANT: Any time an electric gauge or meter does not register correctly, replace it with a new one. Do not attempt to repair it.

Following is a brief description of the components on the instrument (gauge) panel:

A—Oil Pressure Gauge - This gauge indicates oil pressure. It also has an adjustable electrical contact which activates the safety switch when oil pressure goes below the pressure set point. This will automatically stop the engine.

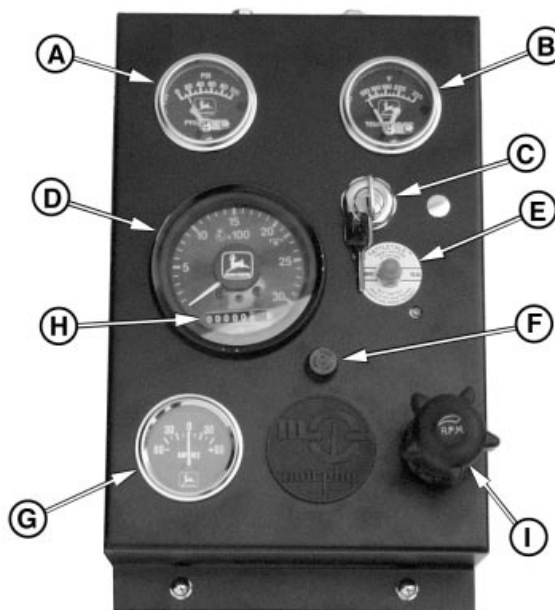
B—Coolant Temperature Gauge - This gauge indicates coolant temperature. It also has an electrical contact which activates the safety switch when coolant temperature goes above the temperature set point. This will automatically stop the engine.

C—Key Switch - The key switch is used to start and stop the engine. A key is required to operate the switch so as to prevent unauthorized operation of the engine.

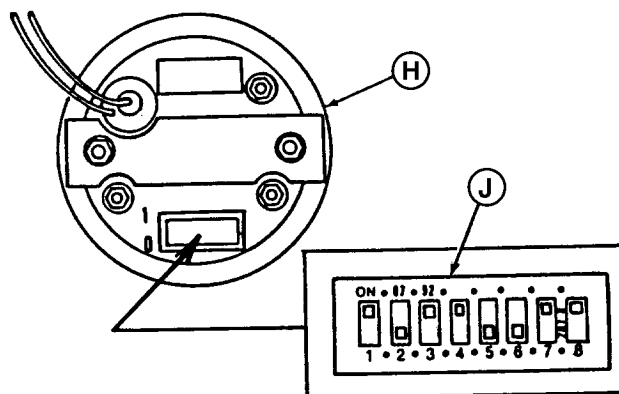
D—Tachometer - The tachometer indicates engine speed in hundreds of revolutions per minute (rpm).

E—Safety Switch (Reset Button) - The safety switch de-energizes the fuel shut-off solenoid or injection rack puller to stop the engine, if one or more conditions are met:

- Low or no oil pressure
- High coolant temperature
- Low crankcase oil level (if equipped with engine oil level switch)
- High crankcase oil level (if equipped with engine oil level switch)



RG11299B -UN-17AUG00



RG10607 -UN-19OCT99

- A—Oil Pressure Gauge
- B—Coolant Temperature Gauge
- C—Key Switch
- D—Tachometer
- E—Reset (Safety) Switch
- F—Fuse Holder (14 Amp Fuse)
- G—Ammeter
- H—Hourmeter
- I—Hand Throttle
- J—Tachometer Binary Code

Continued on next page

DPSG.RG34710,108 -19-19OCT99-1/2

The reset button has to be held in when starting the engine. The button allows the safety switch to override the shut-down circuits until safe engine oil pressure is maintained. Once engine oil pressure is within specifications, the safety switch will latch and the reset button can be released.

F—Fuse Holder - Contains 14 amp fuse.

G—Ammeter - The ammeter indicates the rate of charge (+) or discharge (—) of the battery. When the engine is first started, the ammeter will usually indicate a charge rate of approximately 30 amps. After a short period of operation, the ammeter needle will point slightly to the right of “0”, indicating the charging system is operating normally. A problem with the charging system is indicated if the ammeter needle points to the left of “0” during engine operation.

H—Hour Meter - The hour meter operates when the engine is operating, or when the reset button is manually held in while the key switch is in the ON position. The accumulated hours are displayed in hours and tenths of hours. On some panels, the hourmeter may be separate from the tachometer.

I—Hand Throttle - The hand throttle is used to manually control engine speed. If the hand throttle is electronic (as shown), turn the knob clockwise or counterclockwise to change engine speed. If the hand throttle is mechanical (not shown), turning the handle, either clockwise or counterclockwise, will lock the throttle position. Turn the handle half way between the two lock positions to unlock the throttle.

J—Tachometer Binary Code - The tachometer is calibrated to the number of flywheel gear teeth read. The dip switch to set the binary code is located in back of tachometer and must be set at “10110011” to operate at 30 pulses per revolution.

DPSG,RG34710,108 -19-19OCT99-2/2

VDO Instrument (Gauge) Panel (Except North America)

All controls and gauges are optional equipment for John Deere OEM Engines. They may be provided by the equipment manufacturer instead of John Deere. The following information applies only to those controls and gauges provided by John Deere.

IMPORTANT: Any time an electric gauge or meter does not register correctly, replace it with a new one. Do not attempt to repair it.

Following is a brief description of the components on the instrument (gauge) panel:

A—Oil Pressure Gauge - The oil pressure gauge indicates engine oil pressure.

B—Coolant Temperature Gauge - The coolant temperature gauge indicates coolant temperature.

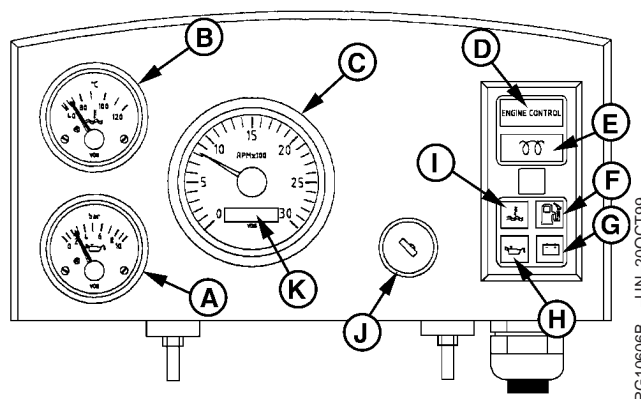
C—Tachometer - The tachometer indicates engine speed in hundreds of revolutions per minute (rpm).

The engine control system consists of the following:

D—Engine Control Light - The engine control light illuminates after the engine has started and oil pressure is up to specification. The light indicates that the engine protection circuitry is activated.

E—Preheater Light - The preheater light illuminates when the key is turned to the bulb test position (position I). It should go off after approximately five seconds. When the key switch is held in position II, the engine preheater is energized and the preheater light illuminates.

F—Fuel Level Light - The fuel level light illuminates when the key is turned to the bulb test position (position I). It should go off after approximately five seconds. After the engine is running, if the engine runs out of fuel, the light will illuminate and protection circuitry will stop the engine. The fuel level light will remain on indicating the engine was stopped due to the fuel tank being empty.



- A—Oil Pressure Gauge
- B—Coolant Temperature Gauge
- C—Tachometer
- D—Engine Control Light
- E—Preheater Light
- F—Fuel Level Light
- G—Battery Light
- H—Oil Pressure Light
- I—Coolant Temperature Light
- J—Key/Start Switch
- K—Hour Meter

G—Battery Light - The battery light illuminates when the key is turned to the bulb test position (position I). It should go off after approximately five seconds. After the engine is running, if the alternator stops charging, the light will illuminate and protection circuitry will stop the engine. The battery light will remain on indicating the engine was stopped due to the alternator not charging.

H—Oil Pressure Light - The oil pressure light illuminates when the key switch is turned to the bulb test position (position I). The light will remain on until the engine is started and the specified oil pressure is reached. If oil pressure is lost during engine operation, the light will illuminate and protection circuitry will stop the engine. The oil pressure light will remain on, indicating that the engine was stopped due to a low oil pressure condition.

I—Coolant Temperature Light - The coolant temperature light illuminates when the key is turned to the bulb test position (position I). It should go off after approximately five seconds. After the engine is running, if the engine overheats, the light will illuminate and protection circuitry will stop the engine. The coolant temperature light will remain on indicating the engine was stopped due to the engine overheating.

Other components on the instrument panel:

J—Key/Start Switch - The four-position key start switch controls the electrical system.

K—Hour Meter - The hour meter is an integral part of the tachometer. It shows the accumulated hours of engine service. The hour meter operates when the engine is running and accumulated hours are displayed in hours and tenths of hours.

DPSG,RG34710,109 -19-20OCT99-2/2

Normal Engine Operation

Observe engine coolant temperature and engine oil pressure. Temperatures and pressures will vary between engines and with changing operating conditions, temperatures, and loads.

Normal engine coolant operating temperature range is 82°—94°C (180°—202°F). If coolant temperature rises above 112°C (234°F), reduce load on engine. Unless temperature drops quickly, stop engine and determine cause before resuming operation.

Operate the engine under a lighter load and at slower than normal speed for first 15 minutes after start-up. DO NOT run engine at slow idle.

IMPORTANT: Should the engine die while operating under load, immediately

remove load and restart the engine. Overheating of the turbocharger parts may occur when oil flow is stopped.

Stop engine immediately if there are any signs of part failure. Symptoms that may be early signs of engine problems are:

- Sudden drop in oil pressure
- Abnormal coolant temperatures
- Unusual noise or vibration
- Sudden loss of power
- Excessive black exhaust
- Excessive fuel consumption
- Excessive oil consumption
- Fluid leaks

RG, RG34710, 5552 -19-20MAY96-1/1

Break-In Service

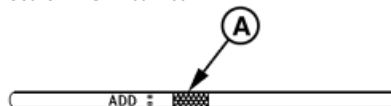
The engine is ready for normal operation. However, extra care during the first 100 hours of operation will result in more satisfactory long-term engine performance and life. DO NOT exceed 100 hours of operation with break-in oil.

1. This engine is factory-filled with John Deere ENGINE BREAK-IN OIL. Operate the engine at heavy loads with minimal idling during the break-in period.
2. If the engine has significant operating time at idle, constant speeds, and/or light load usage, or makeup oil is required in the first 100 hour period, a longer break-in period may be required. In these situations, an additional 100 hour break-in period is recommended using a new change of John Deere ENGINE BREAK-IN OIL and a new John Deere oil filter.



RG8009 -UN-06/JAN99

RG8028A -UN-15/JAN99

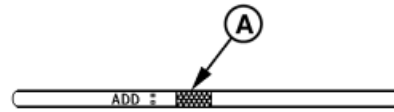


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RG, RG34710, 5553 -19-20MAY96-1/4

RG8028A -UN-15JAN99

IMPORTANT: DO NOT add makeup oil until the oil level is **BELOW** the **ADD** mark on dipstick. John Deere **ENGINE BREAK-IN OIL (TY22041)** should be used to make up any oil consumed during the break-in period.



3. Check engine oil level more frequently during engine break-in period. If oil must be added during this period, John Deere **ENGINE BREAK-IN OIL** is preferred. See **ENGINE BREAK-IN OIL**, in **Fuels, Lubricants, and Coolant Section**.

IMPORTANT: DO NOT use **PLUS-50® Engine Oil** during the break-in period of a new engine or engine that has had a major overhaul. **PLUS-50®** oil will not allow a new or overhauled engine to properly wear during this break-in period.

DO NOT fill above the crosshatch pattern (A) or the **FULL** mark, whichever is present. Oil levels anywhere within the crosshatch are considered in the acceptable operating range.

Specification

| | |
|--|---------------------------------|
| Engine ¹ Oil Pressure at Full Load..... | 345 ± 103 kPa (3.45 ± 1.03 bar) |
| Rated Speed | (50 ± 15 psi) |
| Minimum Oil Pressure at Rated..... | 275 (2.75 bar) (40 psi) |
| Speed | |
| Minimum Oil Pressure at 850 rpm | 105 kPa (1.05 bar) (15 psi) |
| Coolant Temperature Range..... | 82°–94°C (180°–202°F) |

PLUS-50 is a trademark of Deere & Company.

¹At normal operating temperature of 115°C (240°F) sump.

Continued on next page

RG, RG34710, 5553 -19-20MAY96-2/4

4. During the first 20 hours, avoid prolonged periods of engine idling or sustained maximum load operation. If engine will idle longer than 5 minutes, stop engine.
5. Before the first 100 hours (maximum), change engine oil and replace engine oil filter (A). (See CHANGING ENGINE OIL AND REPLACING OIL FILTER in Lubrication and Maintenance/Engine Oil Section.) Fill crankcase with seasonal viscosity grade oil. (See DIESEL ENGINE OIL, in Fuels, Lubricants, and Coolant Section.)



RG7961B -UN-22JAN99

NOTE: Some increase in oil consumption may be expected when low viscosity oils are used. Check oil levels more frequently.

If air temperature is below -10°C (14°F), use an engine block heater.

RG, RG34710, 5553 -19-20MAY96-3/4

6. Watch coolant temperatures (A) closely. If coolant temperature rises above 112°C (234°F), reduce load on engine. Unless temperature drops quickly, stop the engine and determine the cause before resuming operation.

NOTE: When the coolant temperature gauge reads approximately 115°C (239°F), the engine will shutdown automatically, if equipped with safety controls.

7. Check poly-vee belt for proper alignment and seating in pulley grooves.



RG11299F -UN-17AUG00

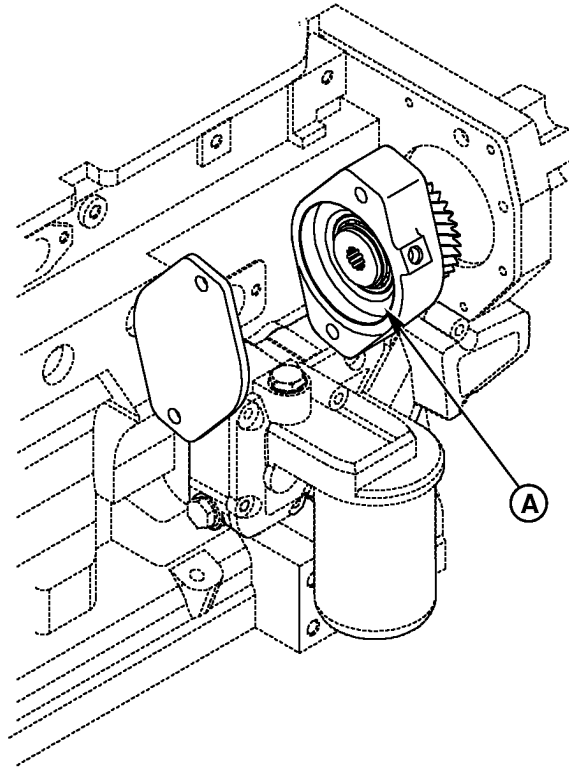
North American (1999—) Instrument Panel Shown

RG, RG34710, 5553 -19-20MAY96-4/4

Auxiliary Gear Drive Limitations

IMPORTANT: When attaching an air compressor, hydraulic pump, or other accessory to be driven by the auxiliary gear drive (A) (engine timing gear train at front of engine), power requirements of the accessory must be limited to values listed below:

- 30 kW (40 hp) Continuous Operation at 2500 rpm
- 37 kW (50 hp) Intermittent Operation at 2500 rpm



RG7634A -JUN-22JAN99

RG, RG34710, 5555 -19-20MAY96-1/1

Generator Set (Standby) Applications

To assure that your engine will deliver efficient standby operation when needed, start engine and run at rated speed (with 50%—70% load) for 30 minutes every 2 weeks. DO NOT allow engine to run extended period of time with no load.

RG, RG34710, 5556 -19-20MAY96-1/1

Starting the Engine

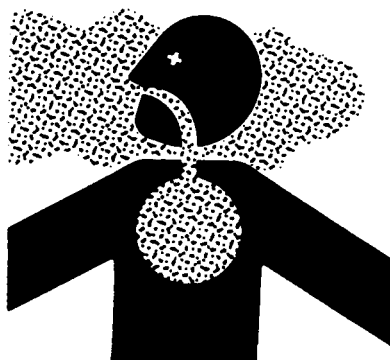
The following instructions apply to the optional controls and instruments available through the John Deere Parts Distribution Network. The controls and instruments for your engine may be different from those shown here; always follow manufacturer's instructions.



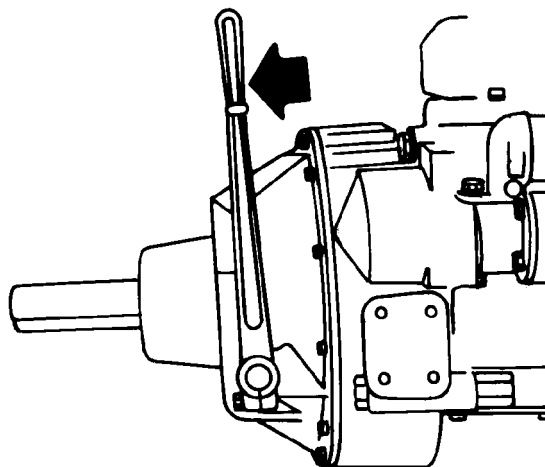
CAUTION: Before starting engine in a confined building, install proper outlet exhaust ventilation equipment. Always use safety approved fuel storage and piping.

NOTE: If temperature is below 0°C (32°F), it may be necessary to use cold weather starting aids (See *COLD WEATHER OPERATION*, later in this section).

1. Perform all prestarting checks outlined in Lubrication & Maintenance/Daily Section later in this manual.
2. Open the fuel supply shut-off valve, if equipped.
3. If equipped with PTO clutch, pull lever (arrow) rearward (away from engine) to disengage PTO clutch.



TS220 -UN-23AUG88



RG5602 -UN-16JUN00

Continued on next page

RG, RG34710, 5557 -19-20MAY96-1/2

4. Electronically controlled governor applications may be equipped with a rotary speed potentiometer on instrument panel.

On mechanical governor (7–10 % regulation) engines, pull hand throttle (A) 1/3 of the way out. Turn the handle in either direction to lock it in place.

5. If equipped, depress and hold reset button (B) while starting.

IMPORTANT: Do not operate the starter for more than 30 seconds at a time. To do so may overheat the starter. If the engine does not start the first time, wait at least 2 minutes before trying again. If engine does not start after four attempts, see Troubleshooting Section.

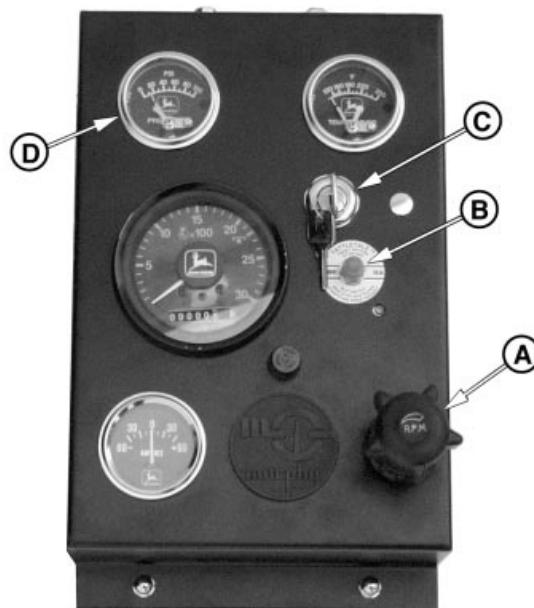
6. Turn the key switch (C) clockwise to crank the engine. When the engine starts, release the key so that it returns to the "ON" position.

IMPORTANT: If the key switch is released before the engine starts, wait until the starter and the engine stop turning before trying again. This will prevent possible damage to the starter and/or flywheel.

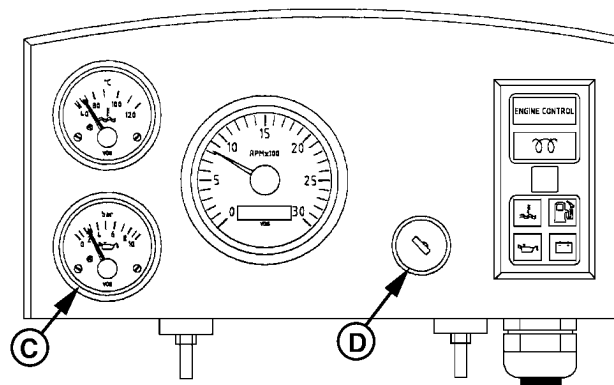
7. After the engine starts, continue to hold the reset button in until the oil pressure gauge (D) reads at least 105kPa (1.05 bar) (15 psi). The safety controls will not allow the engine to run at a lower oil pressure unless the reset button is held in.

IMPORTANT: Should the engine die when operating under load, immediately disengage PTO clutch and restart the engine. Overheating of turbocharger parts may occur when oil flow is stopped.

8. Check all gauges for normal engine operation. If operation is not normal, stop the engine and determine the cause.



North American (1999—) Instrument Panel



VDO Instrument Panel (Except North America)

- A—Hand Throttle
- B—Reset Button
- C—Key Start Switch
- D—Oil Pressure Gauge

RG11299G –UN-08SEP00

RG10611 –UN-21OCT99

Cold Weather Operation

Additional information on cold weather operation is available from your engine distributor or authorized servicing dealer.

Some engines are equipped with an air intake heater which will make starting the engine easier in cold weather. If equipped, follow steps 1–4 as listed under STARTING THE ENGINE, earlier in this section. Switch on the air intake heater for 30 seconds and then proceed to operate the starter. Follow remaining steps 5–8.



CAUTION: Starting fluid is highly flammable. DO NOT use starting fluid on engines equipped with air intake heaters.

DO NOT use starting fluid near fire, sparks, or flames. DO NOT incinerate or puncture a starting fluid container.



TS1356 –UN–18MAR92

RG, RG34710, 5559 –19–20MAY96–1/1

Warming Engine

IMPORTANT: To assure proper lubrication, operate engine at or below 1200 rpm with no load for 1–2 minutes. Extend this period 2–4 minutes when operating at temperatures below freezing.

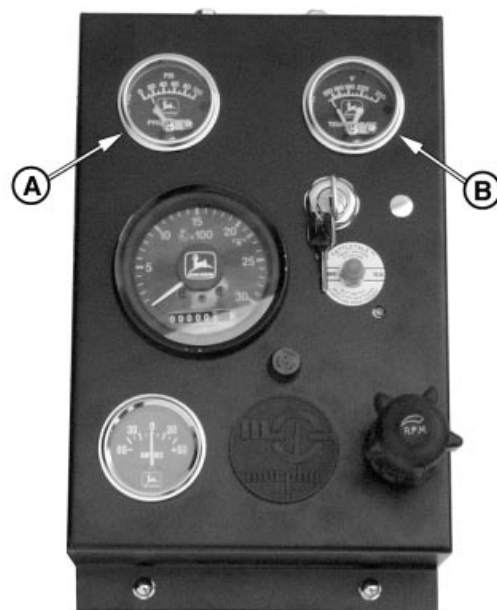
Engines used in generator set applications where the governor is locked at a specified speed may not have a slow idle function. Operate these engines at high idle for 1 to 2 minutes before applying the load. This procedure does not apply to standby generator sets where the engine is loaded immediately upon reaching rated speed.

1. Check oil pressure gauge (A) as soon as engine starts. If gauge needle does not rise above minimum oil pressure specification of 105 kPa (1.05 bar) (15.0 psi) within 5 seconds, stop the engine and determine the cause. Normal engine oil pressure is 345 kPa (3.45 bar) (50 psi) at rated full load speed (1800–2500 rpm) with oil at normal operating temperature of 115°C (240°F).

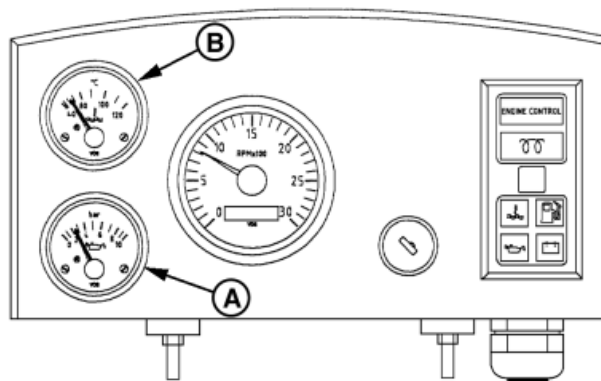
NOTE: On certain engines, the oil pressure and coolant temperature gauges are replaced by indicator warning lights. The lights must be "OFF" when engine is running.

2. Watch coolant temperature gauge (B). Do not place engine under full load until it is properly warmed up. The normal engine coolant temperature range is 82°–94°C (180°–202°F).

NOTE: It is a good practice to operate the engine under a lighter load and at lower speeds than normal for the first few minutes after start-up.



North American Instrument Panel



VDO Instrument Panel (Except North America)

A—Oil Pressure Gauge
B—Coolant Temperature Gauge

RG11299H –JUN-11SEP00

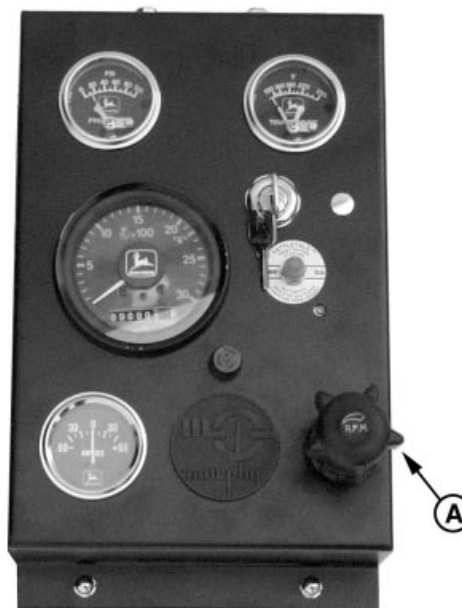
RG10613 –JUN-21OCT99

RG, RG34710, 5560 –19–20MAY96–1/1

Changing Engine Speed—Standard (Mechanical) Governor

To increase engine speed, turn handle (A), if equipped, to the horizontal position and pull out until desired engine speed is obtained. Turn the handle in either direction to lock throttle position. The handle is pushed inward to decrease engine speed.

NOTE: On engines without handle, use throttle lever to control engine speed.



North American Instrument Panel Shown

RG112991 -UN-11SEP00

RG, RG34710, 5561 -19-20MAY96-1/1

Avoid Excessive Engine Idling

Prolonged idling may cause the engine coolant temperature to fall below its normal range. This, in turn, causes crankcase oil dilution, due to incomplete fuel combustion, and permits formation of gummy deposits on valves, pistons, and piston rings. It also promotes rapid accumulation of engine sludge and unburned fuel in the exhaust system.

Once an engine is warmed to normal operating temperatures, engine should be idled at slow idle

speed. Slow idle speed for this engine is 850 rpm at factory. If an engine will be idling for more than 5 minutes, stop and restart later.

NOTE: Generator set applications where the governor is locked at a specified speed may not have a slow idle function. These engines will idle at no load governed speed (high idle).

RG, RG34710, 5562 -19-20MAY96-1/1

Stopping the Engine

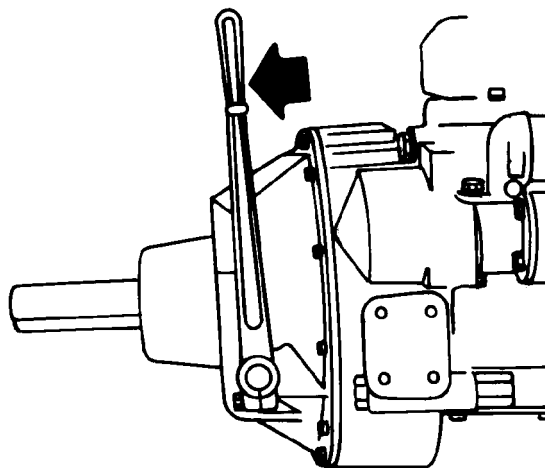
1. Pull PTO clutch lever (arrow) rearward (away from engine) to disengage clutch, if equipped.
2. Move the throttle lever (A) to slow idle on standard (mechanical) governor engines.

IMPORTANT: Before stopping an engine that has been operating at working load, idle engine at least 2 minutes at 1000–1200 rpm to cool hot engine parts.

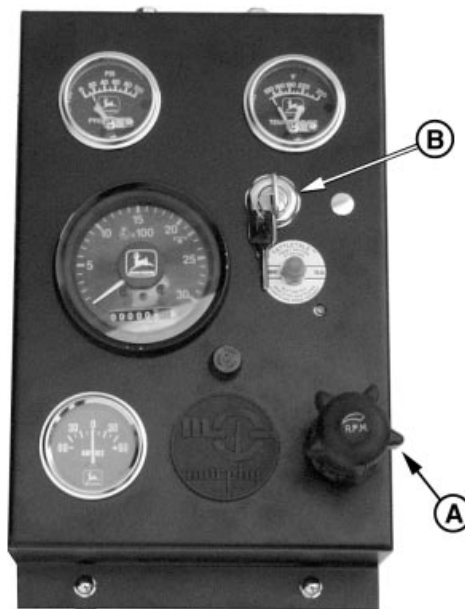
For engines in generator set applications, where the governor is locked at a specified speed and no slow idle function is available, run engine for at least 2 minutes at fast idle and no load.

3. Turn key switch (B) to "OFF" position to stop the engine. Remove ignition key.

IMPORTANT: Make sure that exhaust stack cap (rain cap) is installed when engine is not running. This will prevent water and dirt from entering engine.



RG5602 -UN-16JUN00



North American Instrument Panel Shown

RG11299J -UN-11SEP00



RG10616 -UN-16JUN00

Using a Booster Battery or Charger

A 12-volt booster battery can be connected in parallel with battery(ies) on the unit to aid in cold weather starting. ALWAYS use heavy duty jumper cables.

CAUTION: Gas given off by battery is explosive. Keep sparks and flames away from battery. Before connecting or disconnecting a battery charger, turn charger off. Make last connection and first disconnection at a point away from battery. Always connect **NEGATIVE (-)** cable last and disconnect this cable first.

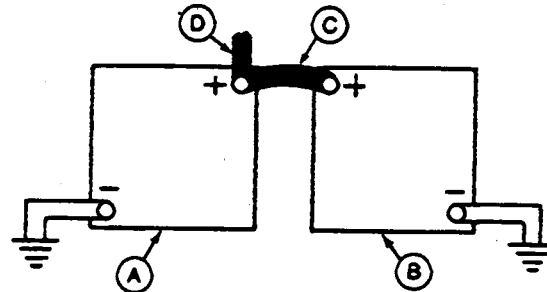
WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after handling.**

IMPORTANT: Be sure polarity is correct before making connections. Reversed polarity will damage electrical system. Always connect positive to positive and negative to ground. Always use 12-volt booster battery for 12-volt electrical systems and 24-volt booster battery(ies) for 24-volt electrical systems.

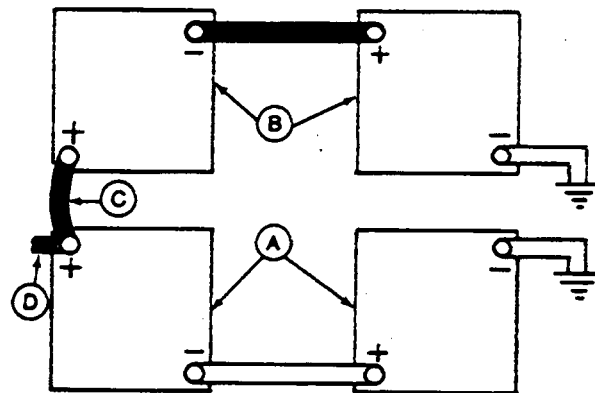
1. Connect booster battery or batteries to produce the required system voltage for your engine application.

NOTE: To avoid sparks, **DO NOT** allow the free ends of jumper cables to touch the engine.

2. Connect one end of jumper cable to the **POSITIVE (+)** post of the booster battery.
3. Connect the other end of the jumper cable to the **POSITIVE (+)** post of battery connected to starter.
4. Connect one end of the other jumper cable to the **NEGATIVE (-)** post of the booster battery.
5. ALWAYS complete the hookup by making the last connection of the **NEGATIVE (-)** cable to a good ground on the engine frame and away from the battery(ies).



12-Volt System



24-Volt System

A—12-Volt Machine Battery (ies)
B—12-Volt Booster Battery (ies)
C—Booster Cable
D—Cable to Starting Motor

TS204 -UN-23AUG88

RG4678 -UN-14DEC88

RG4698 -UN-14DEC88

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RG, RG34710, 5564 -19-20MAY96-1/2

6. Start the engine. Disconnect jumper cables immediately after engine starts. Disconnect NEGATIVE (–) cable first.

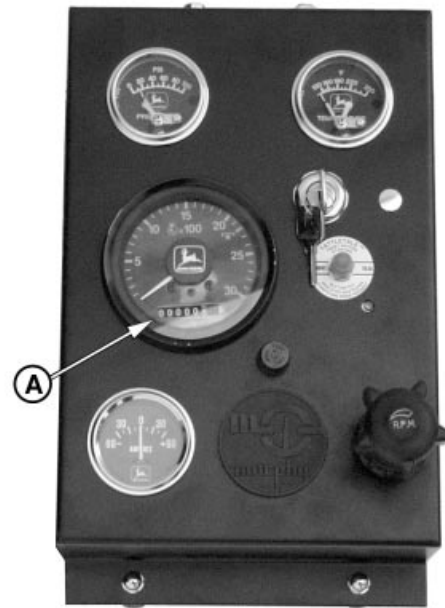
RG, RG34710, 5564 –19–20MAY96–2/2

Lubrication and Maintenance

Observe Service Intervals

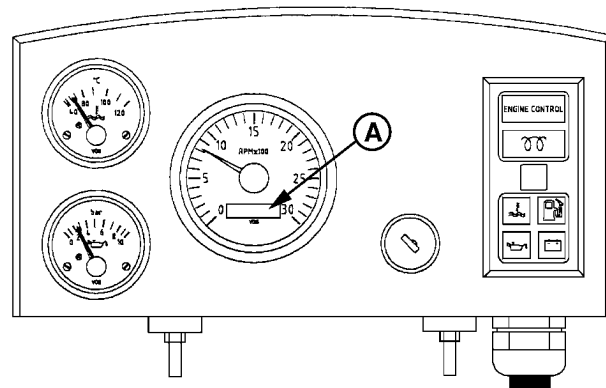
Using hour meter (A) as guide, perform all services at the hourly intervals indicated on following pages. At each scheduled maintenance interval, perform all previous maintenance operations in addition to the ones specified. Keep a record of hourly intervals and services performed using charts provided in Lubrication and Maintenance Records Section.

IMPORTANT: Recommended service intervals are for normal operating conditions. Service **MORE OFTEN** if engine is operated under adverse conditions. Neglecting maintenance can result in failures or permanent damage to the engine.



North American Instrument Panel

RG11299A -JUN-17AUG00



VDO Instrument Panel (Except North America)

RG10618 -JUN-21OCT99

DPSG,QUOE003,20 -19-06JAN99-1/1

Use Correct Fuels, Lubricants, and Coolant

IMPORTANT: Use only fuels, lubricants, and coolants meeting specifications outlined in Fuels, Lubricants, and Coolant Section when servicing your John Deere Engine.

Consult your John Deere engine distributor, servicing dealer or your nearest John Deere Parts Network for recommended fuels, lubricants, and coolant. Also available are necessary additives for use when operating engines in tropical, arctic, or any other adverse conditions.



TS100 -JUN-23AUG88

DPSG,OUOE003,20 -19-06JAN99-1/1

Lubrication and Maintenance Service Interval Chart—Standard

| Item | Lubrication and Maintenance Service Intervals | | | | |
|---|---|----------------------|-----------------------|------------------------|-------------|
| | Daily | 250 Hour/ 6 Month | 500 Hour/ 12 Month | 2000 Hour/ 24 Month | As Required |
| Check Engine Oil and Coolant Level | • | | | | |
| Check Fuel Filter/Water Separator Bowl | • | | | | |
| Lubricate PTO Release Bearings | • | | | | |
| Check Air Cleaner Dust Unloader Valve & Restriction Indicator Gauge ^a | • | | | | |
| Visual Walkaround Inspection | • | | | | |
| Service Fire Extinguisher | | • | | | |
| Lubricate PTO Clutch Shaft Bearings | | • | | | |
| Change Engine Oil and Replace Oil Filter ^b | | • | | | |
| Check PTO Clutch Adjustment | | • | | | |
| Service Battery | | • | | | |
| Check Manual Belt Tensioner and Belt Wear | | • | | | |
| Lubricate PTO Clutch Levers and Linkage | | | • | | |
| Clean Crankcase Vent Tube | | | • | | |
| Check Air Intake Hoses, Connections, & System | | | • | | |
| Replace Fuel Filter Element | | | • | | |
| Check Automatic Belt Tensioner and Belt Wear | | | • | | |
| Check Cooling System | | | • | | |
| Coolant Solution Analysis-Add SCAs as required | | | • | | |
| Pressure Test Cooling System | | | • | | |
| Check Crankshaft Vibration Damper (6-Cylinder) ^c | | | | • | |
| Flush Cooling System ^d | | | | • | |
| Test Thermostats | | | | • | |
| Check and Adjust Engine Valve Clearance | | | | • | |
| ^a Replace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in.) H ₂ O. | | | | | |
| ^b Change the oil for the first time before 100 hours maximum of (break-in) operation, then every 250 hours thereafter. If PLUS-50 oil is used along with a John Deere oil filter, the oil change interval may be extended by 50 percent to 375 hours. | | | | | |
| ^c Replace crankshaft damper at 4500 hours or 60 months, whichever occurs first. | | | | | |
| ^d If John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished as needed by adding a supplemental coolant additive, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first. | | | | | |

Continued on next page

RG, RG34710, 7559 -19-30JUN97-1/2

Lubrication and Maintenance

| | Lubrication and Maintenance Service Intervals | | | | |
|------------------------------|---|----------------------|-----------------------|------------------------|-------------|
| Item | Daily | 250 Hour/ 6 Month | 500 Hour/ 12 Month | 2000 Hour/ 24 Month | As Required |
| Replace Air Cleaner Elements | | | | | • |
| Replace Poly-vee Belt | | | | | • |

RG, RG34710, 7559 -19-30JUN97-2/2

MAINTENANCE INTERVAL CHART- Generator Applications

| Item | 10 H / daily | 500 H | 1000 H / 1 year | 2000 H / 2 years | 2500 H / 3 years | As required |
|---|-----------------|-------|--------------------|---------------------|---------------------|----------------|
| Check engine oil and coolant level | • | | | | | |
| Check air filter restriction indicator ^a | • | | | | | |
| Change engine oil and filter ^b | | • | | | | |
| Replace fuel filter element | | • | | | | |
| Check belt tension and automatic tensioner ^c | | • | • | | | |
| Check and adjust valve clearance ^d | | | • | | | |
| Clean crankcase vent tube | | | • | | | |
| Check air intake hoses, connections and system | | | • | | | |
| Check vibration damper (6 cyl.) ^e | | | | • | | |
| Check engine speed and speed droop governor | | | | • | | |
| Drain and flush cooling system ^f | | | | • | • | |
| Drain water and sediment from fuel filter | | | | | | • |
| Clean filter element (see note a) | | | | | | • |
| Test thermostat and injection nozzles (see your dealer) ^g | | | | | | • |
| ^a Clean air filter element when restriction indicator is red. Replace filter element after 6 cleanings or once a year. | | | | | | |
| ^b Change oil and filter after the first 100 hours of operation, then every 500 hours thereafter. Change oil and filter at least once a year. | | | | | | |
| ^c Check belt tension every 500 hours on 300-Series engines and on POWERTech engines with manual tensioner. Check automatic belt tensioner every 1000 hours/1 year on POWERTech engines when equipped. | | | | | | |
| ^d Have your authorized servicing dealer or engine distributor adjust valve clearance as follows. After the first 500 hours of operation then every 1000 hours thereafter on 300-Series engines. Every 2000 hours on POWERTech engines. | | | | | | |
| ^e Have your authorized dealer or engine distributor replace the vibration damper every 4500 hours/5 years. | | | | | | |
| ^f Drain and flush cooling system every 2500 hours/3 years when John Deere COOL-GARD coolant is used. Otherwise every 2000 hours/2 years. | | | | | | |
| ^g Contact your dealer when thermostat or injection nozzles are suspected to be defective. Replace injection nozzles every 5000 hours and thermostat every 10000 hours. | | | | | | |

DPSG,CD03523,26 -19-09JUL99-1/1

Lubrication & Maintenance/Daily

Daily Prestarting Checks

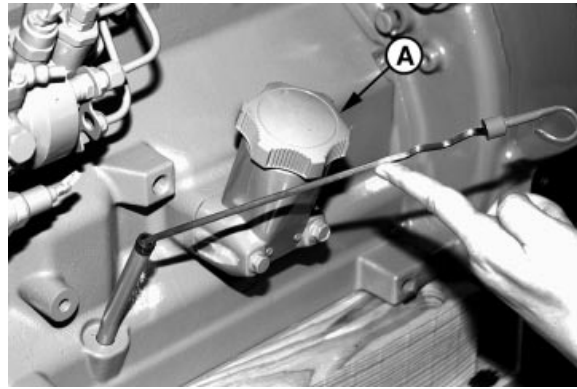
Do the following BEFORE STARTING THE ENGINE for the first time each day:

IMPORTANT: DO NOT add makeup oil until the oil level is **BELOW** the add mark.

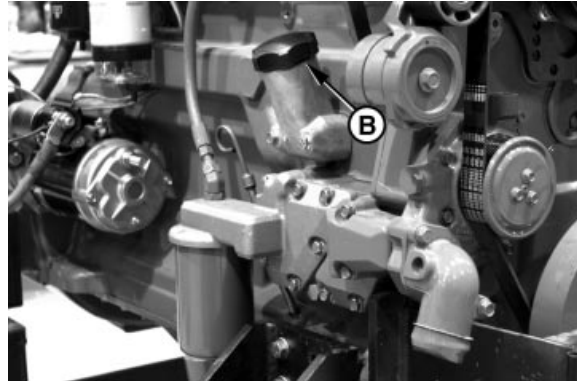
1. Check engine oil level on dipstick. Add as required, using seasonal viscosity grade oil. (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for oil specifications.)

Depending on application, oil may be added at left (A) or right (B) side oil filler cap and rocker arm cover filler cap (C) locations.

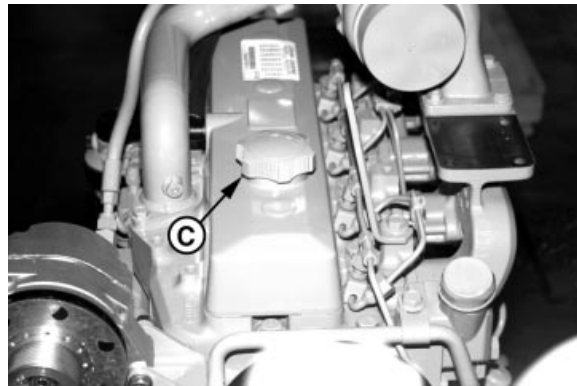
IMPORTANT: DO NOT fill above the top mark (D) on the dipstick. Oil levels anywhere within crosshatch are considered in the acceptable operating range.



RG8009A -UN-16JUN00

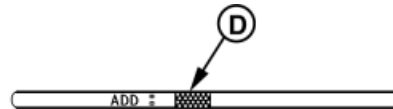


RG8054A -UN-16JUN00



RG8025B -UN-16JUN00

RG8028B -UN-15JAN99



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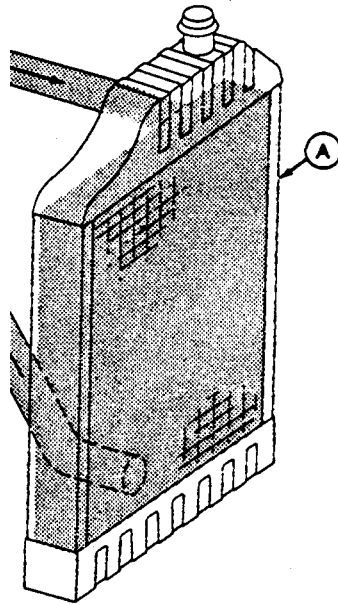
DPSG,OUOE003,20 -19-06JAN99-1/5

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Only remove filler cap when engine is cold or when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

2. Check the coolant level when engine is cold. Coolant level should be at bottom of filler neck. Fill radiator (A) with proper coolant solution if level is low. (See **ADDING COOLANT** in Service As Required Section.) Check overall cooling system for leaks.

NOTE: Refer to your vehicle's operator's manual for recommendations for non-John Deere supplied accessories.



Continued on next page

DPSG,OUOE003,20 -19-06JAN99-2/5

RG4675 -JUN-14DEC88

TS281 -JUN-23AUG88

3. Check the fuel filter for water or debris. If filter is fitted with a see-through bowl, drain as needed based on a daily visual inspection.

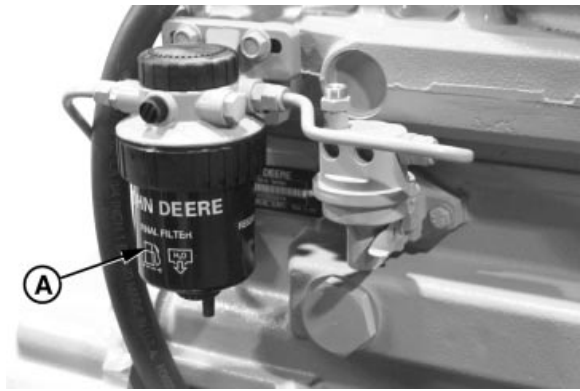
IMPORTANT: Drain water into a suitable container and dispose of properly.

- a. Loosen drain plug (B) at bottom of fuel filter or bowl, if equipped, two or three turns.
- b. Loosen air bleed plug two full turns (A) on fuel filter base and drain water from bottom until fuel starts to drain out.
- c. When fuel starts to drain out, tighten drain plug securely.

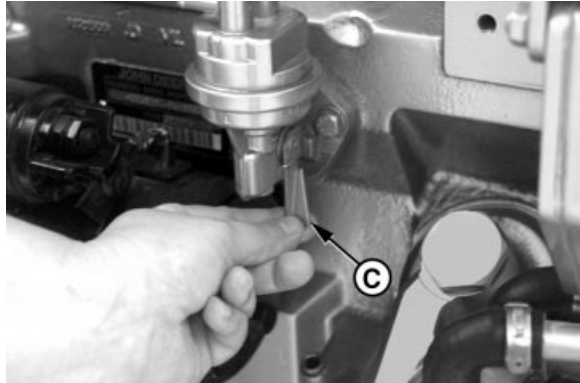
After draining water from the fuel filter, the filter must be primed by bleeding all air from the fuel system.

- a. Operate primer lever of the fuel supply pump (C) until fuel flow is free from air bubbles.
- b. Tighten bleed plug securely, continue operating hand primer until pumping action is not felt. Push hand primer inward (toward engine) as far as it will go.

If the fuel system needs further bleeding of air, see BLEEDING FUEL SYSTEM in Service As Required Section, later in this manual.



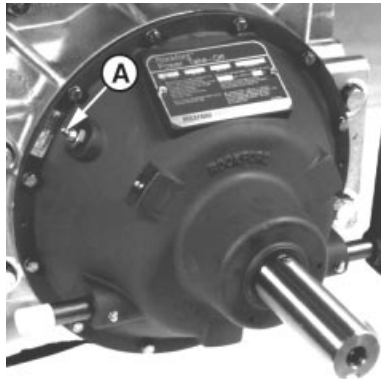
RG7986 -UN-14NOV97



RG7317A -UN-16JUN00

DPSG,OUOE003,20 -19-06JAN99-3/5

4. Apply one shot of John Deere Multi-Purpose Lubricant or equivalent at PTO release bearing grease fitting (A). NO NOT over lubricate.



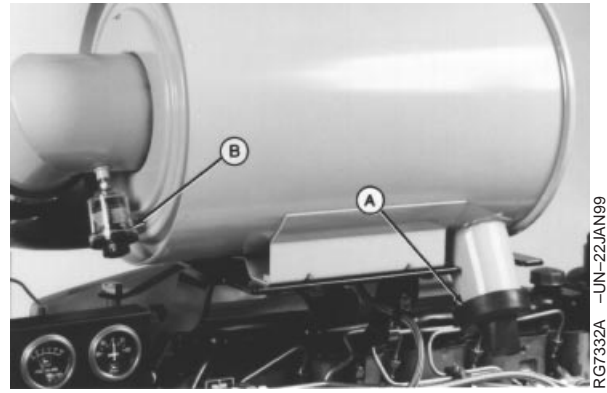
RG7331A -UN-26JUN00

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DPSG,OUOE003,20 -19-06JAN99-4/5

5. If the air cleaner has an automatic dust unloader valve (A), squeeze the unloader valve on air cleaner assembly to clear away any dust buildup.

If equipped with air intake restriction indicator gauge (B), check gauge to determine if air cleaner needs to be serviced.



RG7332A -UN-22JAN99

IMPORTANT: Maximum air intake restriction is 6.25 kPa (0.06 bar) (1.0 psi) (25 in. H₂O). A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.

6. Make a thorough inspection of the engine compartment. Look for oil or coolant leaks, worn fan and accessory drive belts, loose connections and trash build-up. Remove trash buildup and have repairs made as needed if leaks are found.

NOTE: Wipe all fittings, caps, and plugs before performing any maintenance to reduce the chance of system contamination.

Inspect:

- Radiator for leaks and trash build-up.
- Air intake system hoses and connections for cracks and loose clamps.
- Fan, alternator, and accessory drive belts for cracks, breaks or other damage.
- Water pump for coolant leaks.

NOTE: It is normal for a small amount of leakage to occur as the engine cools down and parts contract. Excessive coolant leakage may indicate the need to replace the water pump seal. Contact your engine distributor or servicing dealer for repairs.

DPSG,OUOE003,20 -19-06JAN99-5/5

Lubrication & Maintenance/250 Hour/6 Month

Servicing Fire Extinguisher

A fire extinguisher (A) is available from your authorized servicing dealer or engine distributor.

Read and follow the instructions which are packaged with it. The extinguisher should be inspected at least every 250 hours of engine operation or once a month. Once extinguisher is operated, no matter how long, it must be recharged. Keep record of inspections on the tag which comes with the extinguisher instruction booklet.



RW4918 -UN-15DEC88

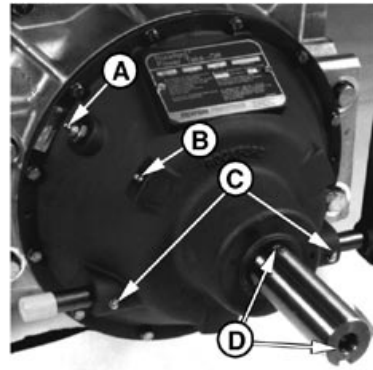
RG, RG34710, 5567 -19-20MAY96-1/1

Lubricating PTO Clutch Shaft Bearings

Apply one or two shots of John Deere Multipurpose Lubricant or equivalent at clutch drive shaft bearing fitting (B) and pilot bearing fittings (D). DO NOT over-lubricate to avoid getting oil on clutch facings.

NOTE: Location of pilot bearing fitting will depend on application. Only one fitting will be used.

- A—Release Bearing Grease Fitting
- B—Drive Shaft Bearing Fitting
- C—Lever Cross Shaft Fittings
- D—Pilot Bearing Fitting



RG7331B -UN-19JUN00

RG, RG34710, 5566 -19-20MAY96-1/1

Changing Engine Oil and Replacing Oil Filter

NOTE: Change engine oil and filter for the first time before 100 hours maximum of operation.



RG4881 -UN-29NOV88

OILSCAN® or OILSCAN PLUS® is a John Deere sampling program to help you monitor machine performance and identify potential problems before they cause serious damage. OILSCAN® and OILSCAN PLUS® kits are available from your John Deere engine distributor or servicing dealer. Oil samples should be taken prior to the oil change. Refer to instructions provided with kit.

1. Run engine approximately 5 minutes to warm up oil. Shut engine off.
2. Remove oil pan drain plug (arrow).
3. Drain crankcase oil from engine while warm.

NOTE: Drain plug location may vary, depending on the application.

*PLUS-50 is a trademark of Deere & Company.
OILSCAN is a trademark of Deere & Company.
OILSCAN PLUS is a trademark of Deere & Company.*

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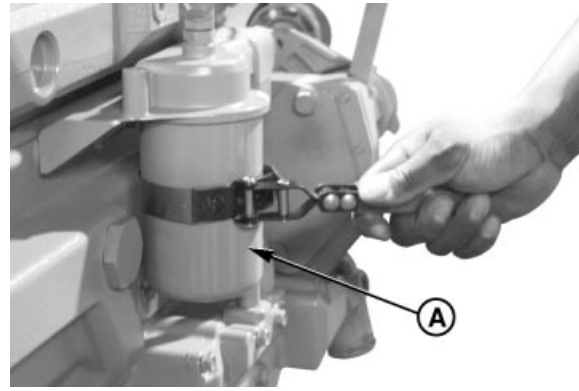
RG, RG34710, 5570 -19-20MAY96-1/3

4. Remove and discard oil filter element (A) using a suitable filter wrench.

NOTE: Depending on engine application, oil filter may be located on either side of the engine.

5. Remove oil filter packing and clean filter mounting pad.

IMPORTANT: Filtration of oils is critical to proper lubrication. Always change filter regularly. Use filter meeting John Deere performance specifications.



RG7961A -UN-22JAN99

6. Oil new packing and install new filter element. Hand tighten element according to values printed on filter element. If values are not provided, tighten element approximately 3/4 — 1-1/4 turn after packing contacts filter housing. DO NOT overtighten filter element.
7. Install oil pan drain plug with a new seal when equipped.

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RG, RG34710, 5570 -19-20MAY96-2/3

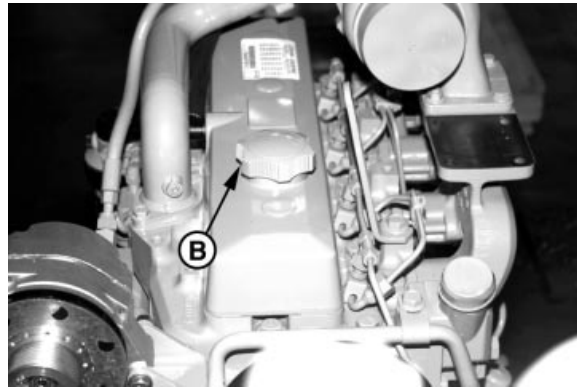
8. Fill engine crankcase with correct John Deere engine oil through rocker arm cover opening (B) or either side oil filler (C) depending on engine application. (See DIESEL ENGINE OIL in Fuels, Lubricants, and Coolant Section for determining correct engine oil.)

To determine the correct oil fill quantity for your engine, see ENGINE CRANKCASE OIL FILL QUANTITIES in the Specifications Section of this manual.

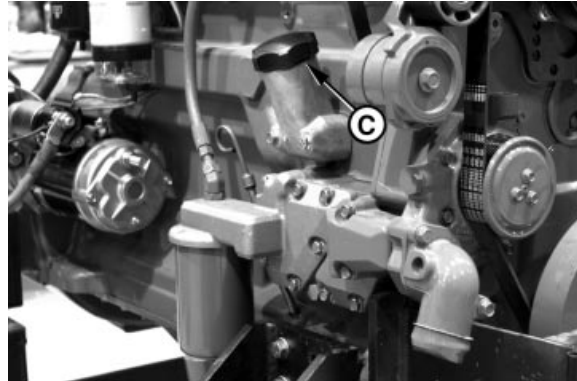
IMPORTANT: Immediately after completing any oil change, crank engine for 30 seconds without permitting engine to start. This will help insure adequate lubrication to engine components before engine starts.

NOTE: Crankcase oil capacity may vary slightly. ALWAYS fill crankcase to full mark or within crosshatch on dipstick, whichever is present. DO NOT overfill.

9. Start engine and run to check for possible leaks.
10. Stop engine and check oil level after 10 minutes. Oil level reading should be within crosshatch of dipstick.



RG8025A -UN-19JUN00



RG8054B -UN-19JUN00

RG, RG34710, 5570 -19-20MAY96-3/3

Checking PTO Clutch Adjustment

CAUTION: Never attempt to service the PTO while it is in operation. Loose clothing could get caught in moving parts; keep clothing tight against body. Use extreme care when working around the PTO.

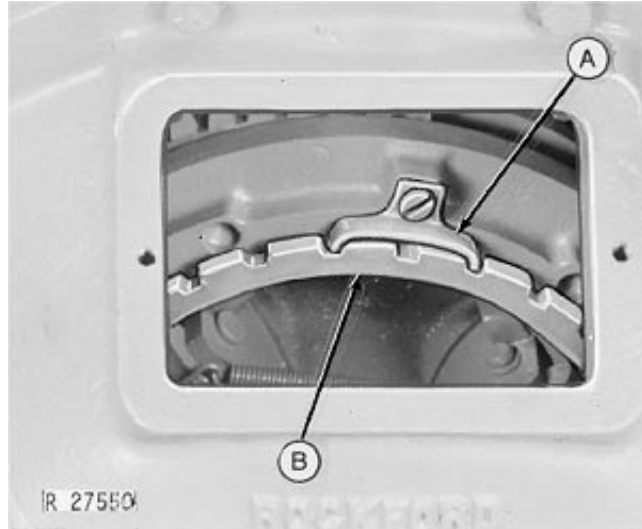
1. Measure clutch engagement force at handle grip using a spring scale. The engagement force should be 267–311 N (60–70 lb force).

IMPORTANT: Improper adjustments of the PTO clutch may shorten clutch life. Make sure adjustments are made properly.

2. If adjustments are needed, disengage clutch and stop engine. Remove cover plate from clutch housing (shown removed).
3. Remove adjusting lock (A).
4. Turn adjusting ring (B) to adjust clutch engagement pressure.
5. Measure engagement force at clutch handle with spring scale.
6. Install lock screw and adjusting lock in clutch body splines when specified engagement pressure is achieved.
7. Tighten screw securely.
8. Recheck clutch engagement force with spring scale. Install cover plate. Disengage clutch.



TS198 -JUN-23AUG88



R27550 -JUN-14DEC88

RG, RG34710, 5572 -19-20MAY96-1/1

Checking Engine Mounts

Engine mounting is the responsibility of the generator manufacturer. Follow manufacturer's guidelines for mounting specifications.

IMPORTANT: Use only Grade SAE 8 or higher grade of hardware for engine mounting.

1. Check the engine mounting bracket, vibration isolators, and mounting bolts on support frame and engine block for tightness. Tighten as necessary.
2. Inspect overall condition of vibration isolators, if equipped. Replace isolators if rubber has deteriorated or mounts have collapsed, as necessary.

DPSG,RG34710,111 -19-30OCT99-1/1

Servicing Battery



CAUTION: Battery gas can explode. Keep sparks and flames away from batteries. Use a flashlight to check battery electrolyte level.

Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.

Always remove grounded **NEGATIVE (-)** battery clamp first and replace it last.



TS204 -JUN-23AUG88

WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after handling.**

1. On regular batteries, check electrolyte level. Fill each cell to bottom of filler neck with distilled water.

NOTE: Low-maintenance or maintenance-free batteries should require little additional service. However, electrolyte level can be checked by cutting the center section of decal on dash-line, and removing cell plugs. If necessary, add clean, soft water to bring level to bottom of filler neck.

2. Keep batteries clean by wiping them with a damp cloth. Keep all connections clean and tight. Remove any corrosion, and wash terminals with a solution of 1 part baking soda and 4 parts water. Tighten all connections securely.

NOTE: Coat battery terminals and connectors with a mixture of petroleum jelly and baking soda to retard corrosion.

3. Keep battery fully charged, especially during cold weather. If a battery charger is used, turn charger off before connecting charger to battery(ies). Attach **POSITIVE (+)** battery charger lead to **POSITIVE (+)** battery post. Then attach **NEGATIVE (-)** battery charger lead to a good ground.

Continued on next page

RG, RG34710, 5568 -19-20MAY96-1/2

CAUTION: Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

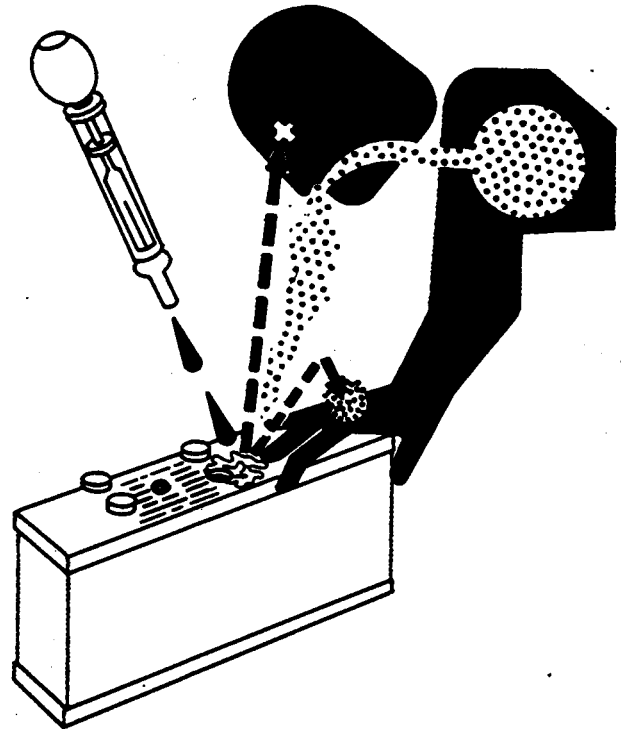
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10–15 minutes. Get medical attention immediately.

If acid is swallowed:

1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.



TS203 -JUN-23AUG88

In freezing weather, run engine at least 30 minutes to assure thorough mixing after adding water to battery.

If necessary to replace battery(ies), replacements must meet or exceed the following recommended capacities at -18°C (0°F):

Specification

| | |
|--------------------------------------|-----|
| 12 Volt Standard Duty Starter..... | 640 |
| Cold Cranking Amps | |
| 12 Volt Heavy Duty Starter Cold..... | 800 |
| Cranking Amps | |
| 24 Volt Standard Duty Starter..... | 570 |
| Cold Cranking Amps | |

Manual Belt Tensioner Adjustment

NOTE: Two types of manual tensioners shown.

Inspect belts for cracks, fraying, or stretched-out areas. Replace if necessary.

As a reference check, twist belt in the middle of a 10—12 inch span with two fingers. A properly tensioned belt will turn 75—85 degrees. If belt turns more, it needs to be tightened. If belt turns less, it needs to be loosened.

NOTE: If timing gear cover or alternator bracket interfere with installation/centering of belt tension gauge (A), install gauge with face toward engine.

1. Install JDG1341 Belt Tension Gauge (A) on belt, halfway between pulleys as shown. (JDG1341 Belt Tension Gauge available from local John Deere Dealer or Distributor.)
2. Loosen cap screws (B) and (C).
3. Slide alternator or tensioner bracket (D) in slot by hand to remove all excess slack in belt.

IMPORTANT: Do not pry against alternator rear frame.

4. Stretch belt by prying outward on alternator front frame or tensioner bracket. Observing tension gauge, stretch the belt until specified tension is achieved.

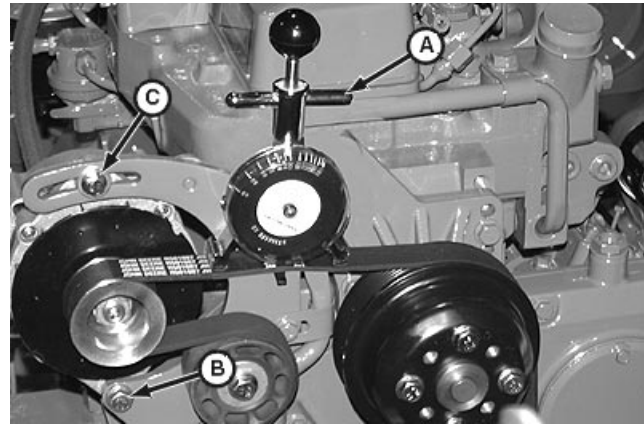
Specification

| | |
|--|------------------------------|
| 8-Rib Poly-Vee Belt Bosch and..... | 535—715 N (120—160 lb-force) |
| New Magneton Alternator New Belt Tension | |
| Old Magneton Alternator New..... | 470—650 N (105—145 lb-force) |
| Belt (Option Code 3101) Tension | |
| Used Belt Tension..... | 400—580 N (90—130 lb-force) |

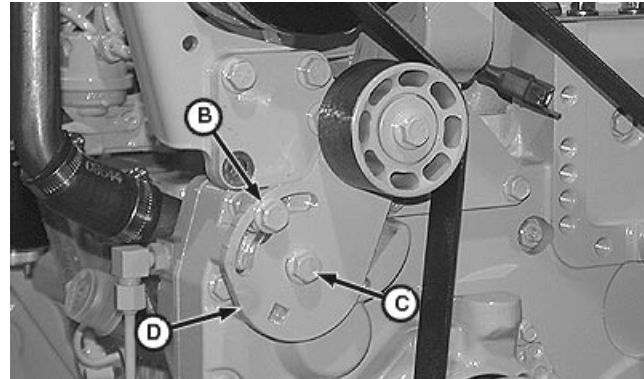
5. Tighten cap screws (B) and (C).

NOTE: After ten minutes run-in, new belts are considered used. Belt tension must then be rechecked per used belt specifications.

6. Run engine for ten minutes and immediately re-check belt tension per used belt specification above.



Adjust Belt Tension



Adjust Belt Tension

- A—Belt Tension Gauge
- B—Cap Screw
- C—Cap Screw
- D—Tensioner Bracket

7. Reset belt tension as necessary.

DPSG,RG41165,128 -19-19JUN00-2/2

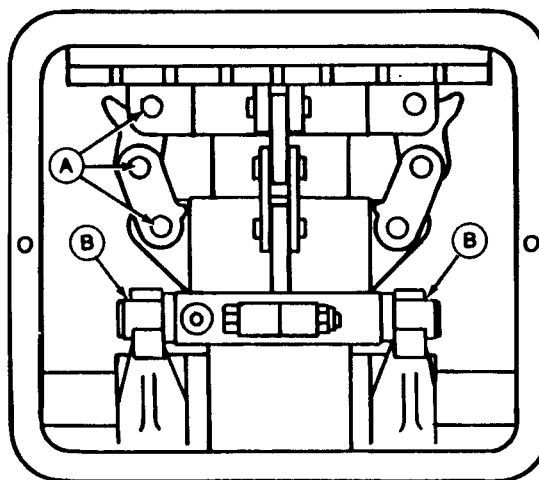
Lubricating PTO Clutch Internal Levers and Linkage

CAUTION: Never attempt to service the PTO while it is in operation. Loose clothing could get caught in moving parts; keep clothing tight against body. Use extreme care when working around the PTO.

1. Remove the PTO housing cover and apply one shot of John Deere Multipurpose Lubricant or equivalent (See FUELS, LUBRICANTS, and COOLANT Section) to the pivot points (A) of each clutch linkage.
2. Apply one shot of John Deere Multipurpose Lubricant or equivalent to the two PTO release lever shaft fittings (B).



TS198 -JUN-23AUG88



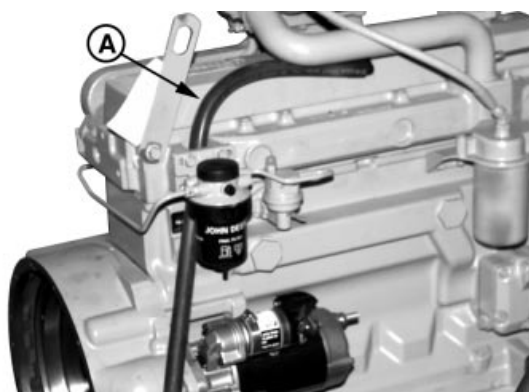
RG6641 -JUN-18FEB93

RG, RG34710, 5573 -19-20MAY96-1/1

Cleaning Crankcase Vent Tube

If you operate the engine in dusty conditions, clean the tube at shorter intervals.

1. Remove and clean crankcase vent tube (A).
2. Install the vent tube. Be sure the O-ring fits correctly in the rocker arm cover for elbow adapter. Tighten hose clamp securely.



RG8017A -JUN-19JUN00

RG, RG34710, 5574 -19-20MAY96-1/1

Checking Air Intake System

IMPORTANT: The air intake system must not leak. Any leak, no matter how small, may result in internal engine damage due to abrasive dirt and dust entering the intake system.

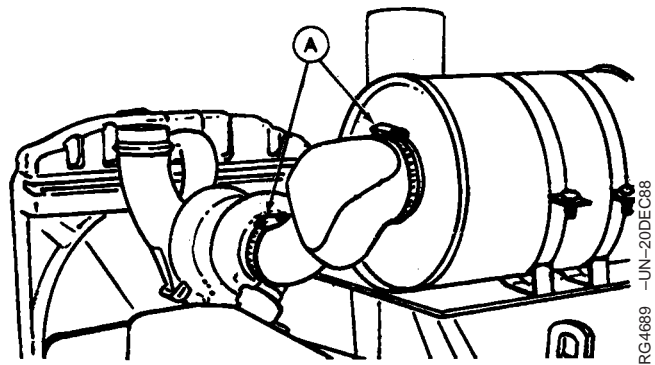
1. Inspect all intake hoses (piping) for cracks. Replace as necessary.
2. Check clamps (A) on piping which connect the air cleaner, engine and, if present, turbocharger. Tighten clamps as necessary. This will help prevent dirt from entering the air intake system through loose connections causing internal engine damage.
3. If engine has a rubber dust unloader valve (B), inspect the valve on bottom of air cleaner for cracks or plugging. Replace as necessary.

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H₂O, is torn, or visibly dirty.

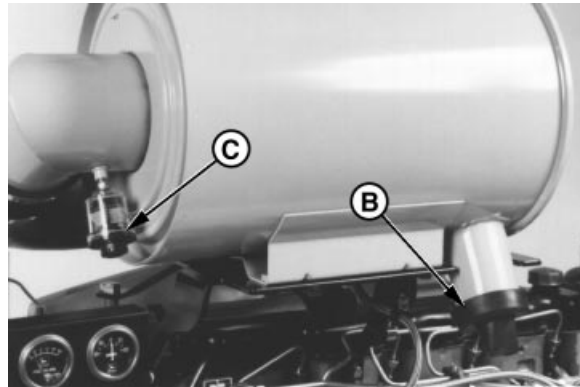
4. Test air restriction indicator (C) for proper operation. Replace indicator as necessary.

IMPORTANT: If not equipped with air restriction indicator, replace air cleaner elements at 600 Hours or 12 Months, whichever occurs first.

5. Remove and inspect primary air cleaner element. Service as necessary. (See INSPECTING PRIMARY FILTER ELEMENT and REPLACING AIR CLEANER ELEMENTS in Service As Required Section.)



RG4689 -UN-20DEC88



RG7332B -UN-22JAN99

RG, RG34710, 5575 -19-20MAY96-1/1

Replacing Fuel Filter Element

CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

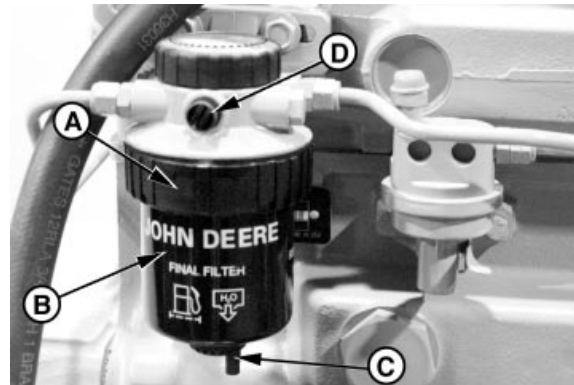
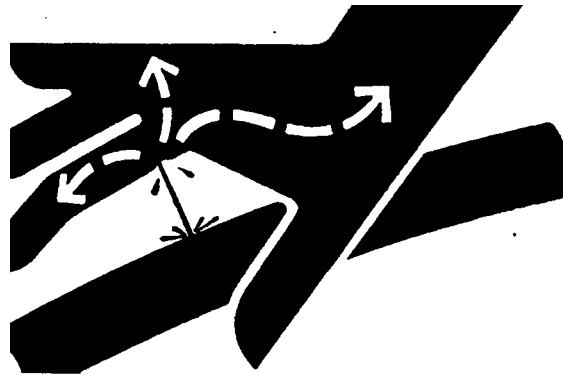
1. Close fuel shut-off valve, if equipped.
2. Thoroughly clean fuel filter assembly and surrounding area.
3. Loosen drain plug (C) and drain fuel into a suitable container.

NOTE: Lifting up on retaining ring as it is rotated helps to get it past raised locators.

4. Firmly grasp the retaining ring (A) and rotate it counterclockwise 1/4 turn. Remove ring with filter element (B).
5. Inspect filter mounting base for cleanliness. Clean as required.

NOTE: Raised locators on fuel filter canister must be indexed properly with slots in mounting base for correct installation.

6. Install new filter element onto mounting base. Be sure element is properly indexed and firmly seated on base. It may be necessary to rotate filter for correct alignment.



A—Retaining Ring
B—Filter Element
C—Drain Plug
D—Bleed Plug

X9811 -UN-23AUG88

RG7721 -UN-15JAN99

Continued on next page

RG, RG34710, 5576 -19-20MAY96-1/2

If equipped with water separator, remove filter element from water separator bowl. Drain and clean separator bowl. Dry with compressed air. Install water separator bowl onto new element. Tighten securely.

7. Align keys on filter element with slots in filter base.
8. Install retaining ring onto mounting base making certain dust seal is in place on filter base. Hand tighten ring (about 1/3 turn) until it "snaps" into the detent. DO NOT overtighten retaining ring.

NOTE: The proper installation is indicated when a "click" is heard and a release of the retaining ring is felt.

A plug is provided with the new element for plugging the used element.

9. Open fuel shut-off valve and bleed the fuel system. (See BLEEDING FUEL SYSTEM in Service As Required Section.) Tighten bleed plug (D).

RG, RG34710, 5576 -19-20MAY96-2/2

Checking Belt Tensioner Spring Tension and Belt Wear (Automatic Tensioner)

Belt drive systems equipped with automatic (spring) belt tensioners cannot be adjusted or repaired. The automatic belt tensioner is designed to maintain proper belt tension over the life of the belt. If tensioner spring tension is not within specification, replace tensioner assembly.

Continued on next page

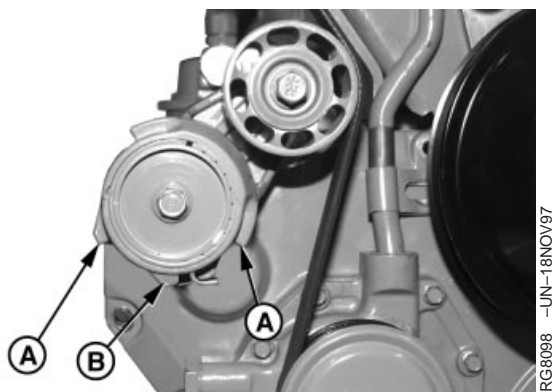
RG, RG34710, 5578 -19-20MAY96-1/3

Checking Belt Wear

The belt tensioner is designed to operate within the limit of arm movement provided by the cast stops (A and B) when correct belt length and geometry is used.

Visually inspect cast stops (A and B) on belt tensioner assembly.

If the tensioner stop on swing arm (A) is hitting the fixed stop (B), check mounting brackets (alternator, belt tensioner, idler pulley, etc.) and the belt length. Replace belt as needed (see REPLACING FAN AND ALTERNATOR BELTS in Service As Required Section).



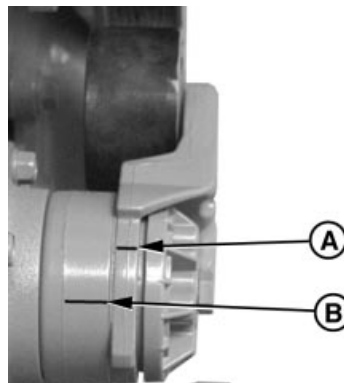
RG8098 -UN-18NOV97

RG, RG34710, 5578 -19-20MAY96-2/3

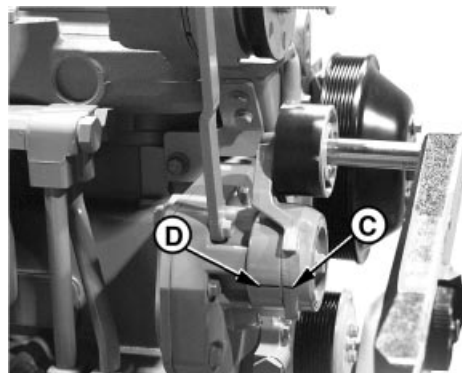
Checking Tensioner Spring Tension

A belt tension gauge will not give an accurate measure of the belt tension when automatic spring tensioner is used. Measure tensioner spring tension using a torque wrench and procedure outlined below:

1. Release tension on belt using a breaker bar and socket on tension arm. Remove belt from pulleys.
2. Release tension on tension arm and remove breaker bar.
3. Put a mark (A) on swing arm of tensioner as shown.
4. Measure 21 mm (0.83 in.) from (A) and put a mark (B) on tensioner mounting base.
5. Rotate the swing arm using a torque wrench until marks (A and B) are aligned.
6. Record torque wrench measurement and compare with specification below. Replace tensioner assembly as required.



RG7977 -UN-14NOV97



RG8037C -UN-11SEP00

Specification

Spring Tension Torque..... 18-22 N•m (13-16 lb-ft)

RG, RG34710, 5578 -19-20MAY96-3/3

Checking Cooling System



CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



TS281 -JUN-23AUG88

IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug when all the air has been expelled.

1. Visually check entire cooling system for leaks. Tighten all clamps securely.
2. Thoroughly inspect all cooling system hoses for hard, flimsy, or cracked condition. Replace hoses if any of the above conditions are found.

RG, RG34710, 5580 -19-20MAY96-1/1

Checking Effectiveness of Coolant Solution

When your coolant has accumulated 500 hours or 12 months of operating time, the effectiveness of your engine coolant should be evaluated by obtaining a coolant sample.

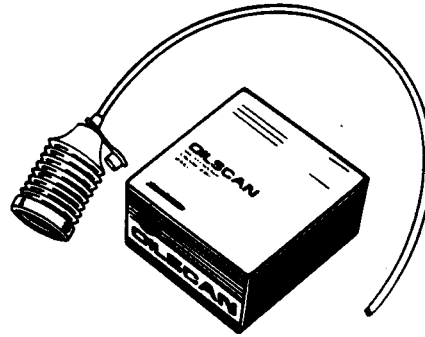
Maintaining adequate concentrations of glycol and inhibiting additives (SCAs) in the coolant is critical to protect the engine and cooling system against freezing, corrosion, and cylinder liner erosion and pitting.

A coolant strip test kit provides a simple, effective way to check freeze point and additive levels.

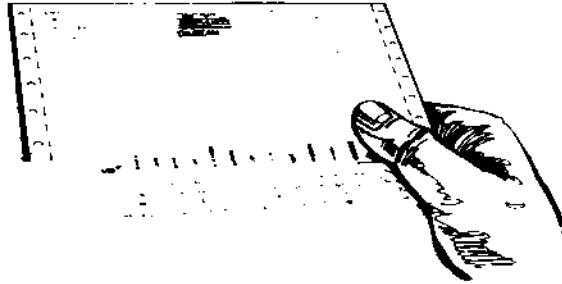
For a more thorough evaluation of your coolant, CoolScan™, where available, is a John Deere sampling program to help you monitor the effectiveness of your engine's coolant solution and identify potential problems before they cause serious damage.

TY16175 or TY16176 3-Way Heavy Duty Coolant Test Kit and DS0251 CoolScan™ kits are available from your John Deere engine distributor or servicing dealer. Refer to instructions provided with kits.

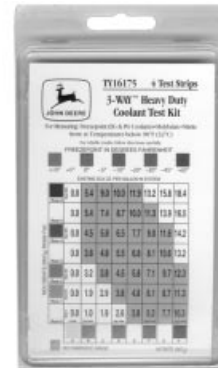
Usually recharging your engine coolant with the recommended amount of TY16004 or TY16005 Liquid Coolant Conditioner at 500 hours or 12 months of operation is adequate. However, with a CoolScan™ analysis report you will be given a more thorough evaluation of your engine coolant condition along with detailed service recommendations. (See ADDING SUPPLEMENTAL COOLANT ADDITIVES, later in this section.)



T6828AB -UN-15JUN89



T6829AB -UN-18OCT88



RG7297 -UN-22SEP99

CoolScan is a trademark of Deere & Company.

RG, RG34710, 5581 -19-20MAY96-1/1

Adding Supplemental Coolant Additives (SCA's)

After 500 hours or 12 months of engine operating time, recharge your engine coolant with the recommended amount (see label on container) of TY16004 or TY16005 Liquid Coolant Conditioner.

IMPORTANT: TY16004 or TY16005 Liquid Coolant Conditioner is a non-chromate inhibitor and should be used only with low silicate, ethylene-glycol base antifreeze. It does not protect the cooling system from freezing.

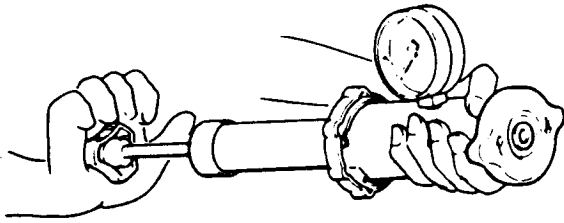


Liquid Coolant Conditioner

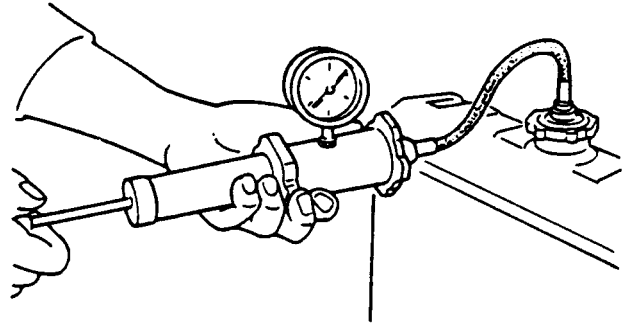
RG7276 -UN-05DEC97

RG, RG34710, 5582 -19-20MAY96-1/1

Pressure Testing Cooling System



RG6657 -JUN-20JAN93



RG6558 -JUN-20JAN93



CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

Test Radiator Cap

1. Remove radiator cap and attach to D05104ST Tester as shown.
2. Pressurize cap to 70 kPa (0.7 bar) (10 psi)¹. Gauge should hold pressure for 10 seconds within the normal range if cap is acceptable.

If gauge does not hold pressure, replace radiator cap.

3. Remove the cap from gauge, turn it 180°, and retest cap. This will verify that the first measurement was accurate.

Test Cooling System

NOTE: Engine should be warmed up to test overall cooling system.

1. Allow engine to cool, then carefully remove radiator cap.
2. Fill radiator with coolant to the normal operating level.

IMPORTANT: DO NOT apply excessive pressure to cooling system, doing so may damage radiator and hoses.

3. Connect gauge and adapter to radiator filler neck. Pressurize cooling system to 70 kPa (0.7 bar) (10 psi)¹.
4. With pressure applied, check all cooling system hose connections, radiator, and overall engine for leaks.

If leakage is detected, correct as necessary and pressure test system again.

If no leakage is detected, but the gauge indicated a drop in pressure, coolant may be leaking internally within the system or at the block-to-head gasket. Have your engine distributor or servicing dealer correct this problem immediately.

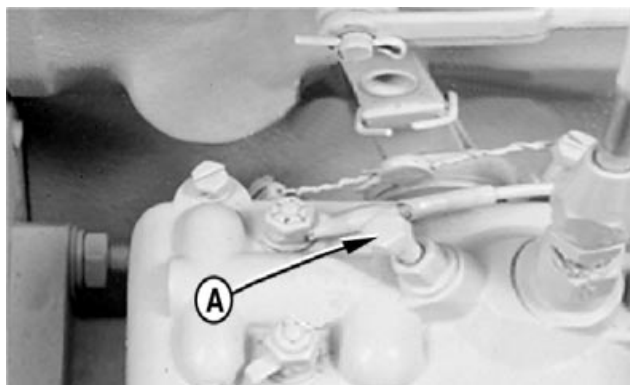
¹Test pressures recommended are for all Deere OEM cooling systems. On specific vehicle applications, test cooling system and pressure cap according to the recommended pressure for that vehicle.

Lubrication & Maint./2000 Hour/24 Month

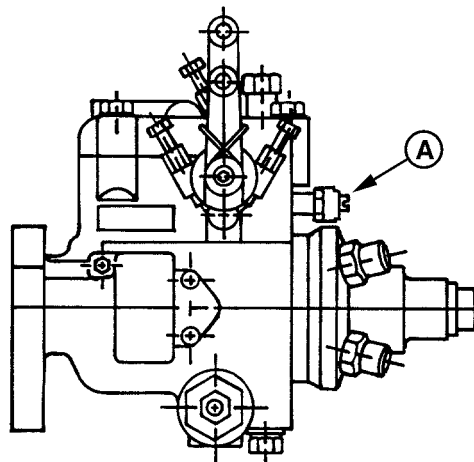
Adjusting Variable Speed (Droop) on Generator Set Engines

Stanadyne Injection Pumps Only

1. Warm engine to normal operating temperature.
2. Run engine at rated speed.
3. Apply full load.
4. Remove load.
5. Note the no-load speed or frequency.
6. If throttle is not spring-loaded type, disconnect throttle linkage or cable.
7. Turn screw (A) to adjust droop.
8. If necessary, adjust and connect throttle linkage or cables.



RG8100 -UN-19JAN99



RG8101 -UN-19JUN00

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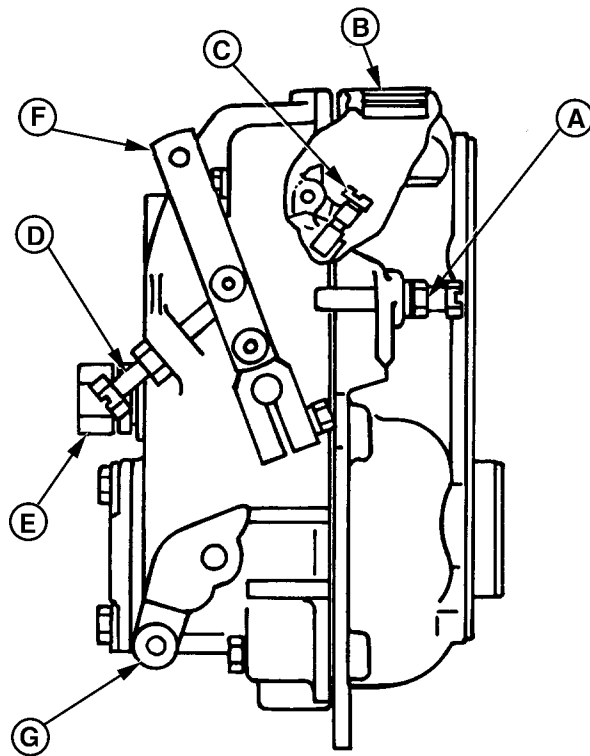
RG, RG34710, 5583 -19-20MAY96-1/3

Denso In-Line Injection Pumps Only

1. Check for specified no-load (frequency). If governor regulation is within 5–7% range, no adjustment is necessary.
2. If governor regulation is above 7% or below 5%, stop engine and remove cap nuts from adjusting screws before making adjustments.
3. Remove droop adjusting screw access plug (B, shown removed) from top of governor housing.
4. Back out slow idle (adjusting) screw (D) and bumper screw. Pull back on throttle lever (F, toward rear of governor housing) by hand until the droop adjusting screw (C) inside housing can be adjusted through the access plug hole.
5. Screw the droop screw in (clockwise), counting the turns until screw bottoms out. Then, return screw to original setting.

NOTE: A noticeable click will occur at each 1/4 turn of droop adjusting screw. One click clockwise will increase no-load speed approximately 10 rpm, counter-clockwise will reduce speed by 10 rpm.

6. Screw in the droop screw (clockwise) no more than 1/2 turn (two clicks) at a time to reduce governor droop. Turn counterclockwise no more than two clicks at a time to increase governor droop (to reduce governor sensitivity).
7. Replace access plug in top of governor housing. Start engine, apply full (100%) load, and readjust high idle adjusting screw until 1500 rpm is obtained at the specified power.
8. Screw in idle (bumper) spring until engine speed increases 5–10 rpm.
9. Repeat steps 4 through 7 until governor regulation is within the 5–7% range.
10. Replace all cap nuts onto adjusting screws and tighten lock nuts securely.



- A—Fast Idle (Stop) Screw
- B—Droop Adjusting Screw Access Plug Location
- C—Droop Adjusting Screw
- D—Slow Idle (Adjusting) Screw
- E—Idle (Bumper) Spring
- F—Throttle Lever
- G—Mechanical Shutoff Lever

RG5752 -JN-03NOV97

Continued on next page

RG, RG34710, 5583 -19-20MAY96-2/3

Lucas Injection Pumps Only

See your authorized Lucas Repair Station for speed droop adjustment. This service requires that an internal pump adjustment be made.

RG,RG34710,5583 -19-20MAY96-3/3

Checking Crankshaft Vibration Damper (6-Cylinder Engine Only)

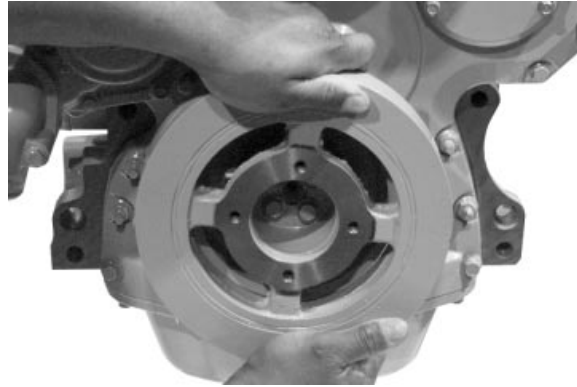
1. Remove belts (shown removed).
2. Grasp vibration damper with both hands and attempt to turn it in both directions. If rotation is felt, damper is defective and should be replaced.

IMPORTANT: The vibration damper assembly is not repairable and should be replaced every 4500 hours or 60 months, whichever occurs first.

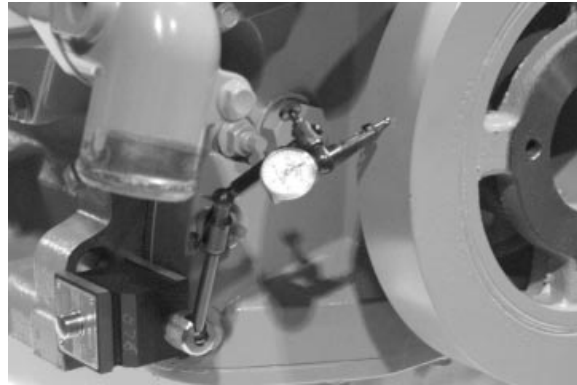
3. Check vibration damper radial runout by positioning a dial indicator (A) so probe contacts damper outer diameter.
4. With engine at operating temperature, rotate crankshaft using either JD281A, JDG820, or JDE83 Flywheel Turning Tool.
5. Note dial indicator reading. If runout exceeds specifications given below, replace vibration damper.

Specification

Vibration Damper Maximum..... 1.50 mm (0.060 in.)
Radial Runout



RG8018 -UN-15JAN99



RG7508 -UN-23NOV97

RG,RG34710,5585 -19-20MAY96-1/1

Flushing Cooling System



CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



TS281 -JUN-23AUG88

NOTE: When John Deere COOL-GARD is used, the drain interval is 3000 hours or 36 months. The drain interval may be extended to 5000 hours or 60 months of operation, **provided that the coolant is tested annually AND additives are replenished, as needed, by adding a supplemental coolant additive (SCA).**

If COOL-GARD is not used, the flushing interval is 2000 hours or 24 months of operation.

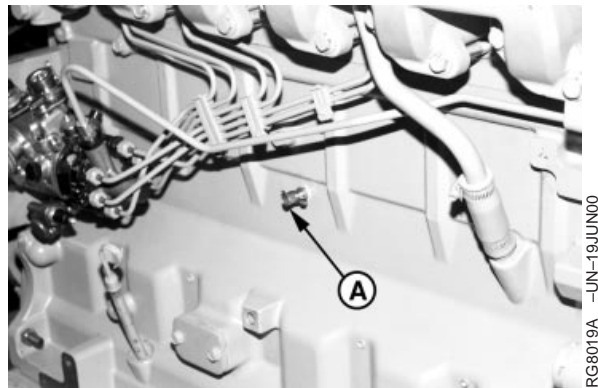
Drain old coolant, flush the entire cooling system, test thermostats, and fill with recommended clean coolant.

1. Pressure test entire cooling system and pressure cap if not previously done. (See PRESSURE TESTING COOLING SYSTEM, in the Lubrication and Maintenance/600 Hour/12 Month Section.)
2. Slowly open the engine cooling system filler cap or radiator cap to relieve pressure and allow coolant to drain faster.

Continued on next page

RG, RG34710, 5587 -19-20MAY96-1/3

3. Open engine block drain valve (A) on left side of engine. Drain all coolant from engine block.
4. Open radiator drain valve. Drain all coolant from radiator.
5. Remove thermostats at this time, if not previously done. Install cover (without thermostats) using old gasket and tighten cap screws to 47 N•m (35 lb-ft).
6. Close all drain valves after coolant has drained.



RG8019A -UN-19JUN00

CAUTION: Do not run engine longer than 10 minutes. Doing so may cause engine to overheat which may cause burns when radiator water is draining.

7. Fill the cooling system with clean water. Run the engine about 10 minutes to stir up possible rust or sediment.
8. Stop engine, pull off lower radiator hose and remove radiator cap. Immediately drain the water from system before rust and sediment settle.
9. After draining water, close drain valves. Reinstall radiator cap and radiator hose and clamp. Fill the cooling system with clean water and TY15979 John Deere Heavy Duty Cooling System Cleaner or an equivalent cleaner such as Fleetguard® RESTORE™ and RESTORE PLUS™. Follow manufacturer's directions on label.
10. After cleaning the cooling system, drain cleaner and fill with water to flush the system. Run the engine about 10 minutes, remove radiator cap and pull off lower radiator hose, then drain out flushing water.
11. Close all drain valves on engine and radiator. Reinstall radiator hose and tighten clamps securely. Install thermostats using a new gasket. (See TESTING THERMOSTATS OPENING TEMPERATURE later in this section.)

Fleetguard is a trademark of Cummins Engine Company, Inc.
 RESTORE is a trademark of Fleetguard.
 RESTORE PLUS is a trademark of Fleetguard.

Continued on next page

RG, RG34710, 5587 -19-20MAY96-2/3

IMPORTANT: Air must be expelled from cooling system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug after filling cooling system.

12. Add coolant to radiator until coolant touches bottom of filler neck. (See ADDING COOLANT in Service As Required Section.) Install radiator cap.
13. Run engine until it reaches operating temperature. This mixes the solution uniformly and circulates it through the entire system. The normal engine coolant temperature range is 82°—94°C (180° — 202°F).
14. After running engine, check coolant level and entire cooling system for leaks.

RG, RG34710, 5587 -19-20MAY96-3/3

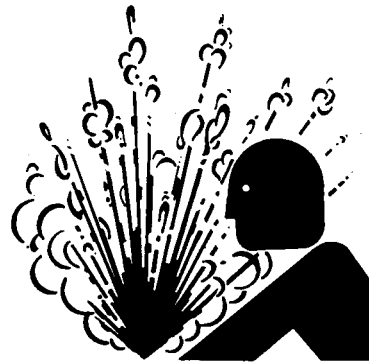
Testing Thermostats Opening Temperature

To Remove Thermostat(s)

NOTE: On some engines, the water manifold/thermostat housing is an integral part of the cylinder head.

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns. DO NOT drain coolant until it has cooled below operating temperature. Always loosen radiator pressure cap or drain valve slowly to relieve pressure.

1. Visually inspect area around thermostat housing for leaks.
2. Remove radiator pressure cap and partially drain cooling system.
3. Remove thermostat cover-to-water pump tube (A) and seal.



TS281 -UN-23AUG88

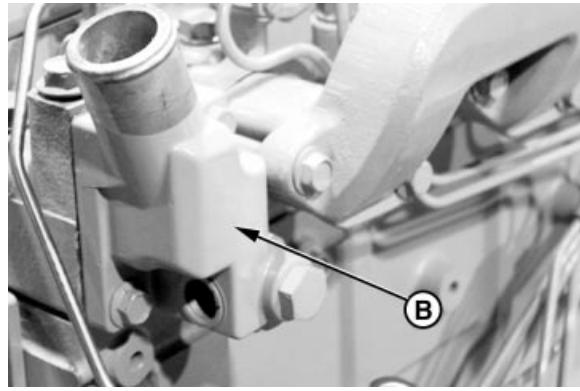


RG8115A -UN-15JAN98

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DPSG, RG34710, 112 -19-05NOV99-1/5

4. Remove water manifold.thermostat cover (B) with gasket.
5. Remove thermostat(s)
6. Remove and discard all gasket material. Clean gasket surfaces.
7. Clean and check cover for cracks or damage.



Continued on next page

DPSG.RG34710,112 -19-05NOV99-2/5

Testing Thermostats Opening Temperature

1. Remove thermostat(s).
2. Visually inspect thermostat(s) for corrosion or damage. If dual thermostats, replace as a matched set as necessary.

CAUTION: DO NOT allow thermostat or thermometer to rest against the side or bottom of container when heating water. Either may rupture if overheated.

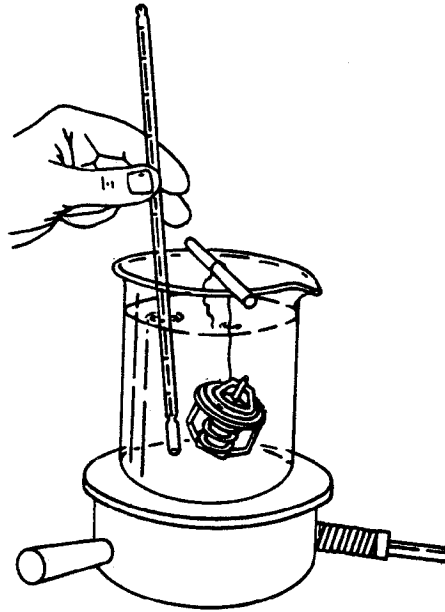
3. Suspend thermostat and a thermometer in a container of water.
4. Stir the water as it heats. Observe opening action of thermostat and compare temperatures with the specification given in chart below.

NOTE: Due to varying tolerances of different suppliers, initial opening and full open temperatures may vary slightly from specified temperatures.

THERMOSTAT TEST SPECIFICATIONS

| Rating | Initial Opening (Range) | Full Open (Nominal) |
|--------------|-------------------------|---------------------|
| 71°C (160°F) | 69—72°C (156—162°F) | 84°C (182°F) |
| 77°C (170°F) | 74—78°C (166—172°F) | 89°C (192°F) |
| 82°C (180°F) | 80—84°C (175—182°F) | 94°C (202°F) |
| 89°C (192°F) | 86—90°C (187—194°F) | 101°C (214°F) |
| 90°C (195°F) | 89—93°C (192—199°F) | 103°C (218°F) |
| 92°C (197°F) | 89—93°C (193—200°F) | 105°C (221°F) |
| 96°C (205°F) | 94—97°C (201—207°F) | 100°C (213°F) |
| 99°C (210°F) | 96—100°C (205—212°F) | 111°C (232°F) |

5. Remove thermostat and observe its closing action as it cools. In ambient air the thermostat should close completely. Closing action should be smooth and slow.
6. Replace any defective thermostat. On a dual thermostat engine, replace both thermostats.



RG5971 -UN-23NOV97

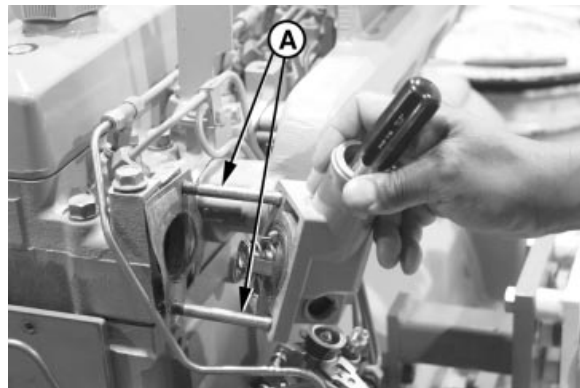
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DPSG, RG34710, 112 -19-05NOV99-3/5

To Install Thermostats

IMPORTANT: Install manifold gasket so that smaller (round) holes are at lower left and upper right corners of manifold (matching studs A).

1. Clean all gasket material from thermostat cover and housing mounting surfaces.
2. Using guide studs (A) to keep gasket in place, install a new gasket on cylinder head.
3. Install thermostat(s) with jiggle wire facing up in the 12 o'clock position.
4. Using a screwdriver to hold thermostat(s) in place, install thermostat(s) and water manifold/thermostat cover.
5. Tighten cover cap screws to 70 N•m (52 lb-ft).
6. Lubricate new O-ring with PT507 Multi-Purpose Grease. Install seal (B) in thermostat cover.



RG7614A -UN-06NOV97



RG7921B -UN-13NOV97

DPSG, RG34710,112 -19-05NOV99-4/5

7. Install water manifold/thermostat cover-to-water pump tube (C). Tighten clamps.
8. If not already done, fill cooling system and check for leaks.

IMPORTANT: Air must be expelled from cooling system when filling. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filling system. Tighten fitting or plug when all air has been expelled.



RG8115B -UN-15JAN98

DPSG, RG34710,112 -19-05NOV99-5/5

Check and Adjust Valve Clearance



CAUTION: To prevent accidental starting of engine while performing valve adjustments, always disconnect **NEGATIVE (—)** battery terminal.

IMPORTANT: Valve clearance **MUST BE** checked and adjusted with engine **COLD**.

1. Remove rocker arm cover and crankcase ventilator tube.

IMPORTANT: Visually inspect contact surfaces of valve tips and rocker arm wear pads. Check all parts for excessive wear, breakage, or cracks. Replace parts that show visible damage.

Rocker arms that exhibit excessive valve clearance should be inspected more thoroughly to identify damaged parts.

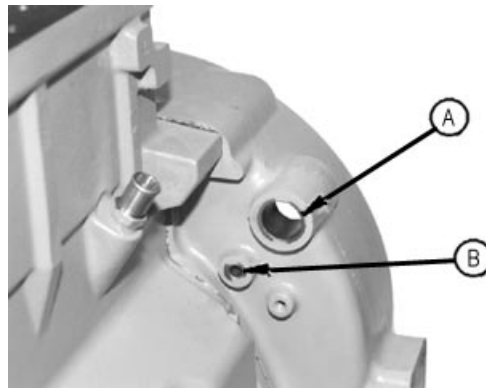
2. Remove plastic plugs or cover plate from engine timing/rotation hole (A) and timing pin hole (B).

NOTE: Some engines are equipped with flywheel housings which do not allow use of an engine flywheel rotation tool. These engines may be rotated from front nose of engine, using JDG966 Crankshaft Front/Rear Rotation Adapter.

3. Using JDE83 or JDG820 Flywheel Turning Tool, rotate engine flywheel in running direction (clockwise viewed from front) until No. 1 cylinder is at TDC compression stroke. Insert JDE81-4 Timing Pin in flywheel.

If No.1 cylinder rocker arms are loose, the engine is at No. 1 TDC compression.

If No. 1 cylinder rocker arms are not loose, rotate engine one full revolution (360°) to No. 1 TDC compression.



Flywheel Housing Timing Holes

A—Timing/Rotation Hole
B—Timing Pin Hole

RG7408 -UN-06AUG96

Continued on next page

DPSG, RG41165, 137 -19-15AUG00-1/5

4. With engine lock-pinned at TDC of No. 1 piston's compression stroke, check valve clearance to following specifications. (Use sequence for 4-cylinder or 6-cylinder engines as outlined on next page.)

Specification

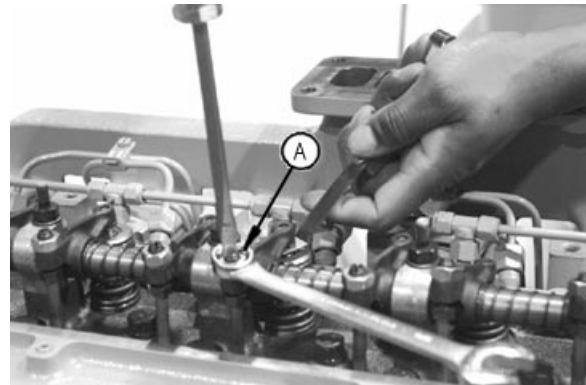
| | |
|--------------------------------------|-------------------|
| Intake Valve Clearance Checking..... | 0.31—0.38 mm |
| (Rocker Arm-to-Valve Tip) | (0.012—0.015 in.) |
| (Engine Cold) Clearance | |
| Exhaust Valve Clearance..... | 0.41—0.48 mm |
| Checking (Rocker Arm-to-Valve | (0.016—0.019 in.) |
| Tip) (Engine Cold) Clearance | |

DPSG,RG41165,137 -19-15AUG00-2/5

5. If valves need adjusting, use the appropriate valve clearance adjustment procedure on the next page and adjust to specifications below. Loosen the jam nut (A) on rocker arm adjusting screw. Turn adjusting screw until feeler gauge slips with a slight drag. Hold the adjusting screw from turning with screwdriver and tighten jam nut to specifications. Recheck clearance again after tightening jam nut. Readjust clearance as necessary.

Specification

| | |
|---------------------------------|---------------------|
| Intake Valve Clearance..... | 0.36 mm (0.014 in.) |
| Adjustment (Rocker Arm-to-Valve | |
| Tip) (Engine Cold) Clearance | |
| Exhaust Valve Clearance..... | 0.46 mm (0.018 in.) |
| Adjustment (Rocker Arm-to-Valve | |
| Tip) (Engine Cold) Clearance | |



Adjusting Valves

A—Adjusting Screw Jam Nut

Specification

| | |
|--------------------------------|-------------------|
| Rocker Arm Adjusting Screw Jam | 27 N•m (20 lb-ft) |
| Nut Torque | |

6. Replace rocker arm cover and crankcase ventilator tube.

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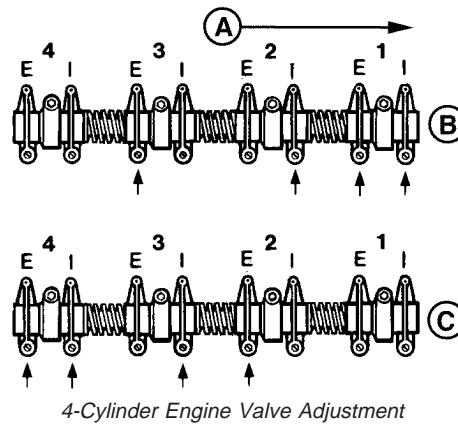
DPSG,RG41165,137 -19-15AUG00-3/5

4-Cylinder Engine:

NOTE: Firing order is 1-3-4-2.

1. Using JDE81-4 Timing Pin, lock No. 1 piston at TDC compression stroke (B).
2. Adjust valve clearance on No. 1 and 3 exhaust valves and No. 1 and 2 intake valves.
3. Turn crankshaft 360°. Lock No. 4 piston at TDC compression stroke (C).
4. Adjust valve clearance on No. 2 and 4 exhaust valves and No. 3 and 4 intake valves.

A—Front of Engine
 B—No. 1 Piston TDC Compression
 C—No. 4 Piston TDC Compression
 E—Exhaust Valve
 I—Intake Valve



RG4776 -UN-31OCT97

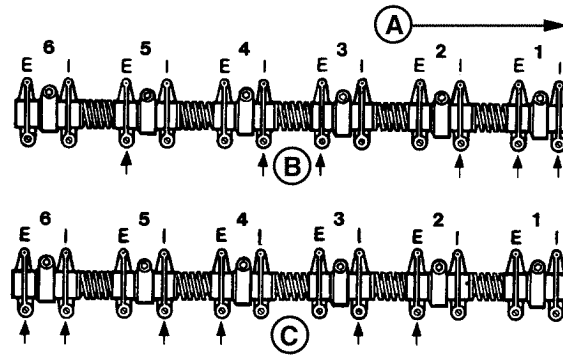
4-Cylinder Engine Valve Adjustment

DPSG, RG41165, 137 -19-15AUG00-4/5

6-Cylinder Engine:

NOTE: Firing order is 1-5-3-6-2-4.

1. Lock No. 1 piston at TDC compression stroke (B).
2. Adjust valve clearance on No. 1, 3 and 5 exhaust valves and No. 1, 2, and 4 intake valves.
3. Turn crankshaft 360°. Lock No. 6 piston at TDC compression stroke (C).
4. Adjust valve clearance on No. 2, 4 and 6 exhaust valves and No. 3, 5, and 6 intake valves.



RG4777 -UN-31OCT97

6-Cylinder Engine Valve Adjustment

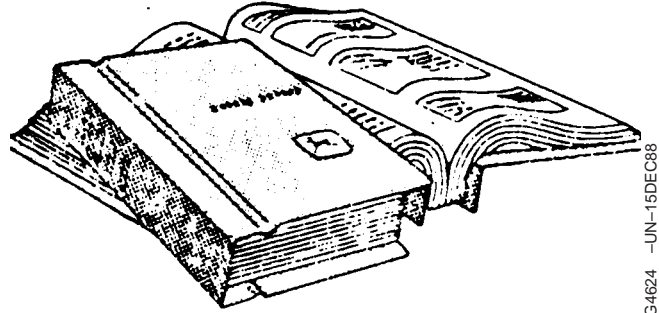
A—Front of Engine
 B—No. 1 Piston TDC Compression
 C—No. 6 Piston TDC Compression
 E—Exhaust Valve
 I—Intake Valve

DPSG, RG41165, 137 -19-15AUG00-5/5

Service as Required

Additional Service Information

This is not a detailed service manual. If you want more detailed service information, use the form in the back of this manual to order a component technical manual.



RG4624 -UN-15DEC88

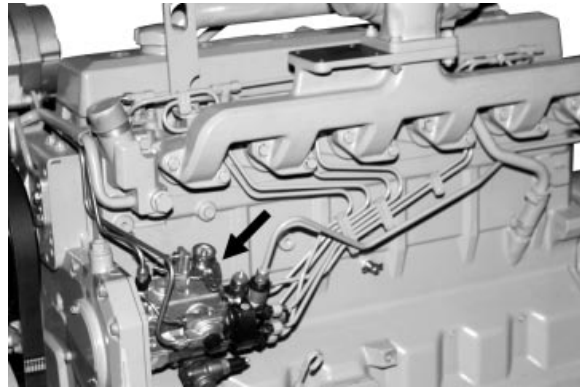
RG, RG34710, 5591 -19-20MAY96-1/1

Do Not Modify Fuel System

IMPORTANT: Modification or alteration of the injection pump (arrow), the injection pump timing, or the fuel injectors in ways not recommended by the manufacturer will terminate the warranty obligation to the purchaser.

In addition, tampering with fuel system which alters emission-related equipment on engines may result in fines or other penalties, per EPA regulations or other local emission laws.

Do not attempt to service injection pump or fuel injectors yourself. Special training and special tools are required. (See your authorized servicing dealer or engine distributor.)



RG8022A -UN-19JUN00

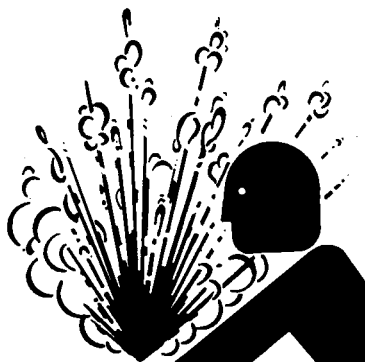
RG, RG34710, 5592 -19-20MAY96-1/1

Adding Coolant



CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



TS281 -JUN-23AUG88

IMPORTANT: Never pour cold liquid into a hot engine, as it may crack cylinder head or block. **DO NOT** operate engine without coolant for even a few minutes.

John Deere TY15161 Cooling System Sealer may be added to the radiator to stop leaks. **DO NOT** use any other stop-leak additives in the cooling system.

Air must be expelled from cooling system when coolant is added.

1. Loosen temperature sending unit fitting at rear of cylinder head or plug in side of thermostat housing to allow air to escape when filling system.

IMPORTANT: When adding coolant to the system, use the appropriate coolant solution. (See **ENGINE COOLANT SPECIFICATIONS** in Fuels, Lubricants, and Coolant Section for mixing of coolant ingredients before adding to cooling system.)

Do not overfill cooling system. A pressurized system needs space for heat expansion without overflowing at top of radiator.

2. Fill until coolant level touches bottom of radiator filler neck.
3. Tighten plugs and fittings when air has been expelled from system.

Continued on next page

RG, RG34710, 5593 -19-20MAY96-1/2

Service as Required

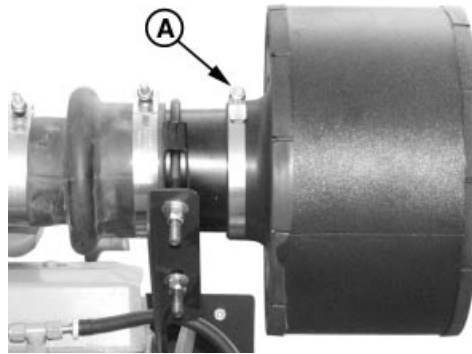
4. Run engine until it reaches operating temperature.

RG, RG34710, 5593 -19-20MAY96-2/2

Replacing Single Stage Air Cleaner

IMPORTANT: ALWAYS REPLACE air cleaner when air restriction indicator shows a vacuum of 625 mm (25 in.) H₂O, is torn, or visibly dirty.

NOTE: This procedure applies to John Deere single stage air cleaner kits. Refer to manufacturers' instructions for servicing air cleaners not supplied by John Deere.



Single Stage Air Filter

1. If equipped, loosen body clamp.
2. Loosen clamp around outlet neck (A).
3. Remove air cleaner.
4. Install new filter so that overlap (B) of air cleaner outlet neck and engine intake pipe is to specification below.

Specification

Air Cleaner Neck to Engine 38 mm (1.5 in)
Intake Overlap

5. Tighten neck clamp (A) to specification below.

Specification

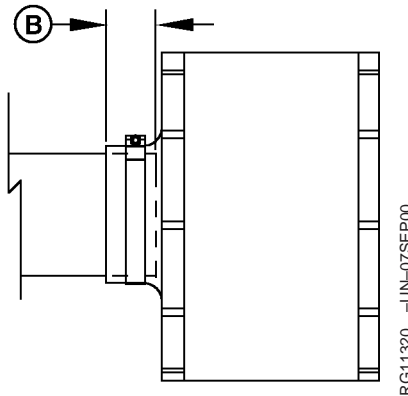
Air Cleaner Neck Clamp Torque 6.8 N•m (60 lb-in.)

IMPORTANT: Do NOT overtighten body clamp. Overtightening may cause crushing of air cleaner body. Tighten body clamp only until snug.

6. If equipped, tighten body clamp until snug.

IMPORTANT: Whenever the air cleaner has been serviced or removed, ALWAYS fully depress the air restriction indicator reset button (if equipped) to assure accurate readings.

7. If equipped, fully depress air restriction indicator reset button and release to reset indicator.



A—Outlet Neck Clamp
B—Filter to Engine Overlap

RG11319A -UN-06SEP00

Replacing Axial Seal Air Cleaner Filter Element

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H₂O, is torn, or visibly dirty.

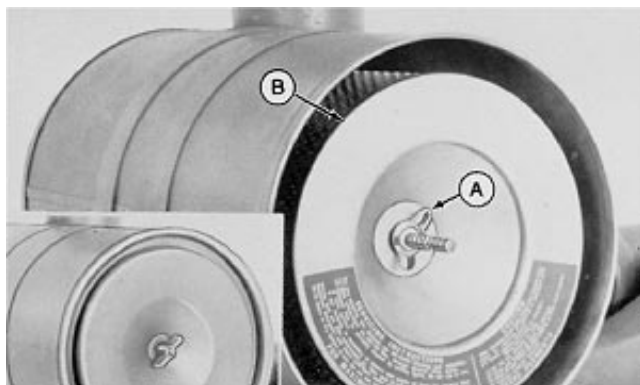
NOTE: This procedure applies to John Deere 2-stage axial seal air cleaner kits. Refer to manufacturers' instructions for servicing air cleaners not supplied by John Deere.

1. Remove wing nut and remove canister cover shown in small illustration inset.
2. Remove wing nut (A) and remove primary element (B) from canister.
3. Thoroughly clean all dirt from inside canister.

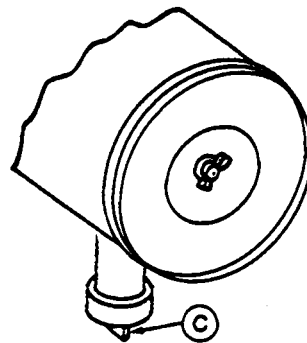
NOTE: Some engines may have a dust unloader valve (C) on the air cleaner. If equipped, squeeze valve tip to release any trapped dirt particles.

IMPORTANT: Remove secondary (safety) element (E) **ONLY** for replacement. **DO NOT** attempt to clean, wash, or reuse secondary element. Replacement of secondary element is usually necessary **ONLY** when primary element has a hole in it.

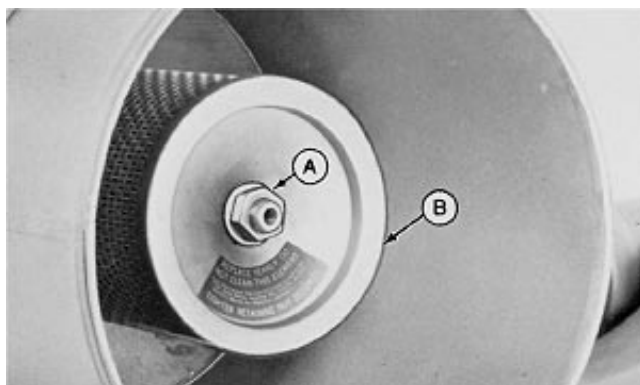
4. To replace secondary element, remove retaining nut (D) and secondary element (E). Immediately replace secondary element with new element to prevent dust from entering air intake system.
5. Install new primary element and tighten wing nut securely. Install cover assembly and tighten retaining wing nut securely.



RG4686 -UN-20DEC88



RG4687 -UN-20DEC88



RG4688 -UN-20DEC88

Continued on next page

RG41165,000008A -19-06SEP00-1/2

IMPORTANT: Whenever the air cleaner has been serviced or had cover removed, **ALWAYS** fully depress the air restriction indicator reset button (if equipped) to assure accurate readings.

6. If equipped, fully depress air restriction indicator reset button and release to reset indicator.

RG41165,000008A -19-06SEP00-2/2

Replacing Radial Seal Air Cleaner Filter Element

IMPORTANT: ALWAYS REPLACE primary air cleaner element when air restriction indicator shows a vacuum of 625 mm (25 in.) H₂O, is torn, or visibly dirty.

NOTE: This procedure applies to John Deere 2-stage radial seal air cleaner kits. Refer to manufacturers' instructions for servicing air cleaners not supplied by John Deere.

1. Unlatch and remove dust cup/cover (A) of air cleaner.
2. Move end of filter (B) back and forth gently to break seal.
3. Pull filter (B) off outlet tube and out of housing.
4. Thoroughly clean all dirt from inside housing and from outlet bore.

IMPORTANT: Remove secondary (safety) element (C) **ONLY** for replacement. **DO NOT** attempt to clean, wash, or reuse secondary element. Replacement of secondary element is usually necessary **ONLY** when primary element has a hole in it.

5. To replace secondary element (C), pull filter element out gently. Immediately replace secondary element with new element to prevent dust from entering air intake system.
6. Install new primary filter element. Apply pressure by hand at outer rim of filter.

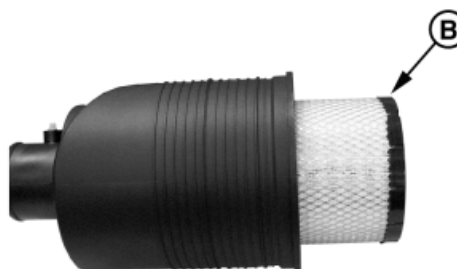
IMPORTANT: Do NOT use latches on cover to force filter into air cleaner. Using cover to force filter will damage cleaner housing.

7. Close housing with dust unloader valve aimed down and latch latches.



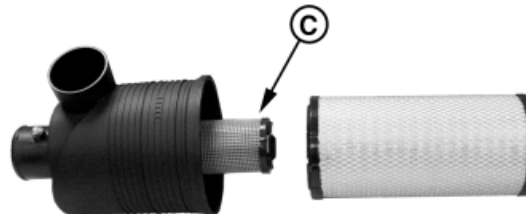
Dust Cup/Cover

RG11321A -UN-08SEP00



Primary Filter Element

RG11322A -UN-08SEP00



Secondary Filter Element

RG11327A -UN-08SEP00

A—Dust Cap/Cover
B—Primary Filter Element
C—Secondary Filter Element

Continued on next page

RG41165,000008B -19-06SEP00-1/2

IMPORTANT: Whenever the air cleaner has been serviced or had cover removed, **ALWAYS** fully depress the air restriction indicator reset button (if equipped) to assure accurate readings.

8. If equipped, fully depress air restriction indicator reset button and release to reset indicator.

RG41165,000008B -19-06SEP00-2/2

Replacing Fan and Alternator Belts

Refer to CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR in Lubrication and Maintenance/250 Hour/6 Month Section for additional information on the belt tensioner.

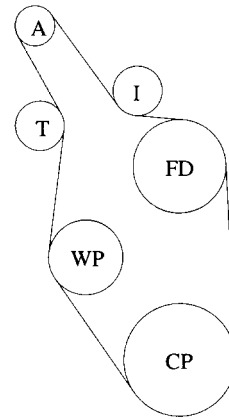
1. Inspect belts for cracks, fraying, or stretched out areas. Replace if necessary.
2. To replace belt with automatic tensioner, release tension on belt using a breaker bar and socket on tension arm.

To replace belt with manual tensioner, release tension at belt tensioner (See MANUAL BELT TENSIONER ADJUSTMENT in Lubrication and Maintenance/250 Hour/6 Month Section.)

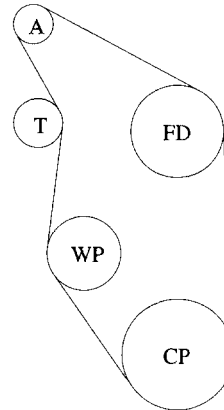
3. Remove poly-vee belt from pulleys and discard belt.
4. Install new belt, making sure belt is correctly seated in all pulley grooves. Refer to belt routing at right for your application.
5. Apply tension to belt with tensioner. Remove socket.
6. Start engine and check belt alignment.

1

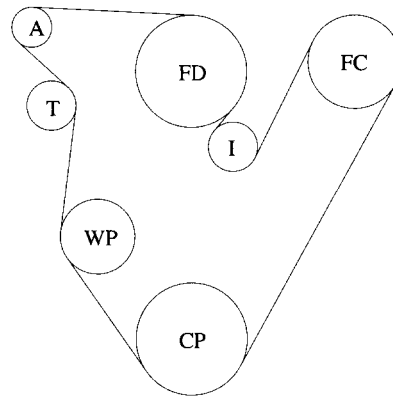
A—Alternator
CP—Crank Pulley
FC—Freon Compressor
FD—Fan Drive
I—Idler Pulley
T—Tensioner
WP—Water Pump



**290 mm (11.4 in.) Fan Height and Lower*



**338 mm (13.3 in.) Fan Height and Higher Without Freon Compressor*



**402 mm (15.8 in.) Fan Height With Freon Compressor*

RG8102 -UN-19JUN00

RG8103 -UN-19JUN00

RG8104 -UN-19JUN00

¹*Measured from crank centerline to fan drive center.

Power Take-Off (PTO) Clutch

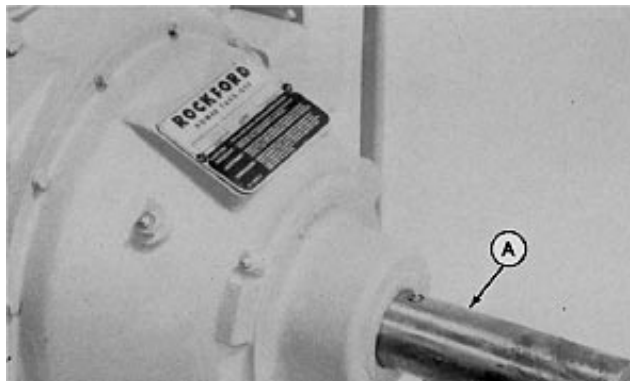
CAUTION: Entanglement in rotating driveline can cause serious injury or death. Keep shield on PTO drive shaft (A) between the clutch housing and the engine driven equipment at all times during engine operation. Wear close fitting clothing. Stop the engine and be sure PTO driveline is stopped before making adjustments.

Proper performance of the power take-off unit will be related to the care it is given. Lubricate it periodically and keep the clutch properly adjusted. (See Lubrication and Maintenance/250 Hour Section.)

If the power take-off does not work properly after adjustment and lubrication, contact your authorized servicing dealer or engine distributor.



TS198 -JUN-23AUG88



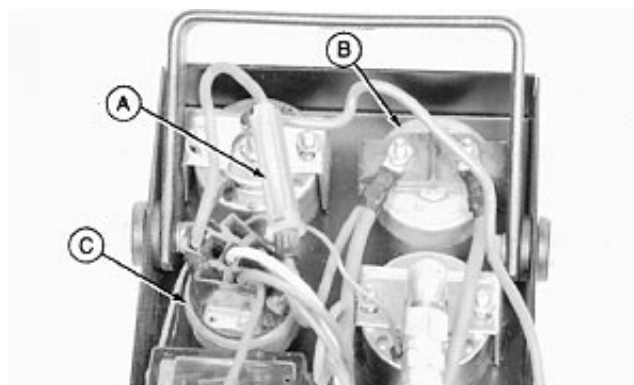
RG4693 -JUN-14DEC88

RG, RG34710, 5600 -19-20MAY96-1/1

Checking Fuses

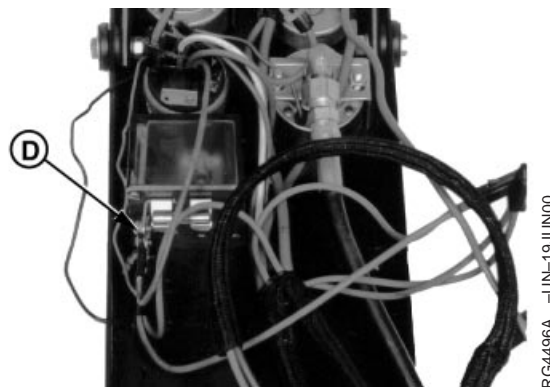
The following instructions apply to engines equipped with a John Deere instrument panel.

1. On engines with the early instrument panel (—1998), check the fuse (A) between the ammeter (B) and key switch (C) located on back side of instrument panel. If defective, replace with an equivalent 25-amp fuse.
2. Check the fuse (D) mounted on the bottom of the magnetic safety switch. If defective, install an equivalent 14-amp fuse.
3. On later (1999—) North American instrument panels, check the fuse in fuse holder (E) on front face of instrument panel. Replace as necessary with an equivalent 14-amp fuse.



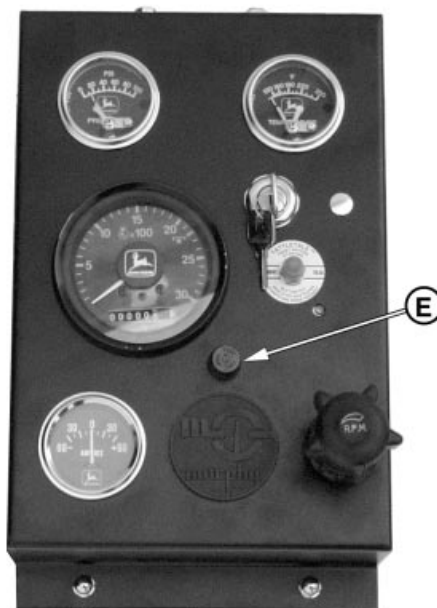
North American (—1998) Instrument Panel Shown

RG4493 —UN-14DEC88



North American (—1998) Instrument Panel Shown

RG4496A —UN-19JUN00



North American (1999—) Instrument Panel Shown

RG, RG34710, 5601 —19-20MAY96-1/1

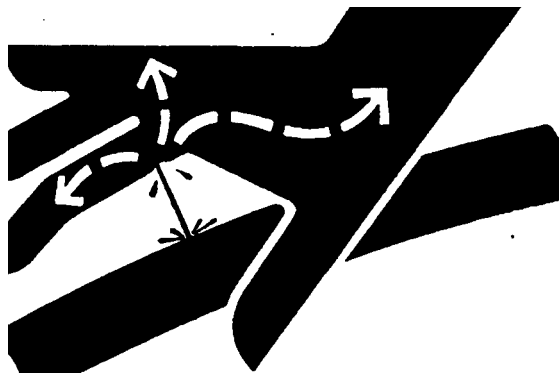
RG11299K —UN-11SEP00

Bleeding the Fuel System



CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

If ANY fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

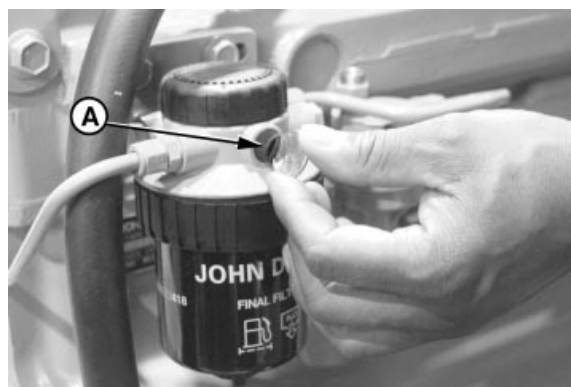


X9811 -UN-23AUG88

Whenever the fuel system has been opened up for service (lines disconnected or filters removed), it will be necessary to bleed air from the system.

RG, RG34710, 5602 -19-20MAY96-1/7

1. Loosen the air bleed vent screw (A) two full turns by hand on fuel filter base.



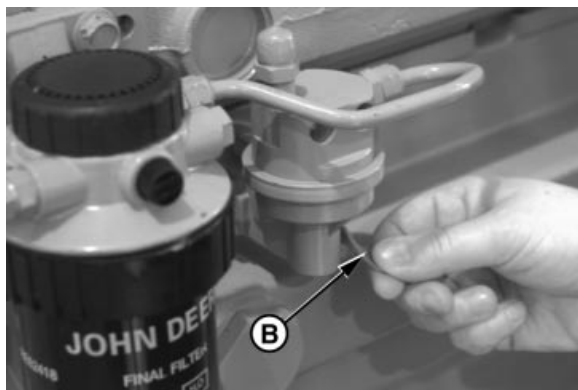
RG7947 -UN-13NOV97

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RG, RG34710, 5602 -19-20MAY96-2/7

2. Operate supply pump primer lever (B) until fuel flow is free from air bubbles.
3. Tighten bleed plug securely, continue operating hand primer until pumping action is not felt. Push hand primer inward (toward engine) as far as it will go.
4. Start engine and check for leaks.

If engine will not start, it may be necessary to bleed air from fuel system at fuel injection pump or injection nozzles as explained next.



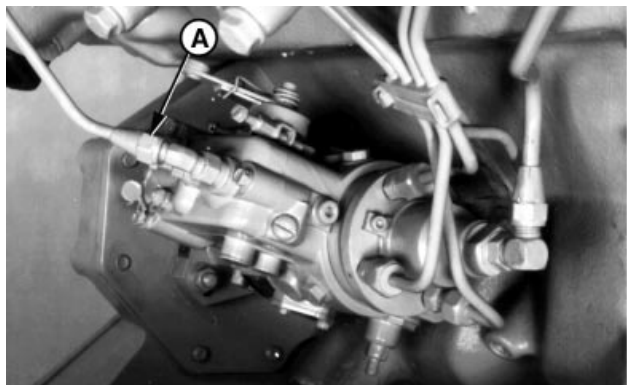
RG8013A -UN-15JAN99

RG, RG34710, 5602 -19-20MAY96-3/7

At Fuel Injection Pump

On Stanadyne rotary pumps:

1. Slightly loosen fuel return line connector (A) at fuel injection pump.
2. Operate fuel supply pump primer lever until fuel, without air bubbles, flows from fuel return line connection.
3. Tighten return line connector to 27 N•m (20 lb-ft).
4. Leave hand primer in the up position away from the cylinder block.



RG6264 -UN-03NOV97

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RG, RG34710, 5602 -19-20MAY96-4/7

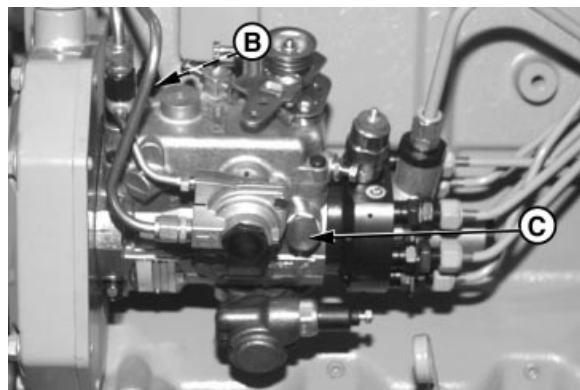
On Lucas rotary pumps:

1. Loosen bleed screw (B) on pump cover.

NOTE: On Models DP200/201/203 Injection Pumps, bleed screw is located on top of cover near the fuel return line.

2. Operate fuel supply pump primer lever or turn ignition switch to "ON".
3. Wait until fuel flow is free of air bubbles. Tighten bleed screw.
4. Leave hand primer in the up position away from the cylinder block.

CAUTION: NEVER loosen screw (C) securing pump head, otherwise pump damage may occur.



RG7948 -UN-13NOV97

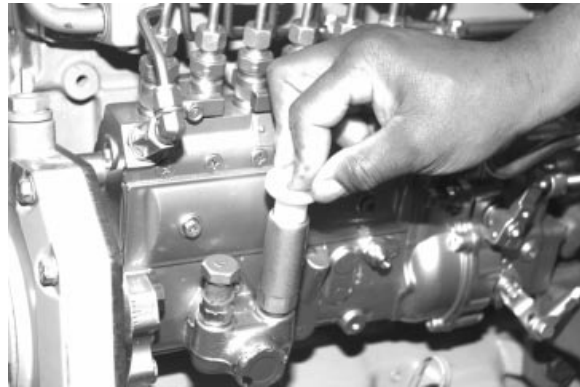
RG, RG34710, 5602 -19-20MAY96-5/7

On Denso in-line pumps:

1. Unscrew hand primer on fuel supply pump until it can be pulled by hand.
2. Open filter port plug.
3. Operate the hand primer until a smooth flow of fuel, free of bubbles, comes out of the filter plug hole.

IMPORTANT: Be sure hand primer is all the way down in barrel before tightening to prevent internal thread damage.

4. Simultaneously stroke the hand primer down and close the filter port plug. This prevents air from entering the system. Tighten plug securely. DO NOT overtighten.
5. Lock hand primer in position.



RG8069 -UN-23NOV97

Continued on next page

RG, RG34710, 5602 -19-20MAY96-6/7

At Fuel Injection Nozzles

1. Move the speed control lever to half throttle position. On engines equipped with electronic fuel shut-off solenoid, energize solenoid.
2. Using two open-end wrenches, loosen fuel line connection at injection nozzle.
3. Crank engine over with starting motor, (but do not start engine), until fuel free from bubbles flows out of loosened connection. Retighten connection to 27 N•m (20 lb-ft).
4. Repeat procedure for remaining injection nozzles (if necessary) until all air has been removed from fuel system.

If engine still will not start, see your authorized servicing dealer or engine distributor.



RG7725 -UN-08JAN97

RG, RG34710, 5602 -19-20MAY96-7/7

Troubleshooting

General Troubleshooting Information

Troubleshooting engine problems can be difficult. An engine wiring diagram is provided in this section to help isolate electrical problems on power units using John Deere wiring harness and instrument (gauge) panel.

Wiring diagrams are shown for each of the three types of instrument panels offered for these engines.

Later in this section is a list of possible engine problems that may be encountered accompanied by possible causes and corrections. The illustrated diagrams and troubleshooting information are of a general nature, final design of the overall system for your engine application may be different. See your engine distributor or servicing dealer if you are in doubt.

A reliable program for troubleshooting engine problems should include the following basic diagnostic thought process:

- Know the engine and all related systems.
- Study the problem thoroughly.
- Relate the symptoms to your knowledge of engine and systems.
- Diagnose the problem starting with the easiest things first.
- Double-check before beginning the disassembly.
- Determine cause and make a thorough repair.
- After making repairs, operate the engine under normal conditions to verify that the problem and cause was corrected.

RG, RG34710, 5605 -19-20MAY96-1/1

Engine Wiring Diagram Legend (North America)

| | |
|---|--|
| A1 — Speed Control Unit | P6 — Ammeter |
| B1 — Magnetic Speed Sensor | R1 — Resistor (48 ohm) ³ |
| B2 — Coolant Temperature Sensor | S1 — Key Switch |
| B3 — Oil Pressure Sensor | S2 — Magnetic Safety Switch—North American |
| F1 — Starting Circuit Fuse (14 amp) | Auto Override Module—European (Saran) |
| F3 — Fuse (Early Models) ¹ | W1 — Ground on K1 Starter Relay Mounting Stud |
| G1 — Battery | Y1 — Starter Solenoid |
| G2 — Alternator | Y2 — Fuel Shut-off Solenoid |
| H1 — Coolant Temperature Indicator Lamp | BLK — Black |
| H2 — Oil Pressure Indicator Lamp | BLU — Blue |
| H3 — Alternator Indicator Lamp | BRN — Brown |
| K1 — Starter Relay | DK BLU — Dark Blue |
| M1 — Starter Motor | GRN — Green |
| P1 — Coolant Temperature Gauge | ORG — Orange |
| P2 — Oil Pressure Gauge | PUR — Purple |
| P3 — Crankcase Oil Level Switch/Gauge | RED — Red |
| P4 — Tachometer ¹ | YEL — Yellow |
| P5 — Hourmeter (Early Models) ² | |

¹ P4 tachometer has a built-in hourmeter. On some earlier engines, a separate hourmeter (P5) and fuse (F3) were used.

² P4 tachometer has a built-in hourmeter. On some engines, a separate hourmeter (P5) and fuse (F3) are used.

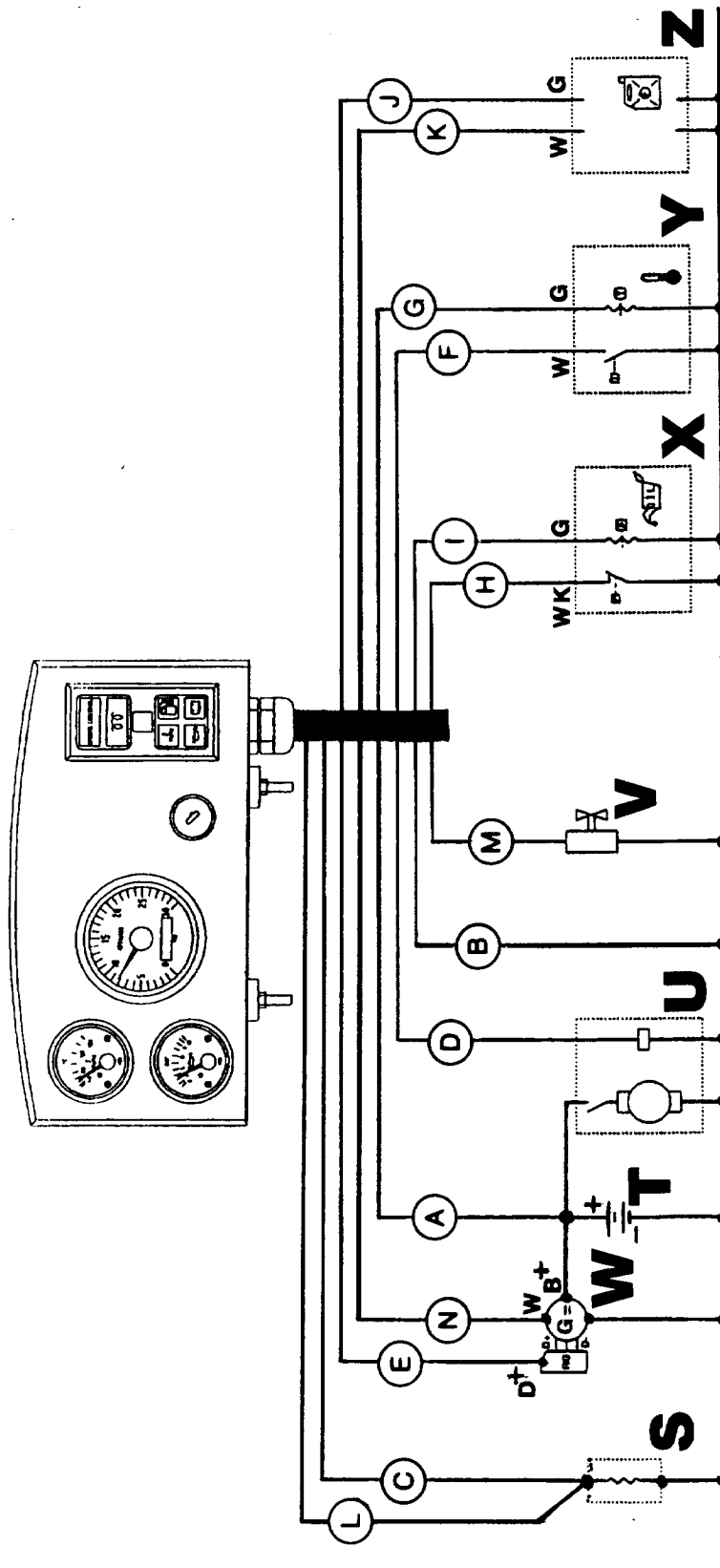
³ Later harnesses have two parallel 100 ohm resistors for the alternator.

Engine Wiring Diagram Legend—VDO Instrument Panel (Except North America)

| | |
|---|--|
| A — 6 mm ² , Red | M — 0.75 mm ² , Green/Yellow |
| B — 1.5 mm ² , Black | N — 0.75 mm ² , Red |
| C — 6 mm ² , Blue | O—R — Not Used |
| D — 4 mm ² , Black | S — Preheater |
| E — 0.75 mm ² , Orange | T — Battery |
| F — 0.75 mm ² , White | U — Starting Motor |
| G — 0.75 mm ² , Blue | V — Electrical Shut-Off |
| H — 0.75 mm ² , Purple | W — Alternator |
| I — 0.75 mm ² , Grey | X — Oil Pressure Sensor |
| J — 0.75 mm ² , Brown | Y — Coolant Temperature Sensor |
| K — 0.75 mm ² , Dark Blue | Z — Fuel Tank Gauge |
| L — 0.75 mm ² , Black | |

DPSG,RG41165,129 -19-19JUN00-1/1

Engine Wiring Diagram—VDO Instrument Panel (Except North America)



CD623P5 -UN-13NOV/98
 DP5G,RG41165,131 -19-19JUN00-1/1

Engine Troubleshooting

| Symptom | Problem | Solution |
|---|--|---|
| Engine cranks but will not start | Incorrect starting procedure. | Verify correct starting procedure. |
| | No fuel. | Check fuel in tank and manual shut-off valve. |
| | Exhaust restricted. | Check and correct exhaust restriction. |
| | Fuel filter plugged or full of water. | Replace fuel filter or drain water from filter. |
| | Injection pump not getting fuel or air in fuel system. | Check fuel flow at supply pump or bleed fuel system. |
| | Faulty injection pump or nozzles. | Consult authorized diesel repair station for repair or replacement. |
| Engine hard to start or will not start | Engine starting under load. | Disengage PTO. |
| | Improper starting procedure. | Review starting procedure. |
| | No fuel. | Check fuel tank. |
| | Air in fuel line. | Bleed fuel line. |
| | Cold weather. | Use cold weather starting aids. |
| | Slow starter speed. | See "Starter Cranks Slowly". |
| | Crankcase oil too heavy. | Use oil of proper viscosity. |
| | Improper type of fuel. | Consult fuel supplier; use proper type fuel for operating conditions. |
| | Water, dirt, or air in fuel system. | Drain, flush, fill, and bleed system. |
| | Clogged fuel filter. | Replace filter element. |
| | Dirty or faulty injection nozzles. | Have authorized servicing dealer or engine distributor check injectors. |
| | Injection pump shut-off not reset. | Turn key switch to "OFF" then to "ON". |

Continued on next page

RG, RG34710, 5608 -19-20MAY96-1/6

| Symptom | Problem | Solution |
|---|--|---|
| Engine knocks | Low engine oil level. | Add oil to engine crankcase. |
| | Injection pump out of time. | See your authorized servicing dealer or engine distributor. |
| | Low coolant temperature. | Remove and check thermostat. |
| | Engine overheating. | See "Engine Overheats". |
| Engine runs irregularly or stalls frequently | Low coolant temperature. | Remove and check thermostat. |
| | Clogged fuel filter. | Replace fuel filter element. |
| | Water, dirt, or air in fuel system. | Drain, flush, fill, and bleed system. |
| | Dirty or faulty injection nozzles. | Have authorized servicing dealer or engine distributor check injectors. |
| Below normal engine temperature | Defective thermostat. | Remove and check thermostat. |
| | Defective temperature gauge or sender. | Check gauge, sender, and connections. |
| Lack of power | Engine overloaded. | Reduce load. |
| | Intake air restriction. | Service air cleaner. |
| | Clogged fuel filter. | Replace filter elements. |
| | Improper type of fuel. | Use proper fuel. |
| | Overheated engine. | See "Engine Overheats". |
| | Below normal engine temperature. | Remove and check thermostat. |
| | Improper valve clearance. | See your authorized servicing dealer or engine distributor. |
| | Dirty or faulty injection nozzles. | Have authorized servicing dealer or engine distributor check injectors. |
| | Injection pump out of time. | See your authorized servicing dealer or engine distributor. |

Continued on next page

RG, RG34710, 5608 -19-20MAY96-2/6

| Symptom | Problem | Solution |
|---|---|---|
| | Turbocharger not functioning. (Turbocharger engines only.) | See your authorized servicing dealer or engine distributor. |
| | Leaking exhaust manifold gasket. | See your authorized servicing dealer or engine distributor. |
| | Defective aneroid control line. | See your authorized servicing dealer or engine distributor. |
| | Restricted fuel hose. | Clean or replace fuel hose. |
| | Low fast idle speed. | See your authorized servicing dealer or engine distributor. |
| Low oil pressure | Low oil level. | Add oil. |
| | Improper type of oil. | Drain, fill crankcase with oil of proper viscosity and quality. |
| High oil consumption | Crankcase oil too light. | Use proper viscosity oil. |
| | Oil leaks. | Check for leaks in lines, gaskets, and drain plug. |
| | Restricted crankcase vent tube. | Clean vent tube. |
| | Defective turbocharger. | See your authorized servicing dealer or engine distributor. |
| Engine emits white smoke | Improper type of fuel. | Use proper fuel. |
| | Low engine temperature. | Warm up engine to normal operating temperature. |
| | Defective thermostat. | Remove and check thermostat. |
| | Defective injection nozzles. | See your authorized servicing dealer or engine distributor. |
| | Engine out of time. | See your authorized servicing dealer or engine distributor. |
| Engine emits black or gray exhaust smoke | Improper type of fuel. | Use proper fuel. |
| | Clogged or dirty air cleaner. | Service air cleaner. |

Continued on next page

RG, RG34710, 5608 -19-20MAY96-3/6

| Symptom | Problem | Solution |
|------------------------------|--|---|
| | Engine overloaded. | Reduce load. |
| | Injection nozzles dirty. | See your authorized servicing dealer or engine distributor. |
| | Engine out of time. | See your authorized servicing dealer or engine distributor. |
| | Turbocharger not functioning. | See your authorized servicing dealer or engine distributor. |
| Engine overheats | Engine overloaded. | Reduce load. |
| | Low coolant level. | Fill radiator to proper level, check radiator and hoses for loose connections or leaks. |
| | Faulty radiator cap. | Have serviceman check. |
| | Stretched poly-vee belt or defective belt tensioner. | Check automatic belt tensioner and check belts for stretching. Replace as required. |
| | Low engine oil level. | Check oil level. Add oil as required. |
| | Cooling system needs flushing. | Flush cooling system. |
| | Defective thermostat. | Remove and check thermostat. |
| | Defective temperature gauge or sender. | Check water temperature with thermometer and replace, if necessary. |
| High fuel consumption | Incorrect grade of fuel. | Use correct grade of fuel. |
| | Improper type of fuel. | Use proper type of fuel. |
| | Clogged or dirty air cleaner. | Service air cleaner. |
| | Engine overloaded. | Reduce load. |
| | Improper valve clearance. | See your authorized servicing dealer or engine distributor. |
| | Injection nozzles dirty. | See your authorized servicing dealer or engine distributor. |

| Symptom | Problem | Solution |
|------------------------------------|---|---|
| Undercharged system | Engine out of time. | See your authorized servicing dealer or engine distributor. |
| | Defective turbocharger. | See your authorized servicing dealer or engine distributor. |
| | Low engine temperature. | Check thermostat. |
| | Excessive electrical load from added accessories. | Remove accessories or install higher output alternator. |
| | Excessive engine idling. | Increase engine rpm when heavy electrical load is used. |
| | Poor electrical connections on battery, ground strap, starter, or alternator. | Inspect and clean as necessary. |
| Battery uses too much water | Defective battery. | Test battery. |
| | Defective alternator. | Test charging system. |
| | Cracked battery case. | Check for moisture and replace as necessary. |
| Batteries will not charge | Defective battery. | Test battery. |
| | Battery charging rate too high. | Test charging system. |
| | Loose or corroded connections. | Clean and tighten connections. |
| | Sulfated or worn-out batteries. | See your authorized servicing dealer or engine distributor. |
| Starter will not crank | Stretched poly-vee belt or defective belt tensioner. | Adjust belt tension or replace belts. |
| | PTO engaged. | Disengage PTO. |
| | Loose or corroded connections. | Clean and tighten loose connections. |
| | Low battery output voltage. | See your authorized servicing dealer or engine distributor. |
| | Faulty start circuit relay. | See your authorized servicing dealer or engine distributor. |

Continued on next page

RG, RG34710, 5608 -19-20MAY96-5/6

| Symptom | Problem | Solution |
|--|---------------------------------|---|
| Starter cranks slowly | Blown fuse (MDL-25) | Replace fuse. |
| | Low battery output. | See your authorized servicing dealer or engine distributor. |
| | Crankcase oil too heavy. | Use proper viscosity oil. |
| Starter and hour meter functions; rest of electrical system does not function | Loose or corroded connections. | Clean and tighten loose connections. |
| | Blown fuse on magnetic switch. | Replace fuse. |
| Entire electrical system does not function | Faulty battery connection. | Clean and tighten connections. |
| | Sulfated or worn-out batteries. | See your authorized servicing dealer or engine distributor. |
| | Blown fuse (MDL-25). | Replace fuse. |

RG, RG34710, 5608 -19-20MAY96-6/6

Storage

Engine Storage Guidelines

1. John Deere engines can be stored outside for up to three (3) months with no long term preparation IF COVERED BY WATERPROOF COVERING.
2. John Deere engines can be stored in a standard overseas shipping container for up to three (3) months with no long term preparation.
3. John Deere engines can be stored inside, warehoused, for up to six (6) months with no long term preparation.
4. John Deere engines expected to be stored more than six (6) months, long term storage preparation MUST BE taken. (See PREPARING ENGINE FOR LONG TERM STORAGE, later in this section.)
5. For John Deere engines not yet installed in machines, run a line from a container of AR41937 Nucle Oil to the fuel transfer pump intake, and another line from the fuel return manifold to the tank, so that Nucle Oil is circulated through the injection system during cranking.

RG, RG34710, 5610 -19-20MAY96-1/1

Use AR41785 Engine Storage Kit

See your John Deere servicing dealer or engine distributor for an AR41785 Engine Storage Kit. Closely follow instructions provided with this kit.

IMPORTANT: Inhibitors can easily change to gas.
Seal or tape each opening immediately
after adding inhibitor.



RG, RG34710, 5611 -19-20MAY96-1/1

Preparing Engine for Long Term Storage

The following storage preparations are good for long term engine storage up to one year. After that, the engine should be started, warmed up, and retreated for an extended storage period.

IMPORTANT: Any time your engine will not be used for over six (6) months, the following recommendations for storing it and removing it from storage will help to minimize corrosion and deterioration. Use the AR41785 Engine Storage Kit. Follow recommended service procedure included with storage kit.

1. Change engine oil and replace filter. Used oil will not give adequate protection. (See CHANGE ENGINE OIL AND FILTER in Lubrication and Maintenance/250 Hour Section.)
2. Service air cleaner. (See REPLACING AIR CLEANER FILTER ELEMENTS in Service As Required Section.)
3. Draining and flushing of cooling system is not necessary if engine is to be stored only for several months. However, for extended storage periods of a year or longer, it is recommended that the cooling system be drained, flushed, and refilled. Refill with appropriate coolant. (See RECOMMENDED ENGINE COOLANT in Fuels, Lubricants, and Coolant Section and ADDING COOLANT in Service As Required Section.)
4. Drain fuel tank and add 30 ml (1 oz) of inhibitor to the fuel tank for each 15 L (4 U.S. gal) of tank capacity. Completely drain fuel filter and close fuel valve, if equipped.
5. Add 30 ml (1 oz) of inhibitor to the engine crankcase for each 0.95 L (1 qt) of crankcase oil.
6. Disconnect air intake piping from the manifold. Pour 90 ml (3 oz) of inhibitor into intake system and reconnect the piping.

7. Crank the engine several revolutions with starter (do not allow the engine to start).
8. Remove fan/alternator poly-vee belt, if desired.
9. Remove and clean batteries. Store them in a cool, dry place and keep them fully charged.
10. Disengage the PTO clutch.
11. Clean the exterior of the engine with salt-free water and touchup any scratched or chipped painted surfaces with a good quality paint.
12. Coat all exposed (machined) metal surfaces with grease or corrosion inhibitor if not feasible to paint.
13. Seal all openings on engine with plastic bags and tape supplied in storage kit. Follow instructions supplied in kit.
14. Store the engine in a dry protected place. If engine must be stored outside, cover it with a waterproof canvas or other suitable protective material and use a strong waterproof tape.

RG, RG34710, 5612 -19-20MAY96-2/2

Removing Engine from Long Term Storage

Refer to the appropriate section for detailed services listed below or have your authorized servicing dealer or engine distributor perform services that you may not be familiar with.

1. Remove all protective coverings from engine. Unseal all openings in engine and remove covering from electrical systems.
2. Remove the batteries from storage. Install batteries (fully charged) and connect the terminals.
3. Install fan/alternator poly-vee belt if removed.
4. Fill fuel tank.
5. Perform all appropriate prestarting checks. (See DAILY PRESTARTING CHECKS in Lubrication and Maintenance/Daily Section.)

IMPORTANT: DO NOT operate starter more than 30 seconds at a time. Wait at least 2 minutes for starter to cool before trying again.

6. Crank engine for 20 seconds with starter (do not allow the engine to start). Wait 2 minutes and crank engine an additional 20 seconds to assure bearing surfaces are adequately lubricated.
7. Start engine and run at low idle and no load for several minutes. Warm up carefully and check all gauges before placing engine under load.
8. On the first day of operation after storage, check overall engine for leaks and check all gauges for correct operation.

RG, RG34710, 5613 -19-20MAY96-1/1

Specifications

General OEM Engine Specifications

| ITEM | ENGINE | | | | | | | |
|----------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | 4045DF120 | 4045DF150 | 4045TF120 | 4045TF150 | 4045TF220 | 4045TF250 | 4045HF120 | 4045HF150 |
| Number of Cylinders | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Bore | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) |
| Stroke | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) |
| Displacement | 4.5 L (276 cu in.) | 4.5 L (276 cu in.) | 4.5 L (276 cu in.) | 4.5 L (276 cu in.) | 4.5 L (276 cu in.) | 4.5 L (276 cu in.) | 4.5 L (276 cu in.) | 4.5 L (276 cu in.) |
| Compression | 17.8:1 | 17.6:1 | 17.0:1 | 17.0:1 | 17.0:1 | 17.0:1 | 17.0:1 | 17.0:1 |
| Max. Crank Pressure | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) |
| Governor Regulation (Industrial) | 7—10 % | 7—10 % | N/A | 7—10 % | N/A | 7—10 % | N/A | 7—10 % |
| Governor Regulation (Generator) | N/A | 5 % | 5% | 5 % | 5% | 5 % | 5% | 5 % |
| Oil Pressure Rated Speed | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) |
| Oil Pressure Low Idle | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) |
| Length | 844.0 mm (33.2 in.) | 861.0 mm (33.9 in.) | 861.0 mm (33.9 in.) | 861.0 mm (33.9 in.) | 861.0 mm (33.9 in.) | 861.0 mm (33.9 in.) | 861.0 mm (33.9 in.) | 861.0 mm (33.9 in.) |
| Width | 550 mm (21.7 in.) | 598 mm (23.5 in.) | 598 mm (23.5 in.) | 598 mm (23.5 in.) | 598 mm (23.5 in.) | 598 mm (23.5 in.) | 598 mm (23.5 in.) | 598 mm (23.5 in.) |
| Height | 871 mm (34.3 in.) | 854 mm (33.6 in.) | 980 mm (38.6 in.) | 980 mm (38.6 in.) | 980 mm (38.6 in.) | 980 mm (38.6 in.) | 980 mm (38.6 in.) | 980 mm (38.6 in.) |
| Weight | 429 kg (945 lb) | 387 kg (851 lb) | 396 kg (872 lb) | 396 kg (872 lb) | 396 kg (872 lb) | 396 kg (872 lb) | 396 kg (872 lb) | 396 kg (872 lb) |

Continued on next page

RG,RG34710,5614 -19-20MAY96-1/2

Specifications

| ITEM | ENGINE | | | | | | | |
|-------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | 6068DF150 | 6068TF120 | 6068TF150 | 6068TF220 | 6068TF250 | 6068HF120 | 6068HF150 | 6068HF250 |
| Number of Cylinders | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Bore | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) | 106 mm (4.19 in.) |
| Stroke | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) | 127 mm (5.0 in.) |
| Displacement | 6.8 L (414 cu in.) | 6.8 L (414 cu in.) | 6.8 L (414 cu in.) | 6.8 L (414 cu in.) | 6.8 L (414 cu in.) | 6.8 L (414 cu in.) | 6.8 L (414 cu in.) | 6.8 L (414 cu in.) |
| Compression | 17.6:1 | 17.0:1 | 17.0:1 | 17.0:1 | 17.0:1 | 17.0:1 | 17.0:1 | 17.0:1 |
| Max. Crank Pressure | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) | 0.5 kPa (2 H ₂ O) |
| Governor Regulation (Industrial) | 7—10 % | N/A | 7—10 % | 7—10 % | 7—10 % | N/A | 7—10 % | 7—10 % |
| Governor Regulation (Generator) | 5 % | 5% | 5 % | 5% | 5 % | 5% | 5 % | 5 % |
| Oil Pressure Rated Speed | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) | 345 kPa (50 psi) |
| Oil Pressure Low Idle | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) | 105 kPa (15 psi) |
| Length | 1117 mm (44.0 in.) | 1117 mm (44.0 in.) | 1117 mm (44.0 in.) | 1116 mm (43.9 in.) | 1117 mm (44.0 in.) | 1141 mm (44.9 in.) | 1116 mm (43.9 in.) | 1141 mm (44.9 in.) |
| Width | 598 mm (23.5 in.) | 598 mm (23.5 in.) | 598 mm (23.5 in.) | 623 mm (24.5 in.) | 598 mm (23.5 in.) | 623 mm (24.5 in.) | 623 mm (24.5 in.) | 623 mm (24.5 in.) |
| Height | 956 mm (37.6 in.) | 984 mm (38.7 in.) | 984 mm (38.7 in.) | 1012 mm (39.9 in.) | 984 mm (38.7 in.) | 1009 mm (39.7 in.) | 1009 mm (39.7 in.) | 1009 mm (39.7 in.) |
| Weight | 522 kg (1149 lb) | 533 kg (1172 lb) | 533 kg (1172 lb) | 551 kg (1212 lb) | 533 kg (1172 lb) | 568 kg (1250 lb) | 550 kg (1210 lb) | 568 kg (1250 lb) |

RG, RG34710, 5614 -19-20MAY96-2/2

Fuel Injection Pump Specifications¹

| Engine Model | Injection Pump Option Codes | Power Rating @ Rated Speed Without Fan kW (hp) | Rated Speed ^a (rpm) | Slow Idle (rpm) | Fast Idle ^b (rpm) |
|--------------|-----------------------------|--|--------------------------------|-----------------|------------------------------|
| 4045DF120 | 16MR, 16MS | 63 (85) | 2500 | 850 | 2700 |
| 4045DF150 | 1601, 1671, 1691 | 60 (80) | 2500 | 850 | 2700 |
| | 1602, 16BG, 16BH | 63 (85) | 2500 | 850 | 2700 |
| | 1603 | 53 (71) | 1800 | 1150 | 1870 |
| | 1663, 16HK | 43 (57) | 2500 | 1600 | 2700 |
| | 1673, 1674 | 53 (71) | 1800 | 1400 | 1870 |
| | 1691 | 60 (80) | 2500 | 1400 | 2700 |
| | 16BJ, 16HV | 36 (48) | 2250 | 850 | 2450 |
| | 16CL | 58 (78) | 2200 | 950 | 2400 |
| | 16DL | 61 (81) | 2400 | 850 | 2600 |
| | 16EN, 16GB, 16GC | 60 (80) | 2500 | 850 | 2700 |
| | 16HJ | 60 (80) | 2500 | 1400 | 2700 |
| | 16KE | 52 (70) | 2500 | 850 | 2700 |
| | 16LM | 60 (80) | 2500 | 850 | 2700 |
| | 16LN | 53 (71) | 1800 | 1150 | 1870 |
| | 16RB, 16RC | 44 (59) | 1500 | N/A | 1560 |
| 4045DF151 | 1663 | 60 (80) | 2500 | 1600 | 2700 |
| 4045DF152 | 1601, 16GB | 60 (80) | 2500 | 850 | 2700 |
| 4045DF153 | 16AY, 16JS | 62 (83) | 2400 | 850 | 2600 |
| 4045DF157 | 16AA, 16BB | 44 (59) | 1500 | N/A | 1560 |
| 4045DF158 | 1673, 1674, 16CC, 16DD | 53 (71) | 1800 | N/A | 1870 |
| | 16AA, 16BB | 44 (59) | 1500 | N/A | 1560 |
| 4045DFG50 | 16BG | 63 (85) | 2500 | 800 | 2700 |
| | 16NS | 60 (80) | 2300 | 800 | 2500 |
| 4045HF120 | 16GR, 16LW | 102 (137) | 1500 | 1400 | 1560 |
| 4045HF150 | 1610, 160C | 104 (140) | 2400 | 850 | 2600 |
| | 1611, 160B | 95 (127) | 1800 | 1400 | 1870 |
| | 16GR, 16LW | 100 (134) | 1500 | N/A | 1560 |
| | 16QZ, 16RA | 111, (149) | 1800 | N/A | 1870 |
| 4045HF157 | 16GR, 16LW | 100 (134) | 1500 | N/A | 1560 |

^aGenerator set engines (3–5% governor) usually run at 1500 rpm (50 Hz) or 1800 (60 Hz) when operating under load depending on cycles of AC current.

^bFor engines with standard governor, fast idle is 7–10% above rated speed. For engines with generator set governors, fast idle is 3–5% above rated speed.

¹ Engine speeds listed are preset to factory specification. Slow idle speed may be reset depending upon specific vehicle application requirements. Refer to your machine operator's manual for engine speeds that are different from those preset at the factory.

Specifications

| Engine Model | Injection Pump Option Codes | Power Rating @ Rated Speed Without Fan kW (hp) | Rated Speed ^a (rpm) | Slow Idle (rpm) | Fast Idle ^b (rpm) |
|--------------|-----------------------------|--|--------------------------------|-----------------|------------------------------|
| 4045HF158 | 16GR, 16LW | 100 (134) | 1500 | N/A | 1560 |
| | 16ME, 16MF | 123 (170) | 1800 | N/A | 1870 |
| 4045TF120 | 16MT, 16MU | 70 (94) | 1500 | 1400 | 1560 |
| 4045TF150 | 1605, 1675, 1676 | 86 (115) | 2500 | 850 | 2700 |
| | 1606 | 93 (125) | 2400 | 850 | 2600 |
| | 1656, 1677, 16LP | 75 (100) | 1800 | 1150 | 1870 |
| | 1692 | 86 (115) | 2500 | 1400 | 2700 |
| | 1694, 1695, 16AB, 16CE | 75 (100) | 2500 | 850 | 2700 |
| | 16BF | 73 (98) | 2200 | 950 | 2400 |
| | 16CM | 66 (89) | 2200 | 950 | 2400 |
| | 16GL | 78 (105) | 2300 | 850 | 2500 |
| | 16LZ, 16MA | 82 (110) | 1800 | 1400 | 1870 |
| | 16MT, 16MU | 70 (94) | 1500 | N/A | 1560 |
| | | | | | |
| 4045TF151 | 1677 | 75 (100) | 1800 | 850 | 1870 |
| | 16CU | 75 (100) | 1800 | 850 | 1870 |
| | 16NH | 75 (100) | 1800 | N/A | 1870 |
| 4045TF152 | 16AX | 76 (102) | 2400 | 850 | 2600 |
| 4045TF153 | 16EP | 72 (97) | 2200 | 950 | 2400 |
| 4045TF154 | 1605 | 86 (115) | 2500 | 850 | 2700 |
| 4045TF155 | 16AX, 16JT | 76 (102) | 2400 | 850 | 2600 |
| 4045TF157 | 16GQ, 16LV | 83 (111) | 1500 | N/A | 1560 |
| 4045TF158 | 16GQ | 83 (111) | 1500 | N/A | 1560 |
| | 16LZ, 16MA | 82 (110) | 1800 | N/A | 1870 |
| | 16MT, 16MU | 70 (94) | 1500 | N/A | 1560 |
| 4045TF220 | 16GO, 16LV | 83 (111) | 1500 | 1400 | 1560 |
| | 16MV, 16MW | 100 (134) | 1800 | 1400 | 1870 |
| | | | | | |
| | 16NT, 16NU | 86 (115) | 2500 | 850 | 2700 |
| 4045TF250 | 1606, 1667, 1683 | 93 (125) | 2400 | 850 | 2600 |
| | 1608, 1682, 160R, 16LQ | 84 (113) | 1800 | 1400 | 1870 |
| | 16CV | 85 (114) | 2200 | 950 | 2400 |
| | 16GQ, 16LV | 83 (111) | 1500 | N/A | 1560 |
| | 16MB, 16MC | 91 (122) | 1800 | 1400 | 1870 |
| 4045TF251 | 1606 | 93 (125) | 2400 | 850 | 2600 |
| 4045TF257 | 16GQ, 16LV | 83 (111) | 1500 | N/A | 1560 |
| 4045TF258 | 16GQ, 16LV | 83 (111) | 1500 | N/A | 1560 |
| | 16MB, 16MC | 91 (122) | 1800 | N/A | 1870 |
| | 16MV, 16MW | 100 (134) | 1800 | N/A | 1870 |
| 6068DF150 | 1613, 1678, 16LR | 93 (125) | 2500 | 850 | 2700 |
| 6068HF120 | 16GT, 16LY | 155 (208) | 1500 | 1400 | 1560 |
| | 16RL, 16SJ | 197 (264) | 2100 | — | 2200 |

Continued on next page

RG, RG34710, 5616 -19-20MAY96-2/4

Specifications

| Engine Model | Injection Pump Option Codes | Power Rating @ Rated Speed Without Fan kW (hp) | Rated Speed ^a (rpm) | Slow Idle (rpm) | Fast Idle ^b (rpm) |
|--------------|-----------------------------|--|--------------------------------|-----------------|------------------------------|
| 6068HF150 | 1621, 160D | 157 (210) | 2400 | 850 | 2600 |
| | 16CY | 143 (192) | 2200 | 1350 | 2400 |
| | 16GT, 16LY | 153 (205) | 1500 | N/A | 1560 |
| | 16ML, 16MM | 187 (251) | 1800 | 1400 | 1870 |
| | 16QV, 160W | 166 (223) | 1800 | N/A | 1870 |
| 6068HF157 | 16GT, 16LY | 153 (205) | 1500 | N/A | 1560 |
| 6068HF158 | 16GT, 16LY | 153 (205) | 1500 | N/A | 1560 |
| | 16ML, 16MM | 187 (251) | 1800 | N/A | 1870 |
| 6068HF250 | 1622 | 168 (225) | 2400 | 850 | 2600 |
| | 1623 | 148 (198) | 1800 | — | 1870 |
| 6068TF120 | 16MX, 165MY | 105 (141) | 1500 | 1400 | 1560 |
| 6068TF150 | 1614, 1680 | 127 (170) | 2500 | 850 | 2700 |
| | 1681, 1688, 16LS | 112 (150) | 1800 | 1150 | 1870 |
| | 1696, 1697, 16DY | 116 (155) | 2500 | 850 | 2700 |
| | 16BE | 117 (157) | 2200 | 950 | 2400 |
| | 16CN | 110 (148) | 2100 | 950 | 2300 |
| | 16CP | 94 (126) | 2200 | 950 | 2400 |
| | 16DK | 96 (129) | 2100 | 900 | 2300 |
| | 16GM | 110 (148) | 2300 | 850 | 2500 |
| | 16GN | 116 (155) | 2400 | 850 | 2600 |
| | 16MG, 16MH | 123 (165) | 1800 | 1400 | 1870 |
| | | | | | |
| 6068TF151 | 1681, 16NJ | 112 (150) | 1800 | N/A | 1870 |
| | 1696 | 116 (155) | 2500 | 850 | 2700 |
| 6068TF152 | 1696, 16JU | 116 (155) | 2500 | N/A | 2700 |
| 6068TF157 | 16GS, 16LX | 120 (161) | 1500 | N/A | 1560 |
| 6068TF158 | 16GS | 120 (161) | 1500 | N/A | 1560 |
| | 16JV, 16JW | 100 (134) | 1500 | N/A | 1560 |
| | 16MG, 16MH | 123 (165) | 1800 | N/A | 1870 |
| | 16MX, 16MY | 105 (141) | 1500 | N/A | 1560 |
| 6068TF159 | 16PD | 96 (129) | 2100 | 850 | 2250 |
| 6068TF220 | 16GS, 16LX | 121 (162) | 1500 | 1400 | 1560 |
| | 16KK | 127 (170) | 2500 | 850 | 2700 |
| | 16RK, 16SH | 138 (185) | 2600 | — | 2700 |
| | 16RJ, 16SG | 172 (231) | 2100 | — | 2200 |
| 6068TF250 | 1615, 1668, 1686, 16LT | 138 (185) | 2400 | 850 | 2600 |
| | 1619, 1685, 16LU | 124 (166) | 1800 | 1150 | 1870 |
| | 16CW | 106 (142) | 2200 | 950 | 2400 |
| | 16CX | 128 (172) | 2300 | 900 | 2500 |
| | 16GS, 16LX | 120 (161) | 1500 | N/A | 1560 |
| | 16MJ, 16MK | 142 (190) | 1800 | 1400 | 1870 |
| | 16UG | 149 (200) | 2400 | 925 | 2600 |
| 6068TF251 | 1615 | 138 (185) | 2400 | N/A | 2600 |

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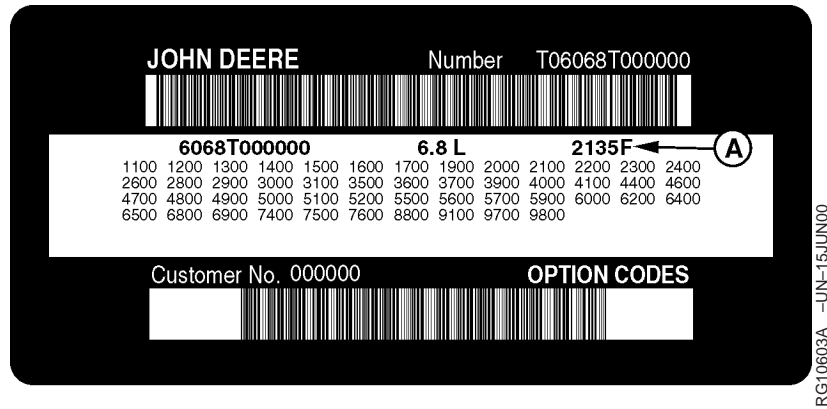
RG, RG34710, 5616 -19-20MAY96-3/4

Specifications

| Engine Model | Injection Pump Option Codes | Power Rating @ Rated Speed Without Fan kW (hp) | Rated Speed ^a (rpm) | Slow Idle (rpm) | Fast Idle ^b (rpm) |
|--------------|-----------------------------|--|--------------------------------|-----------------|------------------------------|
| 6068TF257 | 16GS, 16LX | 120 (161) | 1500 | N/A | 1560 |
| 6068TF258 | 16GS, 16LX | 120 (161) | 1500 | N/A | 1560 |
| | 16MJ, 16MK | 142 (190) | 1800 | N/A | 1870 |

RG, RG34710, 5616 -19-20MAY96-4/4

Engine Crankcase Oil Fill Quantities



Option Code Label

Each engine has a 13-digit John Deere engine serial number. The first two digits identify the factory that produced the engine:

“CD” indicates the engine was built in Saran, France

“PE” indicates the engine was built in Torreon, Mexico

“T0” indicates the engine was built in Dubuque, Iowa

In addition to the serial number plate, OEM engines have an engine option code label affixed to the rocker arm cover. These codes indicate which of the engine options were installed on your engine at the factory. When in need of parts or service, furnish your authorized servicing dealer or engine distributor with these numbers.

To determine the option code for the oil fill quantity of your engine, refer to the engine option code label affixed to the rocker arm cover. The first two digits of the code (19) identify the oil pan option group. The last two digits of each code identify the specific oil pan on your engine.

The following table lists engine crankcase oil fill quantities:

Continued on next page

RG, RG34710, 5617 -19-20MAY96-1/4

Specifications

| Engine Model | Oil Pan Option Code(s) | Crankcase Oil Capacity L (qt) |
|--------------|------------------------|-------------------------------|
| 4045DF120 | 1901 | 8.0 (8.5) |
| | 1902 | 8.0 (8.5) |
| | 1903 | 12.5 (13.2) |
| | 1904 | 13.5 (14.3) |
| | 1923 | 14.5 (15.3) |
| 4045DF150 | 1901 | 8.0 (8.5) |
| | 1902 | 8.0 (8.5) |
| | 1903 | 12.5 (13.2) |
| | 1904 | 13.5 (14.3) |
| | 1923 | 14.5 (15.3) |
| | 1949 | 12.5 (13.2) |
| 4045DF151 | 1901 | 8.0 (8.5) |
| 4045DF152 | 1902 | 8.0 (8.5) |
| 4045DF153 | 1901 | 8.0 (8.5) |
| | 1903 | 12.5 (13.2) |
| | 1937 | 12.5 (13.2) |
| 4045DF154 | 1937 | 12.5 (13.2) |
| 4045DF157 | 1902 | 8.0 (8.5) |
| 4045DF158 | 1902 | 8.0 (8.5) |
| 4045DFG50 | 1901 | 8.0 (8.5) |
| | 1964 | x.x (x.x) |
| 4045HF120 | 1904 | 13.5 (14.3) |
| 4045HF150 | 1904 | 13.5 (14.3) |
| | 1921 | 16.5 (17.4) |
| | 1922 | 16.5 (17.4) |
| | 1949 | 12.5 (13.2) |
| 4045HF157 | 1949 | 12.5 (13.2) |
| 4045HF158 | 1949 | 12.5 (13.2) |
| 4045TF120 | 1903 | 12.5 (13.2) |
| | 1904 | 13.5 (14.3) |
| | 1923 | 14.5 (15.3) |
| 4045TF150 | 1903 | 12.5 (13.2) |
| | 1904 | 13.5 (14.3) |
| | 1923 | 14.5 (15.3) |
| | 1949 | 12.5 (13.2) |
| 4045TF151 | 1903 | 12.5 (13.2) |
| | 1934 | 12.5 (13.2) |
| | 1936 | 12.5 (13.2) |
| 4045TF152 | 1903 | 12.5 (13.2) |
| | 1937 | 12.5 (13.2) |

Continued on next page

RG, RG34710, 5617 -19-20MAY96-2/4

Specifications

| Engine Model | Oil Pan Option Code(s) | Crankcase Oil Capacity L (qt) |
|--------------|------------------------|-------------------------------|
| 4045TF154 | 1904 | 13.5 (14.3) |
| 4045TF155 | 1937 | 12.5 (13.2) |
| 4045TF157 | 1949 | 12.5 (13.2) |
| 4045TF158 | 1949 | 12.5 (13.2) |
| 4045TF220 | 1903 | 12.5 (13.2) |
| | 1904 | 13.5 (14.3) |
| | 1923 | 14.5 (15.3) |
| 4045TF250 | 1903 | 12.5 (13.2) |
| | 1904 | 13.5 (14.3) |
| | 1923 | 14.5 (15.3) |
| | 1949 | 12.5 (13.2) |
| 4045TF251 | 1904 | 13.5 (14.3) |
| 4045TF257 | 1949 | 12.5 (13.2) |
| 4045TF258 | 1949 | 12.5 (13.2) |
| 6068DF150 | 1907 | 19.0 (20.1) |
| | 1908 | 19.0 (20.1) |
| | 1909 | 18.0 (19.0) |
| | 1944 | 20.0 (21.1) |
| | 1948 | 20.0 (21.1) |
| 6068HF120 | 1907 | 19.0 (20.1) |
| | 1908 | 19.0 (20.1) |
| | 1909 | 18.0 (19.0) |
| | 1956 | 18.0 (19.0) |
| 6068HF150 | 1907 | 19.0 (20.1) |
| | 1908 | 19.0 (20.1) |
| | 1909 | 18.0 (19.0) |
| | 1924 | 23.5 (24.8) |
| | 1944 | 20.0 (21.1) |
| | 1948 | 20.0 (21.1) |
| | 1950 | 20.0 (21.1) |
| | 1956 | 18.0 (19.0) |
| 6068HF157 | 1950 | 20.0 (21.1) |
| 6068HF158 | 1950 | 20.0 (21.1) |
| 6068HF250 | 1907 | 19.0 (20.1) |
| | 1908 | 19.0 (20.1) |
| | 1909 | 18.0 (19.0) |
| | 1924 | 23.5 (24.8) |
| | 1944 | 20.0 (21.1) |
| | 1948 | 20.0 (21.1) |
| | 1961 | 32.0 (33.8) |
| 6068TF120 | 1907 | 19.0 (20.1) |
| | 1908 | 19.0 (20.1) |

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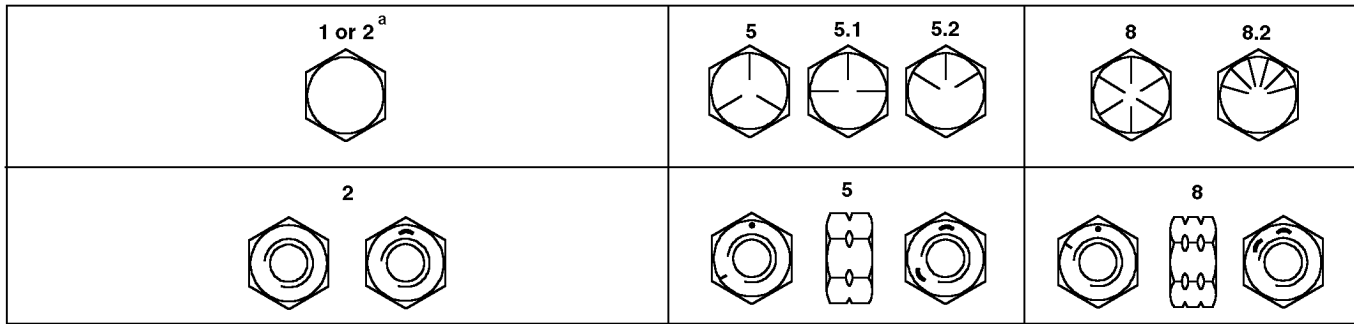
Specifications

| Engine Model | Oil Pan Option Code(s) | Crankcase Oil Capacity L (qt) |
|--------------|------------------------|-------------------------------|
| | 1909 | 18.0 (19.0) |
| | 1944 | 20.0 (21.1) |
| | 1956 | 18.0 (19.0) |
| 6068TF150 | 1907 | 19.0 (20.1) |
| | 1908 | 19.0 (20.1) |
| | 1909 | 18.0 (19.0) |
| | 1944 | 20.0 (21.1) |
| | 1948 | 20.0 (21.1) |
| | 1956 | 18.0 (19.0) |
| 6068TF151 | 1907 | 19.0 (20.1) |
| | 1909 | 18.0 (19.0) |
| | 1944 | 20.0 (21.1) |
| 6068TF152 | 1909 | 18.0 (19.0) |
| 6068TF157 | 1950 | 20.0 (21.1) |
| 6068TF158 | 1950 | 20.0 (21.1) |
| 6068TF159 | 1963 | 21.5 (22.7) |
| 6068TF220 | 1907 | 19.0 (20.1) |
| | 1908 | 19.0 (20.1) |
| | 1909 | 18.0 (19.0) |
| | 1944 | 20.0 (21.1) |
| | 1948 | 20.0 (21.1) |
| | 1956 | 18.0 (19.0) |
| 6068TF250 | 1907 | 19.0 (20.1) |
| | 1908 | 19.0 (20.1) |
| | 1909 | 18.0 (19.0) |
| | 1944 | 20.0 (21.1) |
| | 1948 | 20.0 (21.1) |
| | 1950 | 20.0 (21.1) |
| | 1956 | 18.0 (19.0) |
| 6068TF251 | 1909 | 18.0 (19.0) |
| 6068TF257 | 1950 | 20.0 (21.1) |
| 6068TF258 | 1950 | 20.0 (21.1) |

NOTE: Crankcase oil capacity may vary slightly from amount shown. ALWAYS fill crankcase to within crosshatch. DO NOT overfill.

RG, RG34710, 5617 -19-20MAY96-4/4

Unified Inch Bolt and Cap Screw Torque Values



Top, SAE Grade and Head Markings; Bottom, SAE Grade and Nut Markings

| Size | Grade 1 (No Mark) | | Grade 2 ^a (No Mark) | | Grade 5, 5.1 or 5.2 | | Grade 8 or 8.2 | |
|-------|---------------------------------------|--------------------------------|---------------------------------------|--------------------------------|---------------------------------------|--------------------------------|---------------------------------------|--------------------------------|
| | Lubricated ^b N•m(lb-ft) | Dry ^c N•m(lb-ft) | Lubricated ^b N•m(lb-ft) | Dry ^c N•m(lb-ft) | Lubricated ^b N•m(lb-ft) | Dry ^c N•m(lb-ft) | Lubricated ^b N•m(lb-ft) | Dry ^c N•m(lb-ft) |
| 1/4 | 3.8 (2.8) | 4.7 (3.5) | 6 (4.4) | 7.5 (5.5) | 9.5 (7) | 12 (9) | 13.5 (10) | 17 (12.5) |
| 5/16 | 7.7 (5.7) | 9.8 (7.2) | 12 (9) | 15.5 (11.5) | 19.5 (14.5) | 25 (18.5) | 28 (20.5) | 35 (26) |
| 3/8 | 13.5 (10) | 17.5 (13) | 22 (16) | 27.5 (20) | 35 (26) | 44 (32.5) | 49 (36) | 63 (46) |
| 7/16 | 22 (16) | 28 (20.5) | 35 (26) | 44 (32.5) | 56 (41) | 70 (52) | 80 (59) | 100 (74) |
| 1/2 | 34 (25) | 42 (31) | 53 (39) | 67 (49) | 85 (63) | 110 (80) | 120 (88) | 155 (115) |
| 9/16 | 48 (35.5) | 60 (45) | 76 (56) | 95 (70) | 125 (92) | 155 (115) | 175 (130) | 220 (165) |
| 5/8 | 67 (49) | 85 (63) | 105 (77) | 135 (100) | 170 (125) | 215 (160) | 240 (175) | 305 (225) |
| 3/4 | 120 (88) | 150 (110) | 190 (140) | 240 (175) | 300 (220) | 380 (280) | 425 (315) | 540 (400) |
| 7/8 | 190 (140) | 240 (175) | 190 (140) | 240 (175) | 490 (360) | 615 (455) | 690 (510) | 870 (640) |
| 1 | 285 (210) | 360 (265) | 285 (210) | 360 (265) | 730 (540) | 920 (680) | 1030 (760) | 1300 (960) |
| 1-1/8 | 400 (300) | 510 (375) | 400 (300) | 510 (375) | 910 (670) | 1150 (850) | 1450 (1075) | 1850 (1350) |
| 1-1/4 | 570 (420) | 725 (535) | 570 (420) | 725 (535) | 1280 (945) | 1630 (1200) | 2050 (1500) | 2600 (1920) |
| 1-3/8 | 750 (550) | 950 (700) | 750 (550) | 950 (700) | 1700 (1250) | 2140 (1580) | 2700 (2000) | 3400 (2500) |
| 1-1/2 | 990 (730) | 1250 (930) | 990 (730) | 1250 (930) | 2250 (1650) | 2850 (2100) | 3600 (2650) | 4550 (3350) |

^a Grade 2 applies for hex cap screws (not hex bolts) up to 6 in. (152 mm) long. Grade 1 applies for hex cap screws over 6 in. (152 mm) long, and for all other types of bolts and screws of any length.

^b "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.

^c "Dry" means plain or zinc plated without any lubrication.

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

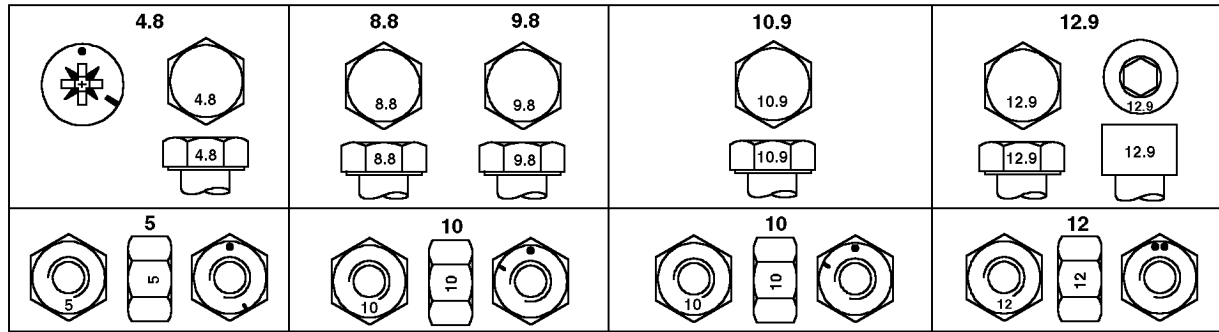
Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

Metric Bolt and Cap Screw Torque Values



Top, Property Class and Head Markings; Bottom, Property Class and Nut Markings

| Size | Class 4.8 | | Class 8.8 or 9.8 | | Class 10.9 | | Class 12.9 | |
|------|---------------------------------------|--------------------------------|---------------------------------------|--------------------------------|---------------------------------------|--------------------------------|---------------------------------------|--------------------------------|
| | Lubricated ^a N•m(lb-ft) | Dry ^b N•m(lb-ft) | Lubricated ^a N•m(lb-ft) | Dry ^b N•m(lb-ft) | Lubricated ^a N•m(lb-ft) | Dry ^b N•m(lb-ft) | Lubricated ^a N•m(lb-ft) | Dry ^b N•m(lb-ft) |
| M6 | 4.7 (3.5) | 6 (4.4) | 9 (6.6) | 11.5 (8.5) | 13 (9.5) | 16.5 (12.2) | 15.5 (11.5) | 19.5 (14.5) |
| M8 | 11.5 (8.5) | 14.5 (10.7) | 22 (16) | 28 (20.5) | 32 (23.5) | 40 (29.5) | 37 (27.5) | 47 (35) |
| M10 | 23 (17) | 29 (21) | 43 (32) | 55 (40) | 63 (46) | 80 (59) | 75 (55) | 95 (70) |
| M12 | 40 (29.5) | 50 (37) | 75 (55) | 95 (70) | 110 (80) | 140 (105) | 130 (95) | 165 (120) |
| M14 | 63 (46) | 80 (59) | 120 (88) | 150 (110) | 175 (130) | 220 (165) | 205 (150) | 260 (190) |
| M16 | 100 (74) | 125 (92) | 190 (140) | 240 (175) | 275 (200) | 350 (255) | 320 (235) | 400 (300) |
| M18 | 135 (100) | 170 (125) | 265 (195) | 330 (245) | 375 (275) | 475 (350) | 440 (325) | 560 (410) |
| M20 | 190 (140) | 245 (180) | 375 (275) | 475 (350) | 530 (390) | 675 (500) | 625 (460) | 790 (580) |
| M22 | 265 (195) | 330 (245) | 510 (375) | 650 (480) | 725 (535) | 920 (680) | 850 (625) | 1080 (800) |
| M24 | 330 (245) | 425 (315) | 650 (480) | 820 (600) | 920 (680) | 1150 (850) | 1080 (800) | 1350 (1000) |
| M27 | 490 (360) | 625 (460) | 950 (700) | 1200 (885) | 1350 (1000) | 1700 (1250) | 1580 (1160) | 2000 (1475) |
| M30 | 660 (490) | 850 (625) | 1290 (950) | 1630 (1200) | 1850 (1350) | 2300 (1700) | 2140 (1580) | 2700 (2000) |
| M33 | 900 (665) | 1150 (850) | 1750 (1300) | 2200 (1625) | 2500 (1850) | 3150 (2325) | 2900 (2150) | 3700 (2730) |
| M36 | 1150 (850) | 1450 (1075) | 2250 (1650) | 2850 (2100) | 3200 (2350) | 4050 (3000) | 3750 (2770) | 4750 (3500) |

^a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.

^b "Dry" means plain or zinc plated without any lubrication.

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.

Fasteners should be replaced with the same or higher property class. If higher property class fasteners are used, these should only be tightened to the strength of the original.

Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

TORQ2 -UN-07SEP99

Lubrication and Maintenance Records

Using Lubrication and Maintenance Records

Refer to specific Lubrication and Maintenance Section for detailed service procedures.

1. Keep a record of the number of hours you operate your engine by regular observation of hour meter.
2. Check your record regularly to learn when your engine needs service.
3. DO ALL the services within an interval section. Write the number of hours (from your service records) and the date in the spaces provided. For a

complete listing of all items to be performed and the service intervals required, refer to the quick-reference chart near the front of the Lubrication and Maintenance Section.

IMPORTANT: The service recommendations covered in this manual are for the accessories that are provided by John Deere. Follow manufacturer's service recommendations for servicing engine driven equipment not supplied by Deere.

RG, RG34710, 5620 -19-20MAY96-1/1

Daily (Prestarting) Service

- Check engine oil level.
- Check coolant level.

IMPORTANT: Drain water by rotating drain valve counter-clockwise. Premature pump failure may occur if water is not drained daily.

- Check fuel filter/water separator bowl.
- Lubricate PTO release bearing.
- Check air cleaner dust unloader valve and air restriction indicator, if equipped.
- Visual walkaround inspection.

RG, RG34710, 5621 -19-20MAY96-1/1

250 Hour/6 Month Service

- Change engine oil and filter.¹
- Service fire extinguisher.
- Lubricate PTO clutch shaft bearings.
- Check PTO clutch adjustment.
- Service battery.
- Check automatic belt tensioner and belt wear.

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¹ If John Deere PLUS-50 oil is used along with a John Deere oil filter, the oil change interval may be extended by 50 percent to 375 hours.

500 Hour/12 Month Service

- Lubricate PTO clutch internal levers and linkage.
- Clean crankcase vent tube.
- Check air intake hoses, connections, and system.
- Replace fuel filter element.
- Check automatic belt tensioner and belt wear.
- Check cooling system.
- Coolant solution analysis – add SCAs as needed.
- Pressure test cooling system.

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RG, RG34710, 5624 -19-20MAY96-1/1

2000 Hour/24 Month Service

- Check crankshaft vibration damper (6-cylinder only).
- Flush cooling system.¹
- Test thermostats.
- Check and adjust valve clearance.

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¹ If John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours, or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished as needed by adding a supplemental coolant additive, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.

Service as Required

- Service air cleaner.
- Replace poly-vee belts.

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RG, RG34710, 5627 -19-20MAY96-1/1

Emission System Warranty

U.S. EPA Emissions Control Warranty Statement

Emissions control-related parts and components are warranted by John Deere for five years or 3000 hours of operation, whichever occurs first. John Deere further warrants that the engine covered by this warranty was designed, built, and equipped so as to conform at the time of sale with all U.S. emissions standards at the time of manufacture, and that it is free of defects in materials and workmanship which would cause it not to meet these standards within the period of five years or 3000 hours of operation, whichever occurs first.

Warranties stated in this manual refer only to emissions-related parts and components of your engine. The complete engine warranty, less emissions-related parts and components, is provided separately as the "John Deere New Off-Highway Engine Warranty".

RG, RG34710, 7629 -19-30JUN97-1/1

Emissions Control System Certification Label



CAUTION: Statutes providing severe penalties for tampering with emissions controls may apply to the user or dealer.

The emissions warranty described below applies only to those engines marketed by John Deere that have been certified by the United States Environmental Protection Agency (EPA) and/or California Air Resources Board (CARB); and used in the United States and Canada in non-road mobile (self-propelled or portable/transportable¹) equipment. The presence of an emissions label like the one shown signifies that the engine has been certified with the EPA and/or CARB. The EPA and CARB warranties only apply to new engines having the certification label affixed to the engine and sold as stated above in the geographic areas. The presence of an EU number in the third line of the label signifies that the engine has been certified with the European Union countries per Directive 97/68/EC. The emissions warranty does not apply to the EU countries.

NOTE: *The hp/kW rating on the engine emissions certification label specifies the gross engine hp/kW, which is flywheel power without fan. In most applications this will not be the same rating as the advertised vehicle hp/kW rating.*

¹Equipment moved at least once every 12 months.

IMPORTANT ENGINE INFORMATION

DEERE & COMPANY



- This engine is certified to run on Diesel Fuel. This engine conforms to 2000 Model Year US EPA and California regulations on heavy-duty non road diesel cycle engines.
- Exhaust Emission Control System: EM, TC • Family No. YJDXL06.8015
- Engine Model: 6068TN052 • Displacement: 6.8 L
- Valve Clearance: Intake 0.356 mm Exhaust: 0.457 mm
- Fuel Rate: 95.7 mm³/stroke @ 200 hp [149 kW] @ 2400 rpm
- Injection Timing: 16.2 °BTDC • No Other Adjustments Required. R503149

**John Deere Engine Manufacturing
For Engine Service and Parts Call 1-800-JD ENGINE**

Emissions Label

RG11123 -UN-15JUN00

John Deere Service Literature Available

Technical Information

Technical information is available from John Deere. Some of this information is available in electronic as well as printed form. Order from your John Deere dealer or call **1-800-522-7448**. Please have available the model number, serial number, and name of the product.

Available information includes:

- **PARTS CATALOGS** list service parts available for your machine with exploded view illustrations to help you identify the correct parts. It is also useful in assembling and disassembling.
- **OPERATOR'S MANUALS** providing safety, operating, maintenance, and service information. These manuals and safety signs on your machine may also be available in other languages.
- **OPERATOR'S VIDEO TAPES** showing highlights of safety, operating, maintenance, and service information. These tapes may be available in multiple languages and formats.
- **TECHNICAL MANUALS** outlining service information for your machine. Included are specifications, illustrated assembly and disassembly procedures, hydraulic oil flow diagrams, and wiring diagrams. Some products have separate manuals for repair and diagnostic information. Some components, such as engines, are available in separate component technical manuals
- **FUNDAMENTAL MANUALS** detailing basic information regardless of manufacturer:
 - Agricultural Primer series covers technology in farming and ranching, featuring subjects like computers, the Internet, and precision farming.
 - Farm Business Management series examines "real-world" problems and offers practical solutions in the areas of marketing, financing, equipment selection, and compliance.
 - Fundamentals of Services manuals show you how to repair and maintain off-road equipment.
 - Fundamentals of Machine Operation manuals explain machine capacities and adjustments, how to improve machine performance, and how to eliminate unnecessary field operations.



Parts Catalogs

RG9262 –UN-16MAR98



Operator Manuals

RG9260 –UN-16MAR98



Component Technical Manuals

RG9261 –UN-16MAR98



Fundamental Manuals

TS1663 –UN-10OCT97

DP5G, RG41165, 134 –19-10JUL00-1/1

Publications for this Engine

Technical information is available from John Deere in support of our products. Some of this information is available in electronic as well as printed form. Order from your John Deere dealer or call **1-800-522-7448**. Please have available the model number, and name of the product.

| Title | Order Number |
|---|--|
| <i>POWERTECH</i> 4.5 L and 6.8 L OEM Diesel Engines (English): | |
| Operation and Maintenance Manual | OMRG25204 |
| Parts Catalogs <i>POWERTECH</i> 4.5 L <i>POWERTECH</i> 6.8 L | PC2521 PC2522 |
| Component Technical Manual Binder Binder Includes: Base Engine Mechanical Fuel Systems Level 4 Electronic Fuel Injection System with Bosch VP44 Pump | CTM350 CTM104 CTM207 CTM170 |
| OEM Engine Accessories | CTM67 |
| Alternators and Starter Motors | CTM77 |

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POWERTECH **4.5/6.8 OEM Engines**

OMRG25204 (22SEP00)



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A breakdown view exists for this item

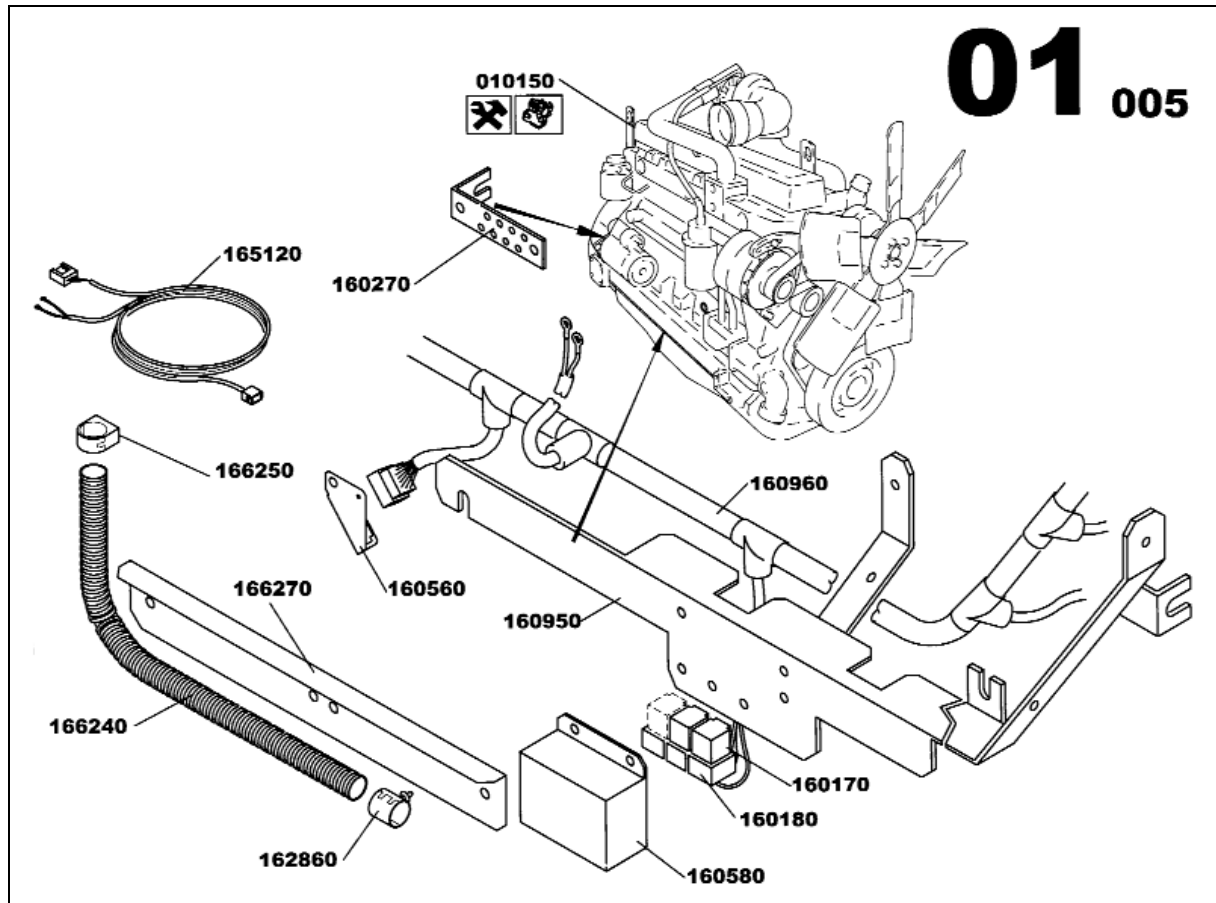


A supplier spare parts documentation exists for this item.

Some items drawing on the breakdown view are not mounted on this genset, so they are not in the part list.

ENGINE ASSEMBLY

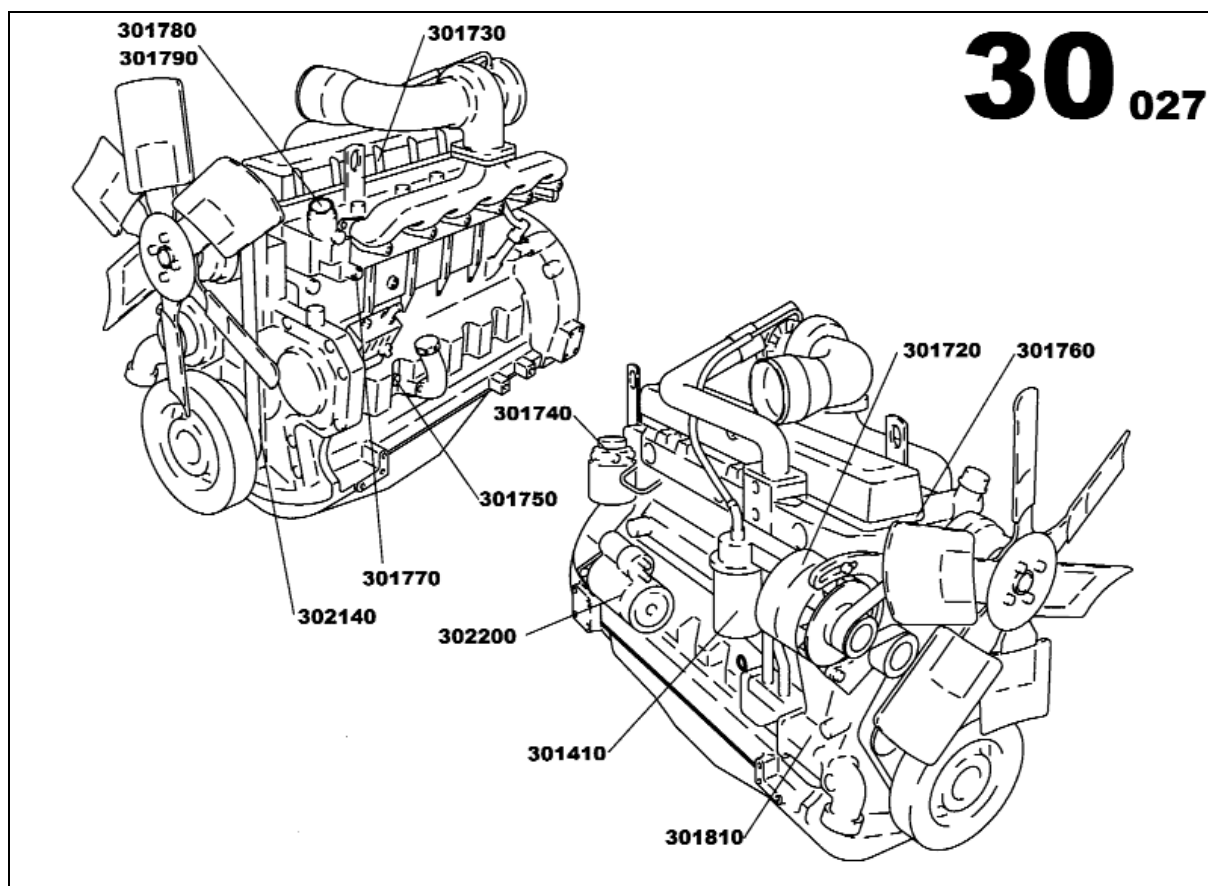
F01005



| Item | Part number | Description | Quantity | Units |
|--------|-------------|--|----------|-------|
| 010150 | 85403004 | JD 6068TF ENGINE SAE 3/11.5 | 1.0 | UN |
| 160560 | 85407286 | CONNECTOR SUPPORT BRACKET | 1.0 | UN |
| 160950 | 85407963 | WIRING BRACKET JD 6068 | 1.0 | UN |
| 160580 | 85407971 | STARTING RELAY PROTECTION PANEL | 1.0 | UN |
| 160960 | 85408045 | ENGINE WIRING LOOM JD 6068 | 1.0 | UN |
| 160270 | 85408078 | COPPER BAR 5x25 COMMON EARTH BAR | 1.0 | UN |
| 160170 | 85408896 | RELAY 12V 20/30A | 2.0 | UN |
| 160180 | 85408912 | AUTOMOBILE RELAY BASE | 3.0 | UN |
| 165120 | 85410652 | INTELLISYS™ WIRING LOOM 010 L1=3500 L2=400 | 1.0 | UN |
| 166270 | 85426971 | WIRING BRACKET | 1.0 | UN |
| 166240 | 85427268 | ELECTRICAL SHAFT D29 | 3.8 | ML |
| 162860 | 85427276 | CLIP D29 | 7.0 | UN |
| 166250 | 85427029 | CLIP D29 | 2.0 | UN |

ENGINE DETAILS

F30027

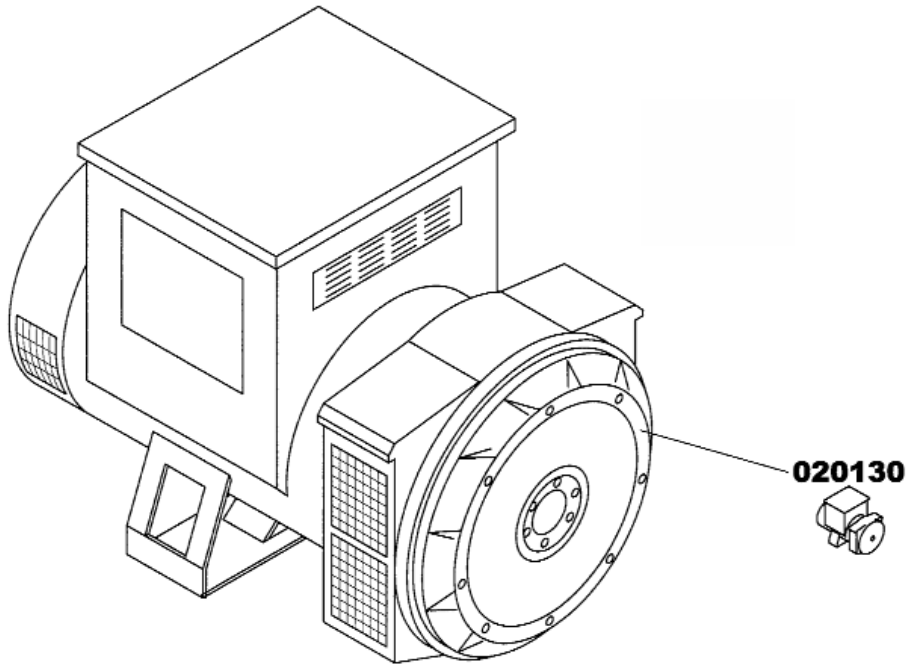


| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---------------------|-----------------|--------------|
| 301410 | 36881696 | OIL FILTER | 1.0 | UN |
| 301740 | 85400976 | FUEL FILTER | 1.0 | UN |
| 302140 | 85425460 | BELT | 1.0 | UN |
| 301730 | 85400893 | INJECTOR | 6.0 | UN |
| 302200 | 85425551 | STARTER | 1.0 | UN |
| 301720 | 85400877 | CHARGING ALTERNATOR | 1.0 | UN |
| 301810 | 85401313 | WATER PUMP | 1.0 | UN |
| 301750 | 85401099 | PRESSURE SWITCH | 1.0 | UN |
| 301770 | 85401164 | TEMPERATURE SWITCH | 1.0 | UN |
| 301790 | 85401206 | THERMOSTAT SEAL | 1.0 | UN |
| 301780 | 85401180 | THERMOSTAT | 1.0 | UN |
| 301760 | 85401131 | ROCKER COVER GASKET | 1.0 | UN |

ALTERNATOR ASSEMBLY

F02004

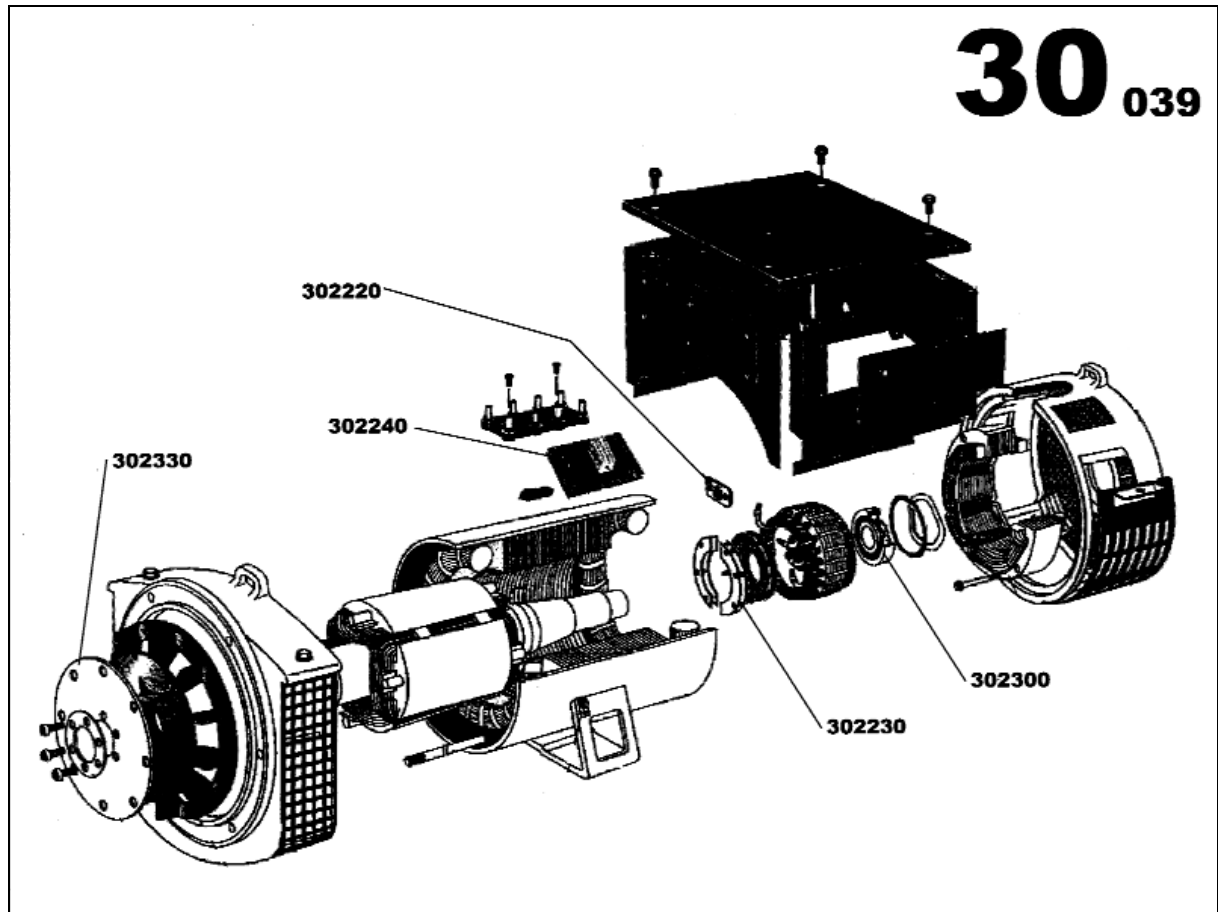
02₀₀₄



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---------------------|-----------------|--------------|
| 020130 | 85403103 | LS 442S7 ALTERNATOR | 1.0 | UN |

ALTERNATOR DETAILS

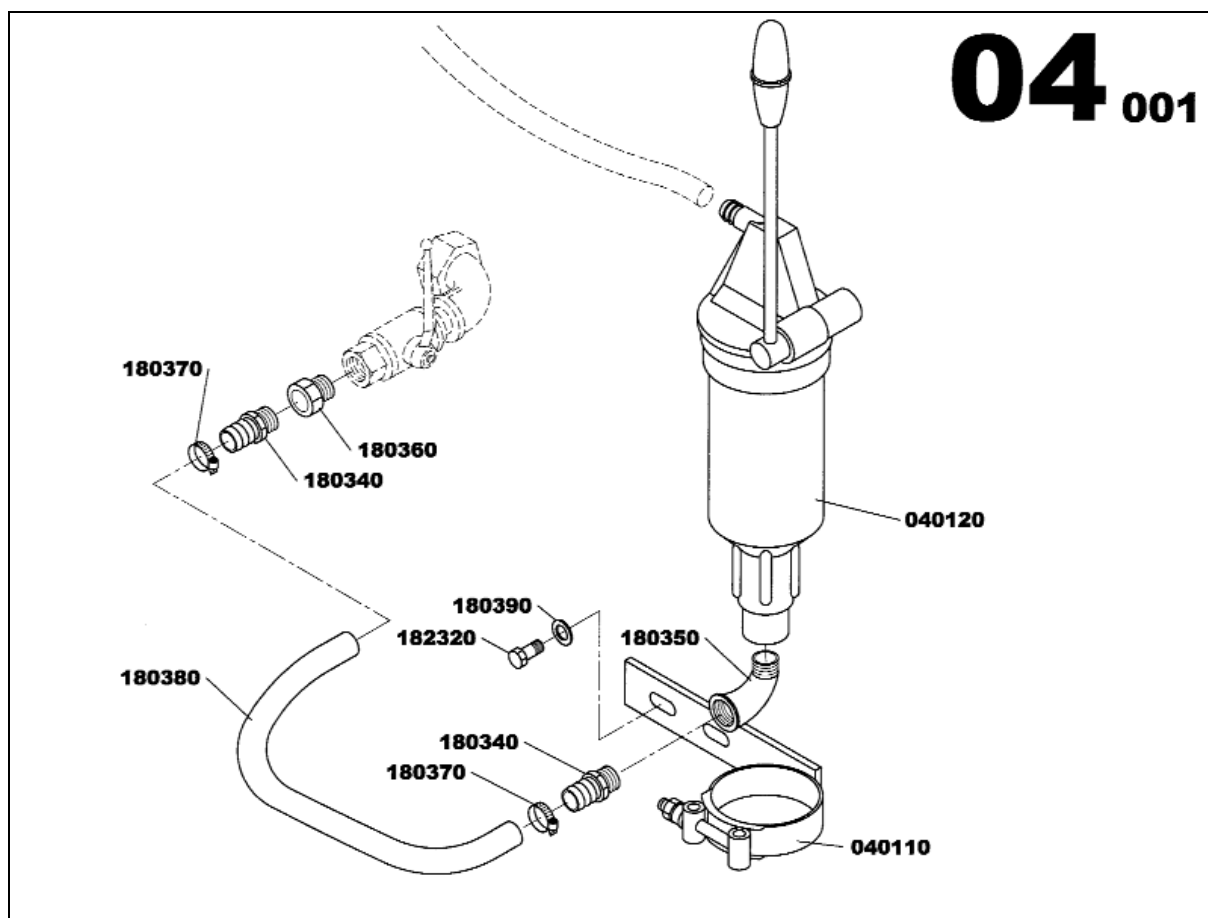
F30039



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--------------------|-----------------|--------------|
| 302240 | 85402451 | VOLTAGE REGULATOR | 1.0 | UN |
| 302300 | 85425908 | BEARING | 1.0 | UN |
| 302330 | 85425932 | DRIVE DISC | 1.0 | UN |
| 302230 | 85425593 | DIODE BRIDGE | 1.0 | UN |
| 302220 | 85425585 | SURGE SUPPRESSOR | 1.0 | UN |

OIL SUMP DRAIN PUMP ALL JD ASSEMBLY

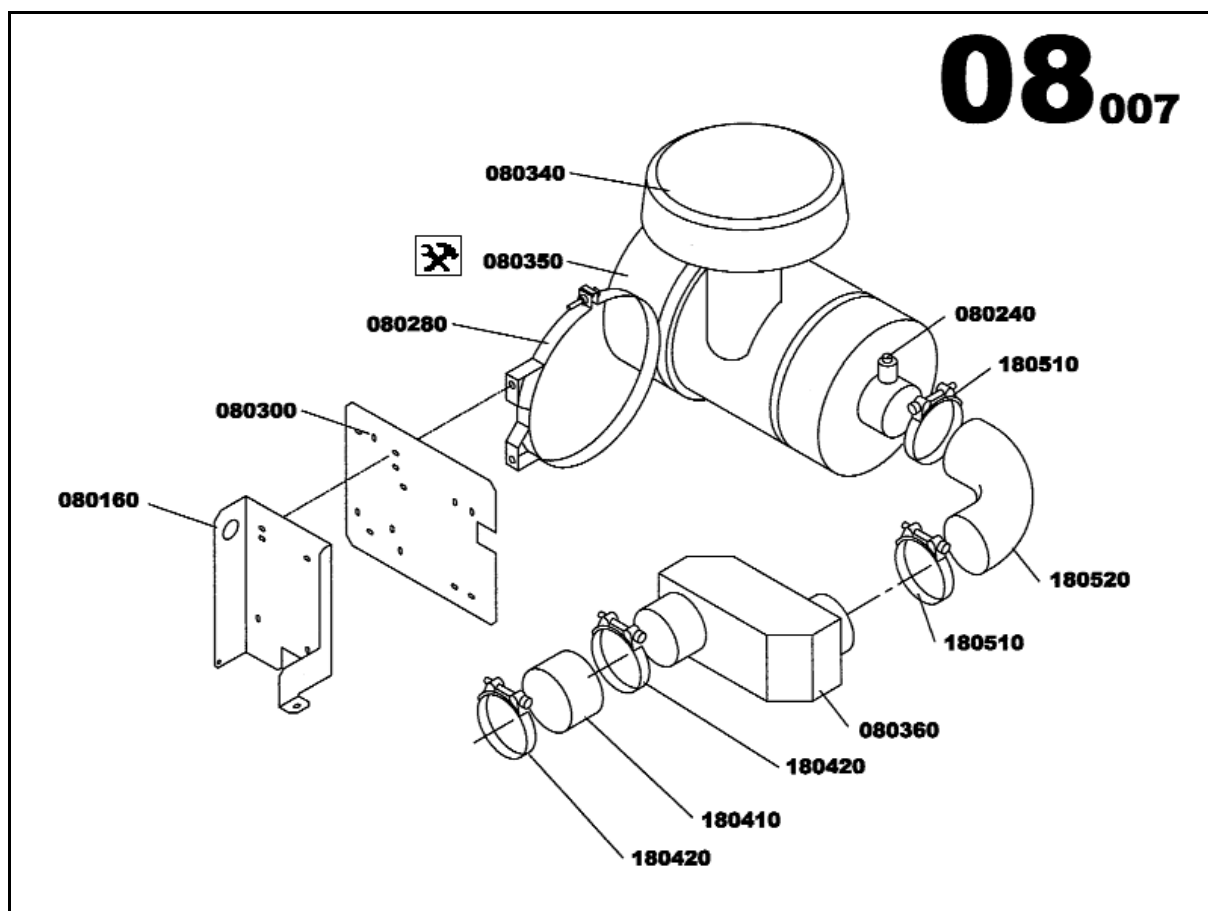
F04001



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-------------------------------------|-----------------|--------------|
| 040110 | 85403426 | OIL SUMP PUMP BRACKET | 1.0 | UN |
| 040120 | 85403434 | MANUAL PUMP | 1.0 | UN |
| 182320 | 85409209 | SCREW H M12x25 | 2.0 | UN |
| 180340 | 85409258 | PIPE UNION REDUCER MAL/MAL 3/8G D15 | 2.0 | UN |
| 180350 | 85409308 | PIPE UNION ELBOW 90° MAL/FEM 3/8G | 1.0 | UN |
| 180360 | 85409324 | PIPE UNION REDUCER MAL/FEM 1/2 3/8G | 1.0 | UN |
| 180370 | 85409423 | HOSE CLIP D20/32 | 2.0 | UN |
| 180380 | 85409597 | FLEXIBLE HOSE D15x23 | 0.65 | ML |

AIR FILTER HEAVY DUTY ASSEMBLY

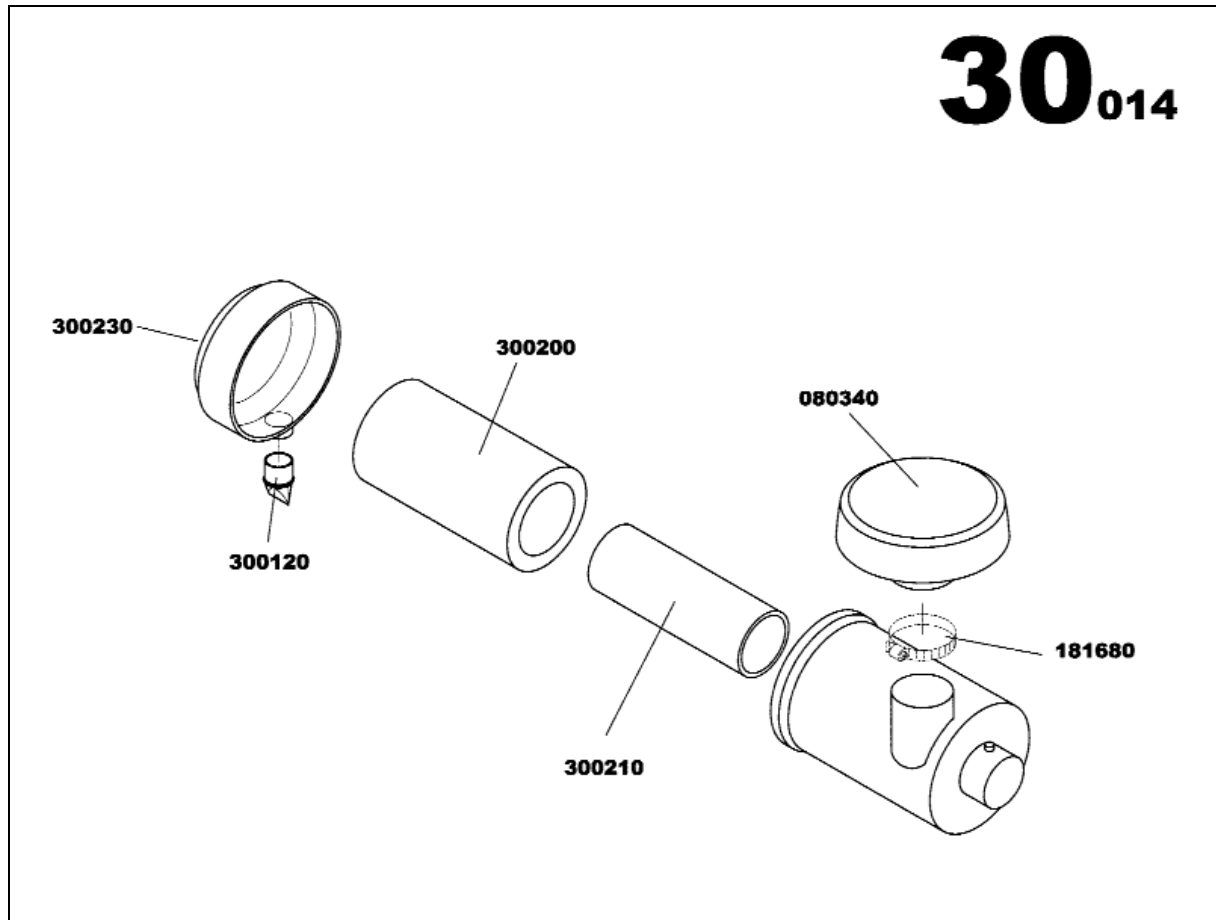
F08007



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|----------------------------------|-----------------|--------------|
| 080330 | 85403848 | AIR CLEANER CLAMP D330 | 2.0 | UN |
| 080340 | 85403863 | RAIN CAP D154 | 1.0 | UN |
| 080350 | 85403921 | AIR FILTER HEAVY DUTY | 1.0 | UN |
| 080160 | 85404069 | AIR FILTER BRACKET JD4039 | 1.0 | UN |
| 080360 | 85404093 | HEAVY DUTY AIR FILTER INLET PIPE | 1.0 | UN |
| 080300 | 85404101 | AIR FILTER BRACKET ALL JD | 1.0 | UN |
| 180420 | 85409407 | HOSE CLIP D70/90 | 2.0 | UN |
| 180510 | 85409415 | HOSE CLIP D120/140 | 2.0 | UN |
| 180520 | 85409571 | RUBBER HOSE ELBOW D 127 L152x152 | 1.0 | UN |
| 180410 | 85409589 | RUBBER HOSE D76 | 0.06 | ML |
| 080240 | 85410108 | AIR RESTRICTION INDICATOR | 1.0 | UN |

AIR FILTER 080350 DETAILS

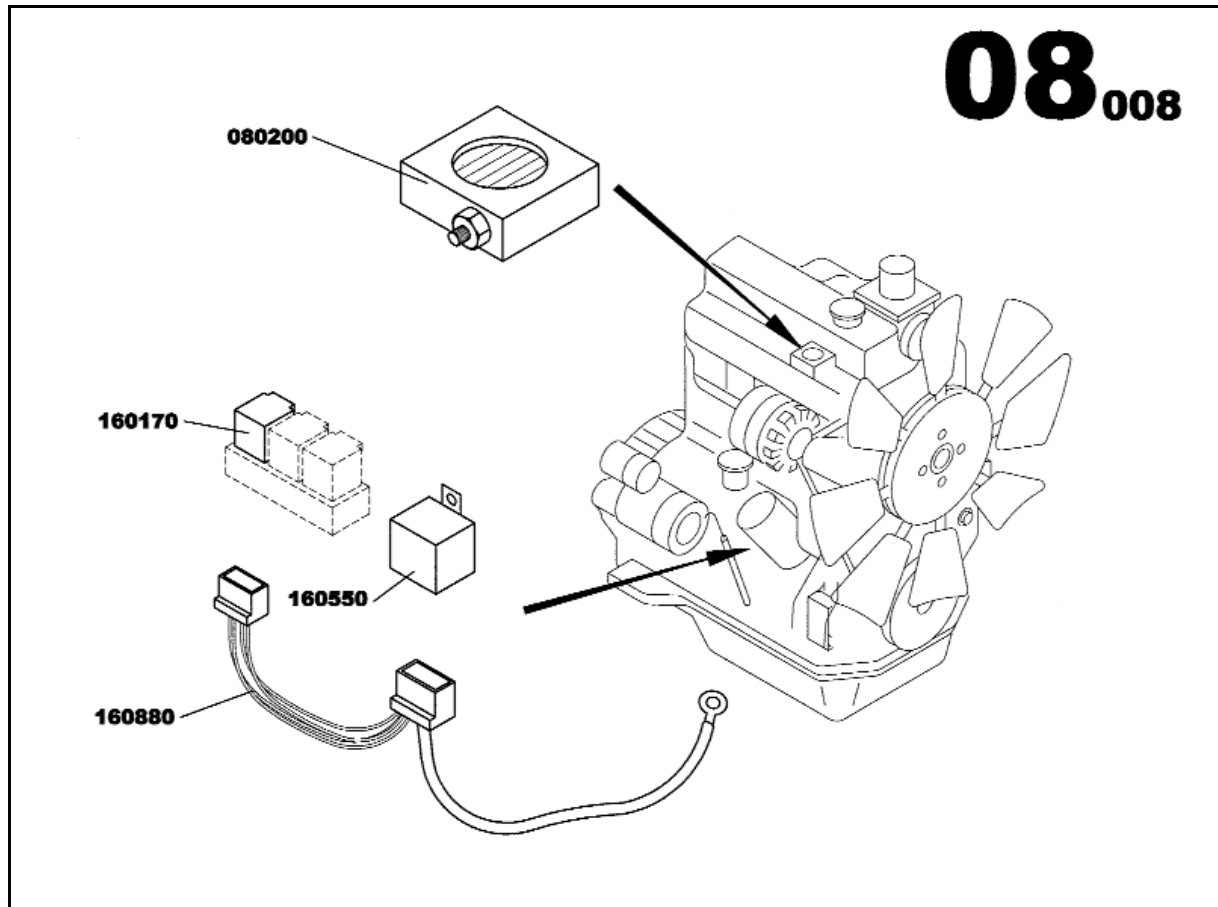
F30014



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--------------------|-----------------|--------------|
| 300200 | 85400737 | OUTER AIR FILTER | 1.0 | UN |
| 300210 | 85400786 | INNER AIR FILTER | 1.0 | UN |
| 300120 | 85501229 | VACUATOR VALVE | 1.0 | UN |
| 300220 | 85501286 | VACUATOR VALVE | 2.0 | UN |
| 080340 | 85403863 | RAIN CAP D154 | 1.0 | UN |
| 181680 | 85501872 | HOSE CLIP D140/160 | 1.0 | UN |

AIR HEATER JD 6068 ASSEMBLY

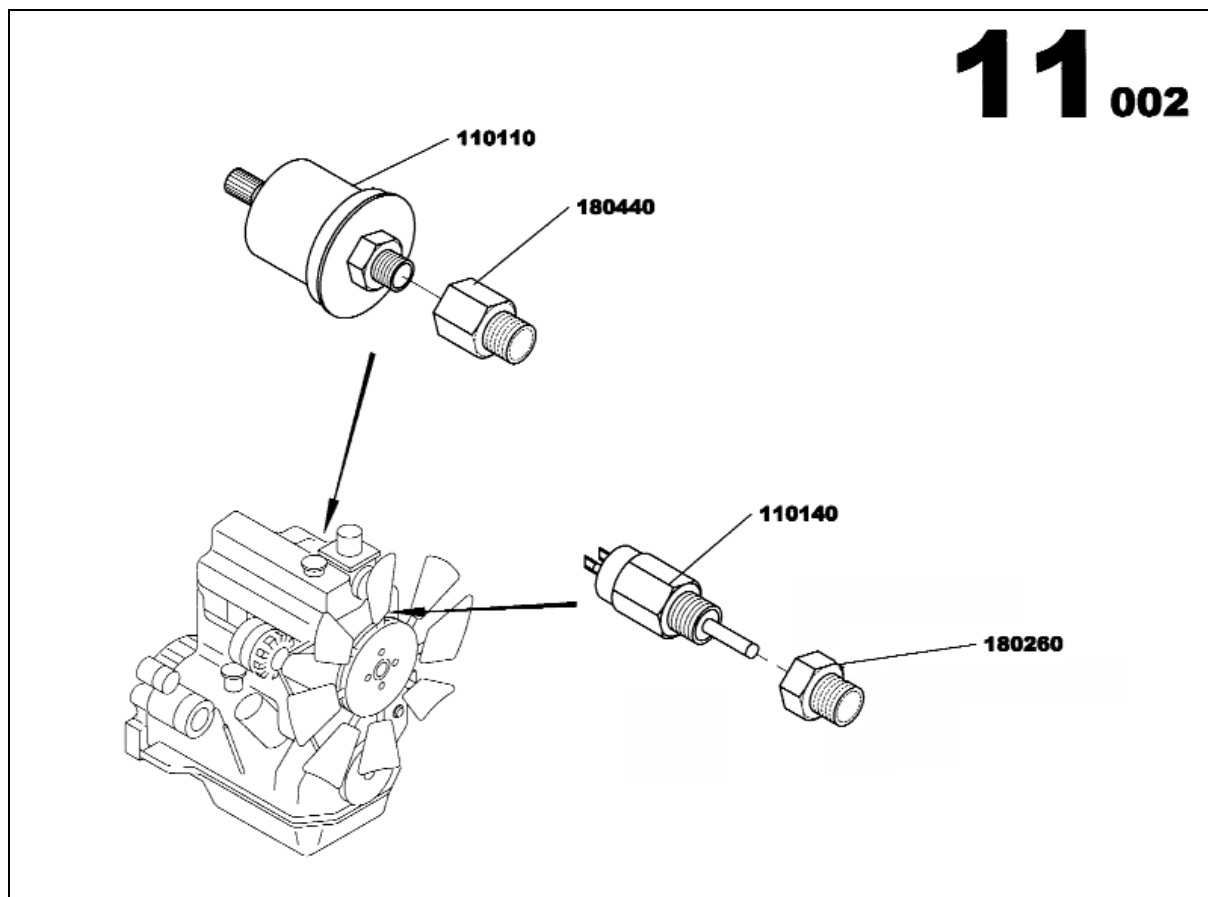
F08008



| Item | Part number | Description | Quantity | Units |
|--------|-------------|---------------------------------|----------|-------|
| 080200 | 85404267 | AIR HEATER RESISTANCE 1200W 12V | 1.0 | UN |
| 160880 | 85408177 | AIR HEATER WIRING LOOM JD 6068 | 1.0 | UN |
| 160550 | 85408938 | RELAY 12V 180A | 1.0 | UN |
| 160170 | 85408896 | RELAY 12V 20/30A | 1.0 | UN |

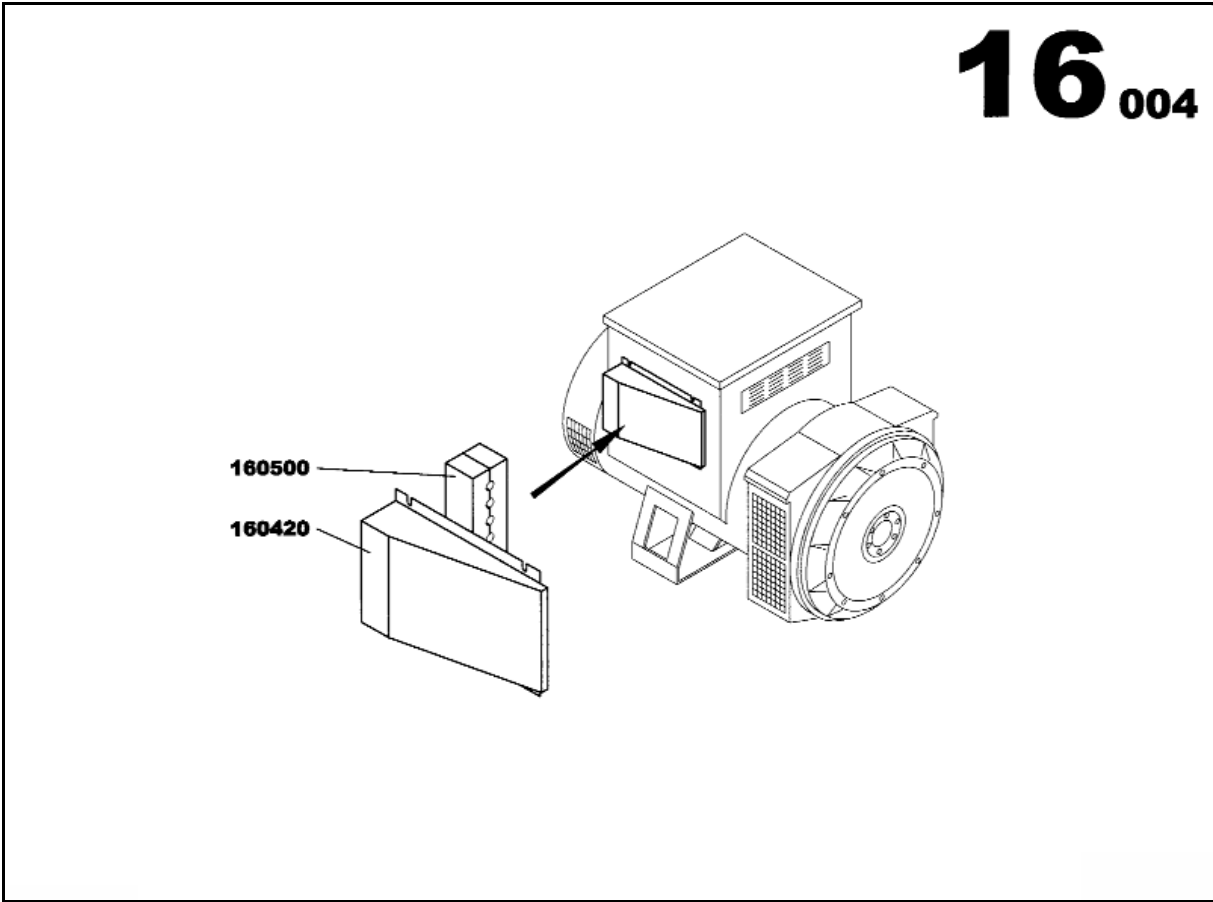
TRANS. WATER TEMPERATURE-OIL PRESSURE ASSEMBLY

F11002



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 110110 | 85404598 | PRESSURE SWITCH 00/10 BAR | 1.0 | UN |
| 110140 | 85404606 | TEMPERATURE SENSOR 40/120° | 1.0 | UN |
| 180440 | 85409134 | PIPE UNION REDUCER MAL/FEM 3/8SAE 1/8G | 1.0 | UN |
| 180260 | 85409340 | PIPE UNION REDUCER MAL/FEM M14X150 | 1.0 | UN |

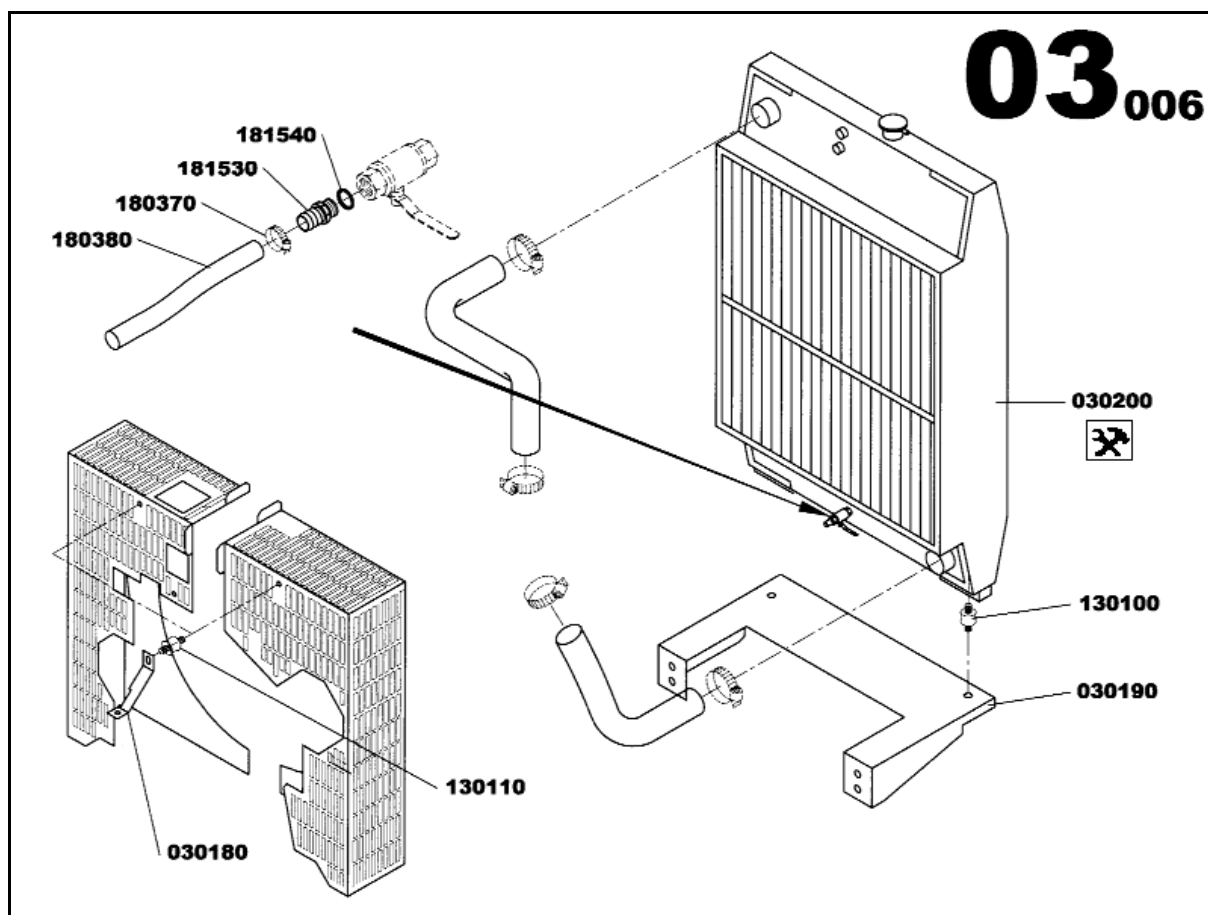
OUTPUT CABLES ALTERNATOR 80A<=480A ASSEMBLY
F16004



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|------------------------------------|-----------------|--------------|
| 160420 | 85406742 | CABLE OUTLET PLATE NW UCD224/UC274 | 1.0 | UN |
| 160500 | 85406874 | FOAM CABLE PROTECTION 170x40x40 | 2.0 | UN |

RADIATOR FITTINGS JD6068T ASSEMBLY

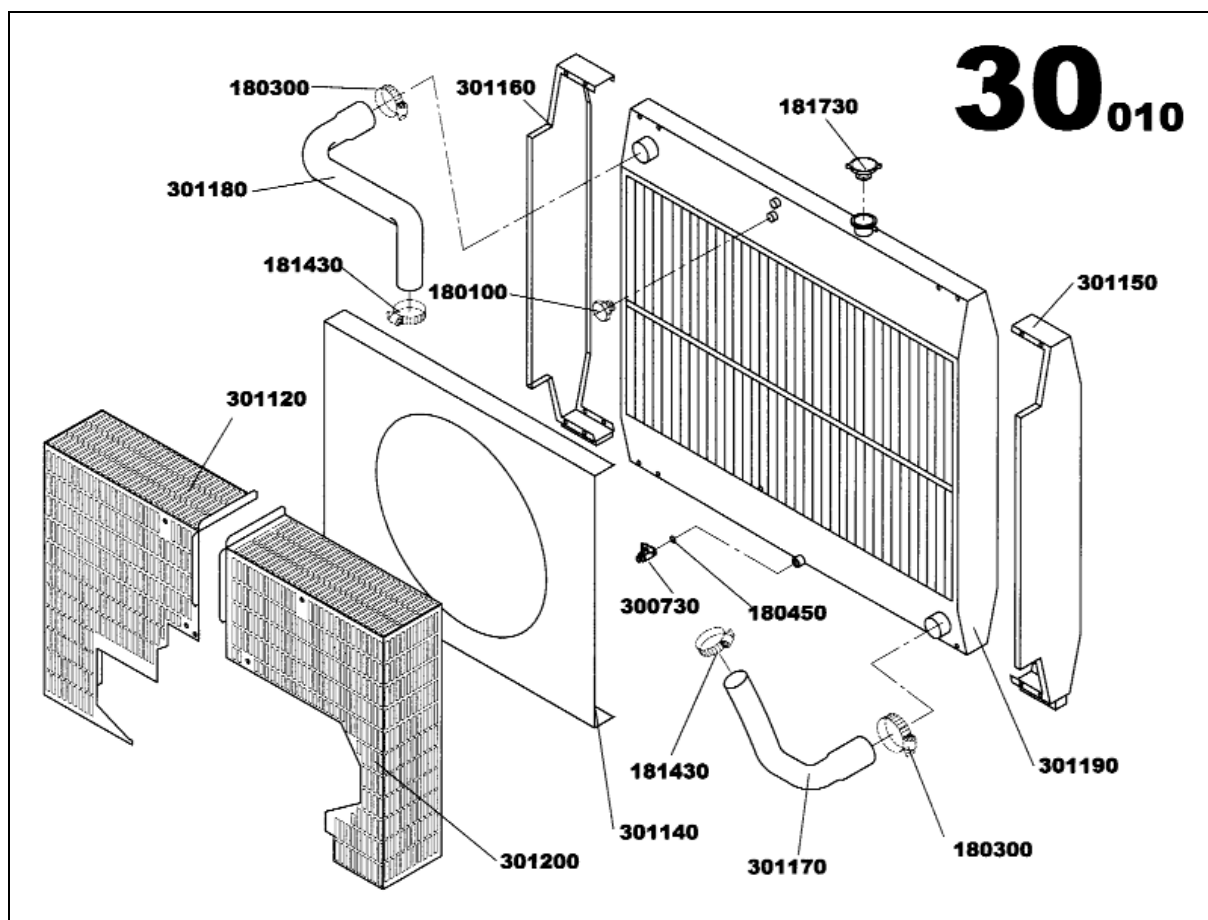
F03006



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-------------------------------------|-----------------|--------------|
| 030180 | 85403251 | RADIATOR BRACKET ENGINE JD 6068 | 2.0 | UN |
| 030190 | 85403269 | RADIATOR BRACKET JD 6CYL | 1.0 | UN |
| 030200 | 85403319 | RADIATOR JD 6068T WITH HOSE KIT | 1.0 | UN |
| 130100 | 85405009 | ANTI-VIBRATION MOUNT D40 h28 | 2.0 | UN |
| 130110 | 85405017 | ANTI-VIBRATION MOUNT D40 h28 | 2.0 | UN |
| 181530 | 85427110 | PIPE UNION REDUCER FEMALE/MALE 1/4G | 1.0 | UN |
| 180370 | 85409423 | HOSE CLIP D20/32 | 2.0 | UN |
| 181540 | 85492163 | GASKET D6x10 Th1 | 1.0 | UN |
| 180380 | 85409597 | FLEXIBLE HOSE D15x23 | 0.75 | ML |

RADIATOR 030200 DETAILS

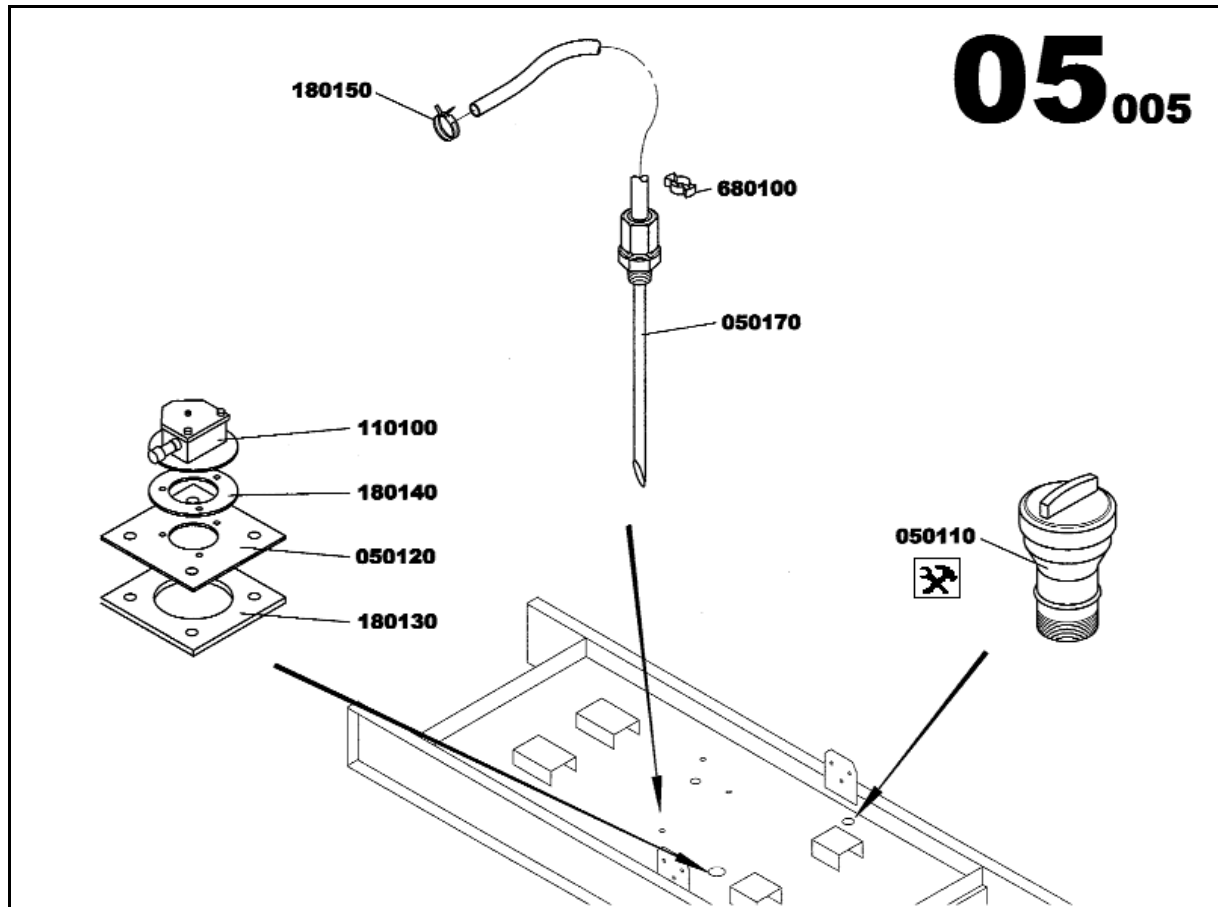
F30010



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------------|-----------------|--------------|
| 301170 | 85426005 | RADIATOR BOTTOM HOSE | 1.0 | UN |
| 301180 | 85401289 | RADIATOR TOP HOSE | 1.0 | UN |
| 301190 | 85500635 | WATER RADIATOR | 1.0 | UN |
| 181730 | 85500536 | PLUG RADIATOR +0,70B/-0,04B | 1.0 | UN |
| 180300 | 85409399 | HOSE CLIP D60/80 | 2.0 | UN |
| 181430 | 85412922 | HOSE CLIP D50/70 | 2.0 | UN |
| 301120 | 85500791 | LEFT FAN PROTECTION | 1.0 | UN |
| 301200 | 85500924 | RIGHT FAN PROTECTION | 1.0 | UN |
| 301140 | 85501005 | PLENUM | 1.0 | UN |
| 301150 | 85501088 | RADIATOR RIGHT UPRIGHT | 1.0 | UN |
| 301160 | 85501161 | RADIATOR LEFT UPRIGHT | 1.0 | UN |
| 300730 | 85502649 | 2 WAY VALVE | 1.0 | UN |
| 180450 | 85410298 | GASKET D14x18 Th1.5 | 1.0 | UN |
| 180100 | 85409316 | PLUG 1/2G | 1.0 | UN |

FUEL TANK M214 ASSEMBLY

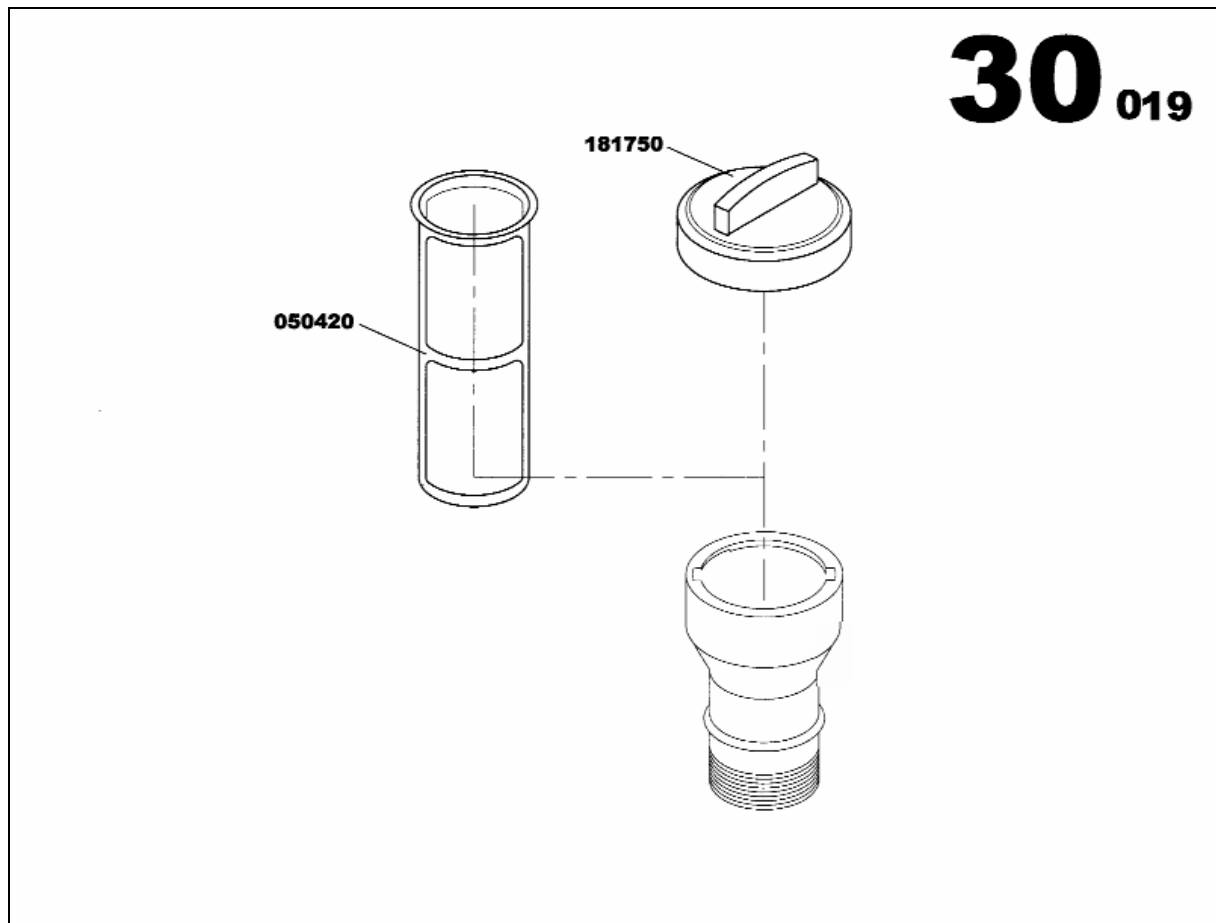
F05005



| Item | Part number | Description | Quantity | Units |
|--------|-------------|-------------------------------------|----------|-------|
| 050170 | 85403475 | FUEL SUCTION PIPE L240 D8 3/8G | 2.0 | UN |
| 050110 | 85403517 | FUEL FILLER BASE FUEL TANK | 1.0 | UN |
| 050120 | 85403509 | LEVEL SENSOR ADAPTER | 1.0 | UN |
| 110100 | 85404572 | LEVEL SENSOR | 1.0 | UN |
| 180130 | 85409068 | SQUARE FLANGE GASKET 95x95 Th3 | 1.0 | UN |
| 180140 | 85409076 | ROUND FLANGE GASKET 36x56 Th1 | 1.0 | UN |
| 180360 | 85409324 | PIPE UNION REDUCER MAL/FEM 1/2 3/8G | 2.0 | UN |
| 180150 | 85409514 | SPRING CLAMP D13/15 | 2.0 | UN |
| 680100 | 85410090 | HOSE CLIP | 2.0 | UN |

FUEL FILLER 050110 DETAILS

F30019

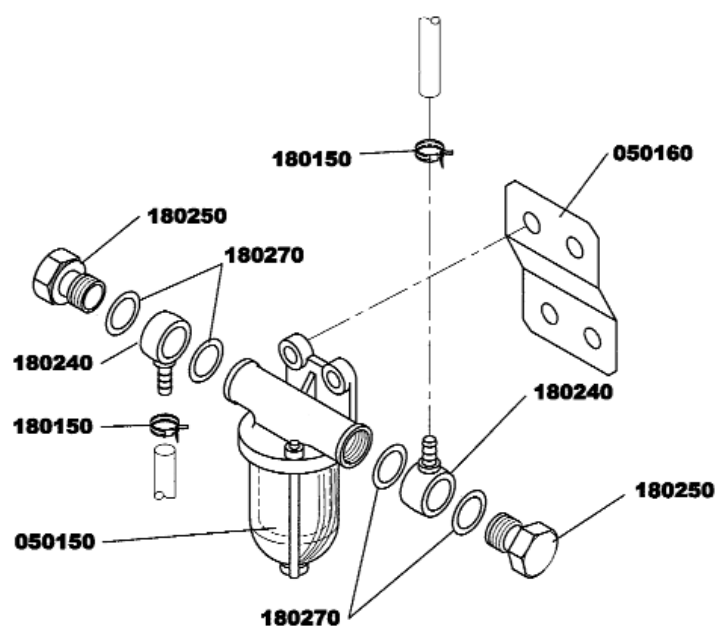


| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--------------------|-----------------|--------------|
| 181750 | 85503035 | TANK PLUG | 1.0 | UN |
| 050420 | 85431120 | FUEL FILTER | 1.0 | UN |

FUEL PREFILTER KIT ASSEMBLY

F05004

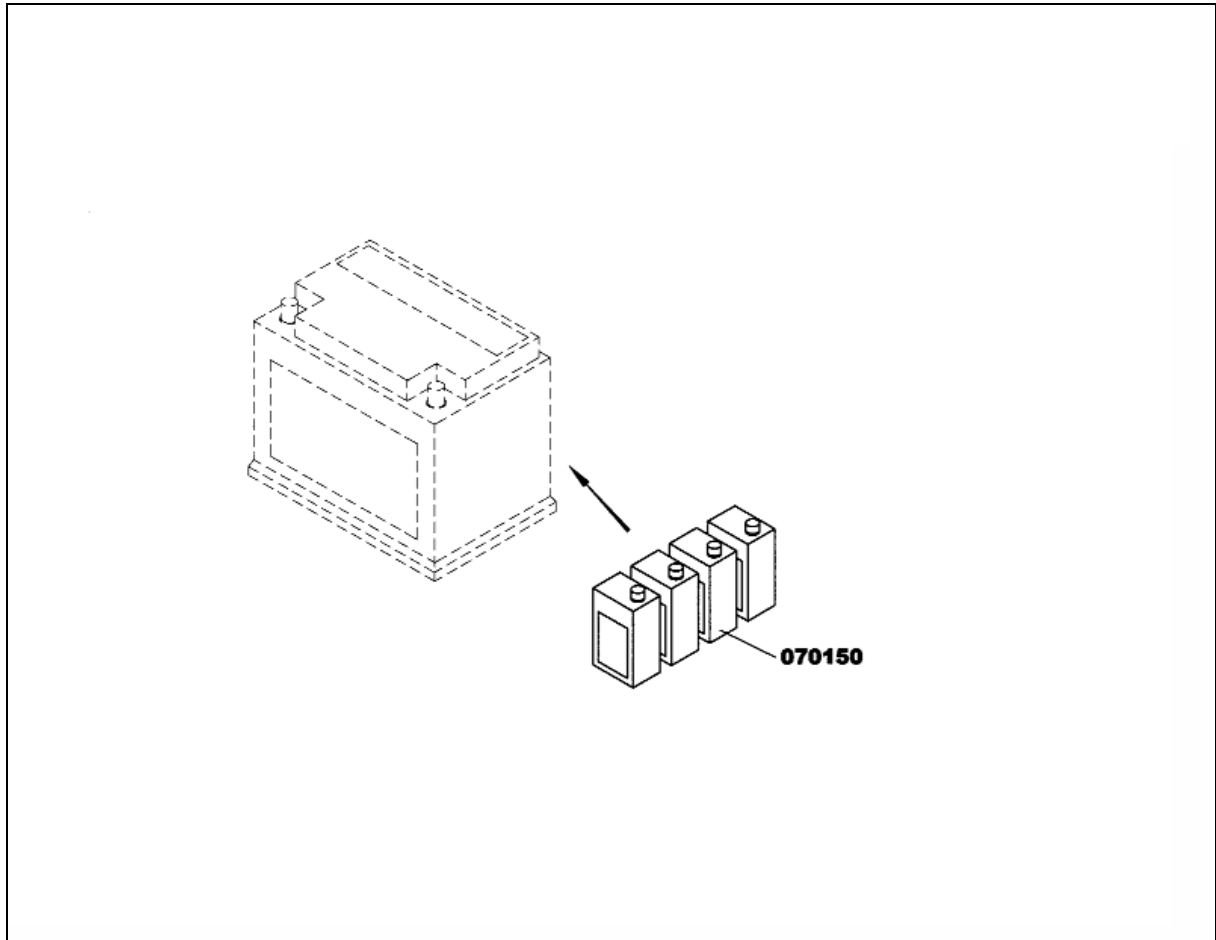
05₀₀₄



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--------------------------|-----------------|--------------|
| 050160 | 85403483 | FUEL FILTER BRACKET | 1.0 | UN |
| 050150 | 85403525 | FUEL FILTER SEPARATOR | 1.0 | UN |
| 180240 | 85409274 | BANJO CONNECTOR MALE D08 | 2.0 | UN |
| 180250 | 85409282 | BANJO SCREW M14X150 L26 | 2.0 | UN |
| 180150 | 85409514 | SPRING CLAMP D13/15 | 2.0 | UN |
| 180270 | 85409522 | GASKET D14x20 Th1.5 | 4.0 | UN |

BATTERY ELECTROLYTE

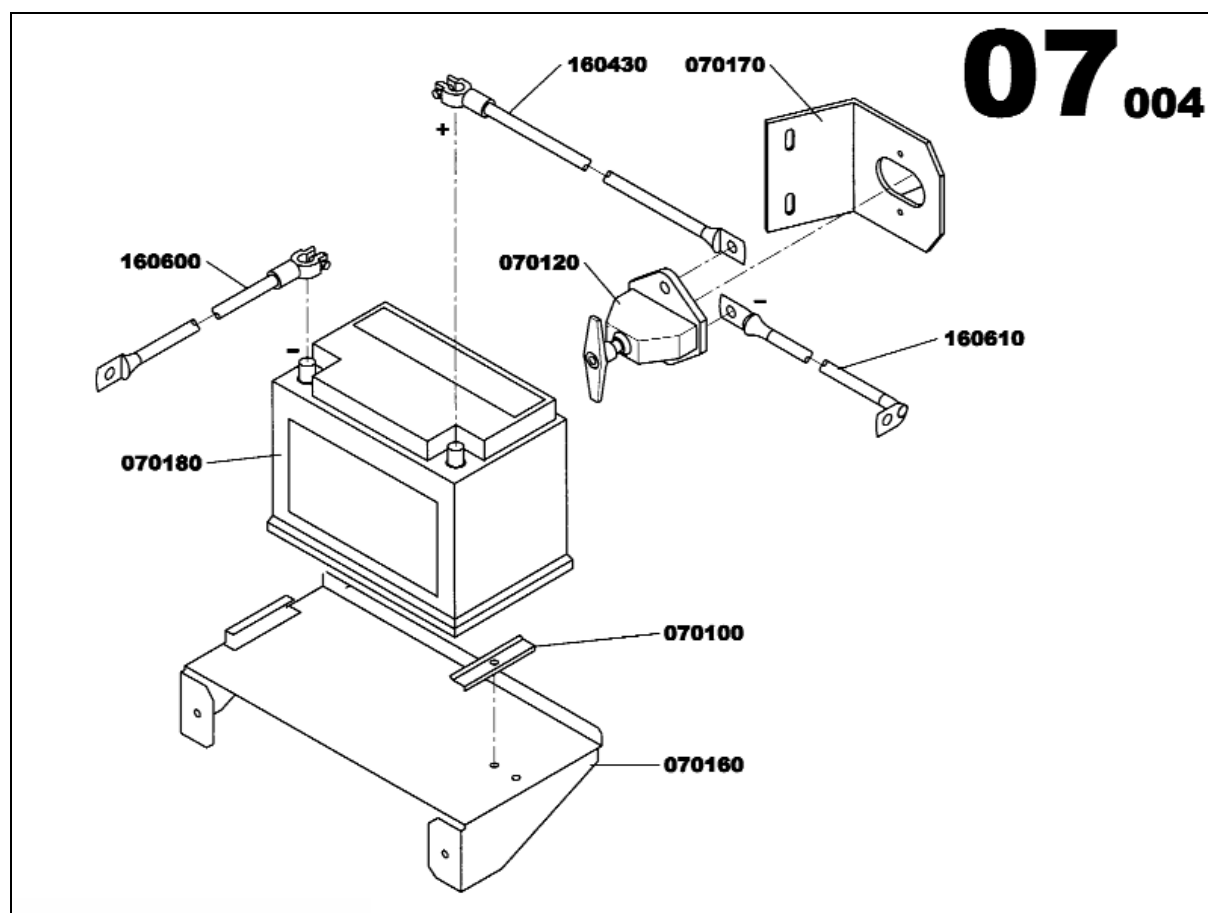
F99002



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---------------------|-----------------|--------------|
| 070150 | 85403756 | BATTERY ELECTROLYTE | 2.0 | UN |

ELECTRIC STARTER M216 ISOLATED ASSEMBLY

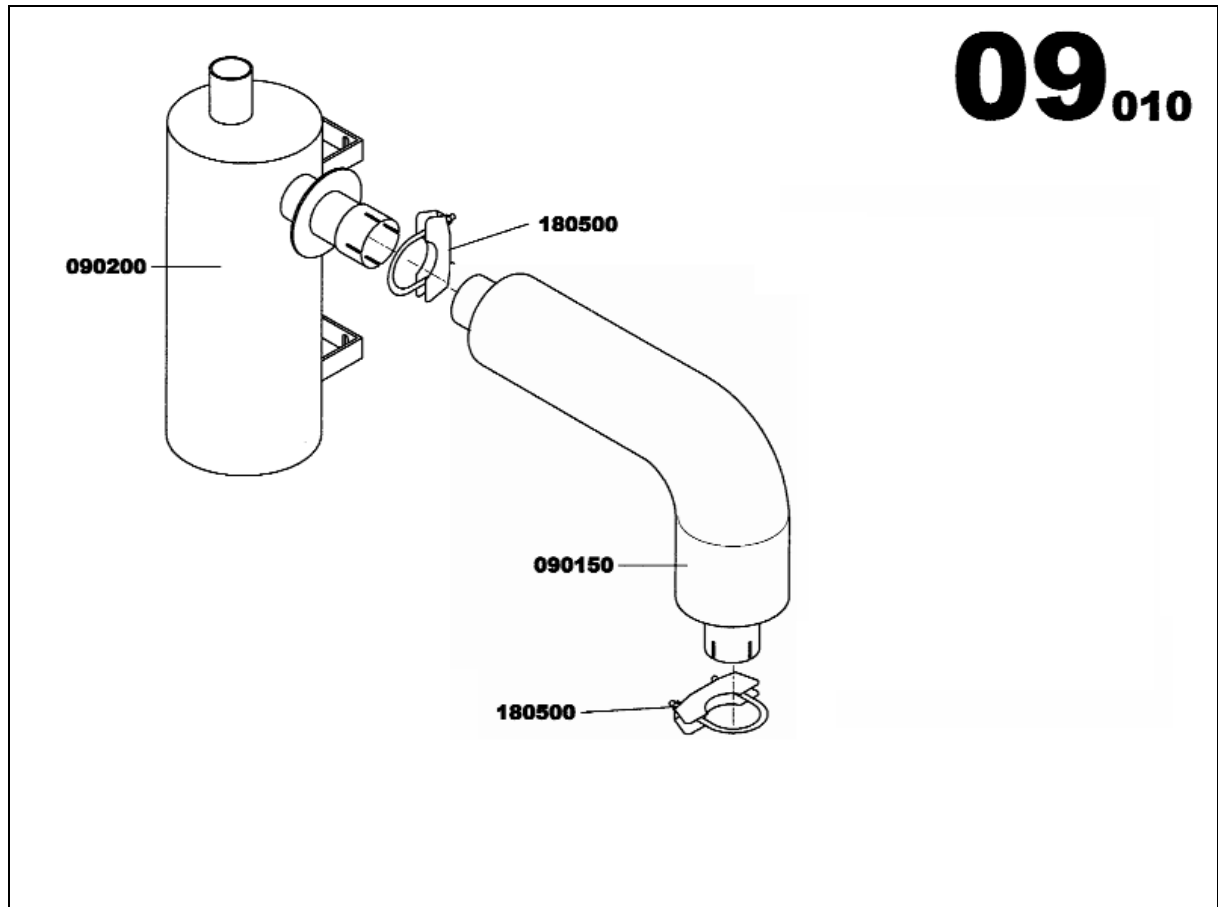
F07004



| Item | Part number | Description | Quantity | Units |
|--------|-------------|------------------------------------|----------|-------|
| 070100 | 85403699 | BATTERY FIXING BRACKET | 1.0 | UN |
| 070170 | 85403707 | BATTERY ISOLATOR BRACKET | 1.0 | UN |
| 070120 | 85403723 | BATTERY ISOLATOR SWITCH | 1.0 | UN |
| 070180 | 85403731 | STARTING BATTERY 12V 100Ah 450A | 1.0 | UN |
| 070160 | 85403806 | BATTERY SUPPORT BRACKET M214/M216 | 1.0 | UN |
| 160430 | 85406387 | BATTERY CABLE (+) 50mm2 L700 RED | 1.0 | UN |
| 160600 | 85406395 | BATTERY CABLE (-) 50mm2 L700 BLACK | 1.0 | UN |
| 160610 | 85408136 | BATTERY CABLE (+) 50mm2 L700 RED | 1.0 | UN |

EXHAUST SYSTEM M216ESI ASSEMBLY

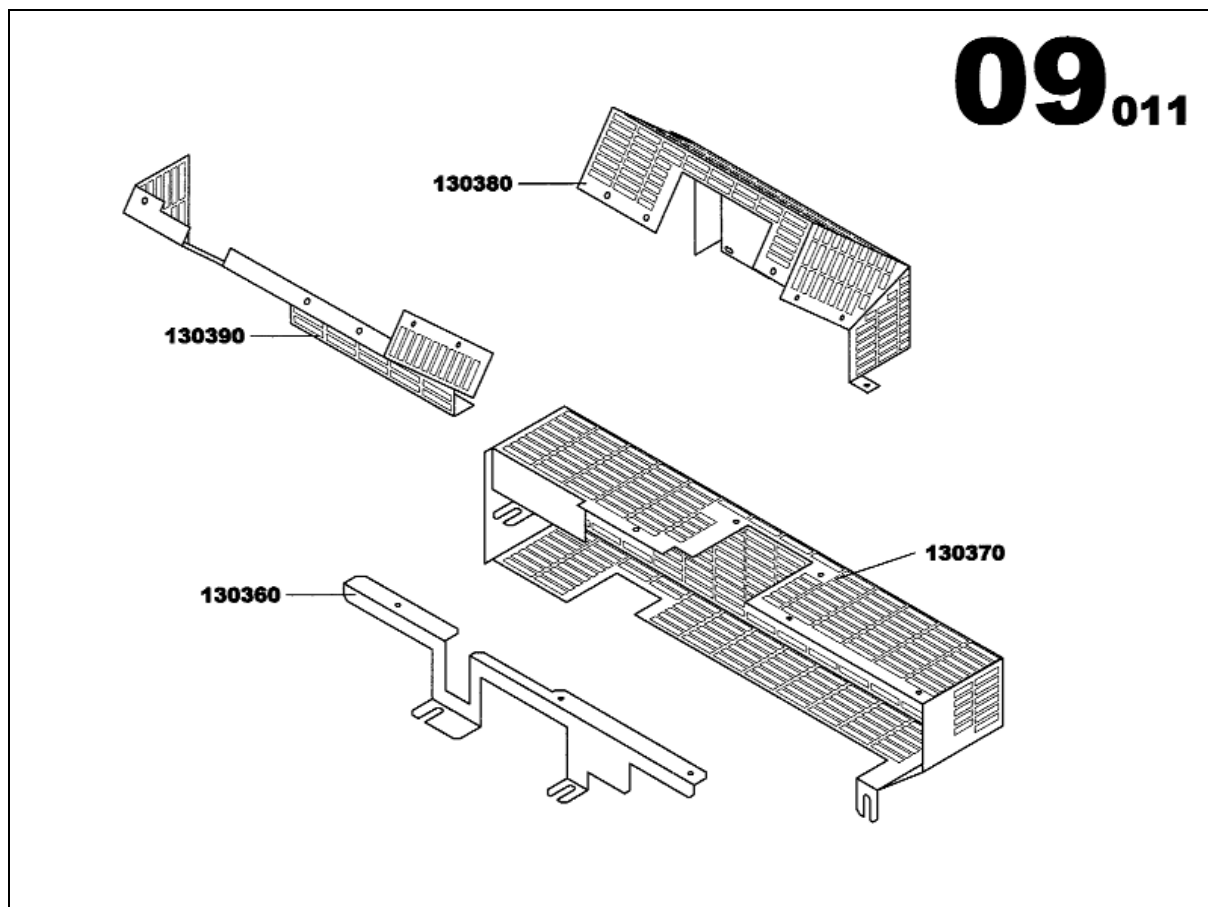
F09010



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|------------------------------|-----------------|--------------|
| 090200 | 85404366 | 29dB MUFFLER | 1.0 | UN |
| 090150 | 85503597 | EXHAUST PIPE M216ESI D114 JD | 1.0 | UN |
| 180500 | 85409381 | HOSE CLAMP D120 | 2.0 | UN |

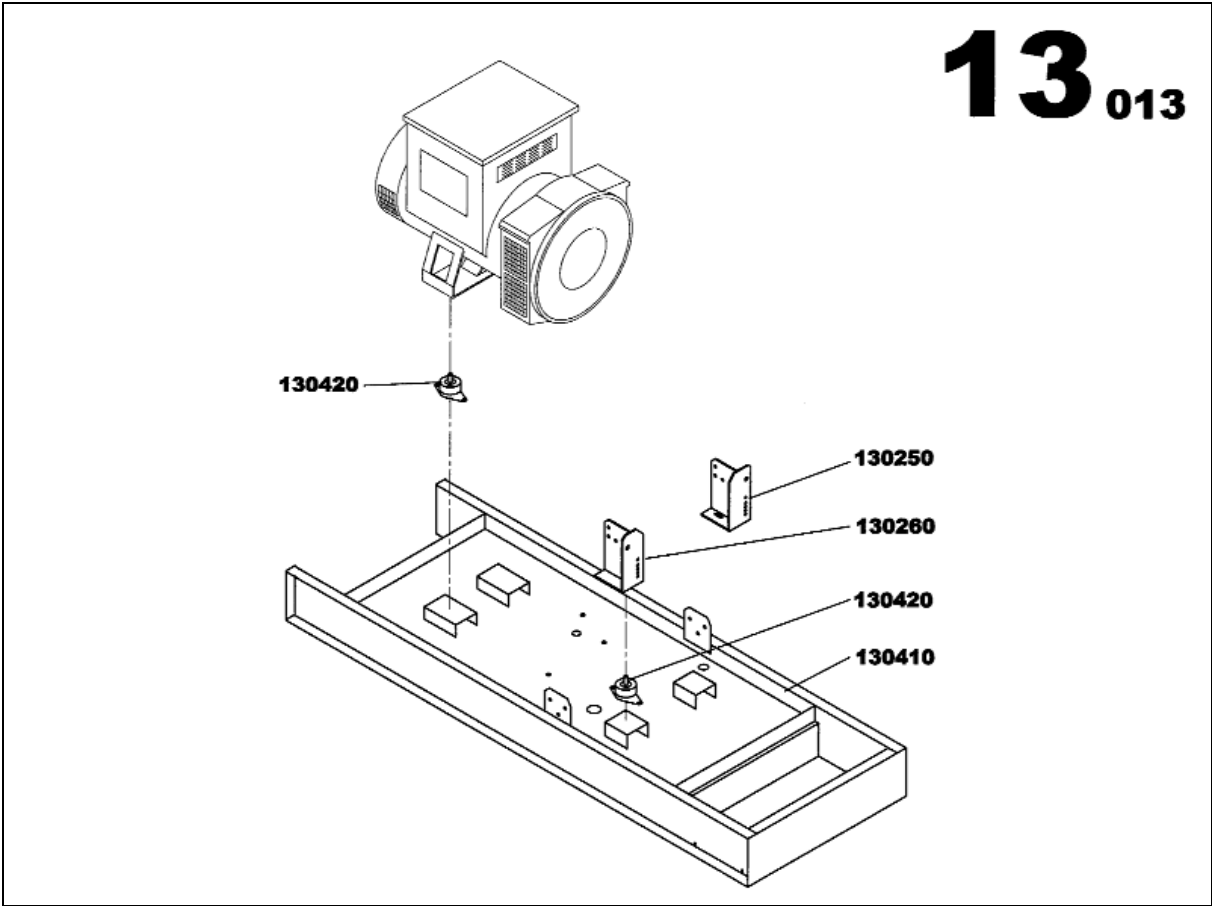
EXHAUST GUARDS JD6068 ASSEMBLY

F09011



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-------------------------------|-----------------|--------------|
| 130360 | 85405025 | EXHAUST GUARD BRACKET JD 6068 | 1.0 | UN |
| 130370 | 85405033 | EXHAUST GUARD JD 6068 | 1.0 | UN |
| 130380 | 85405157 | EXHAUST GUARD JD 6068 | 1.0 | UN |
| 130390 | 85405165 | EXHAUST GUARD JD 6068 | 1.0 | UN |

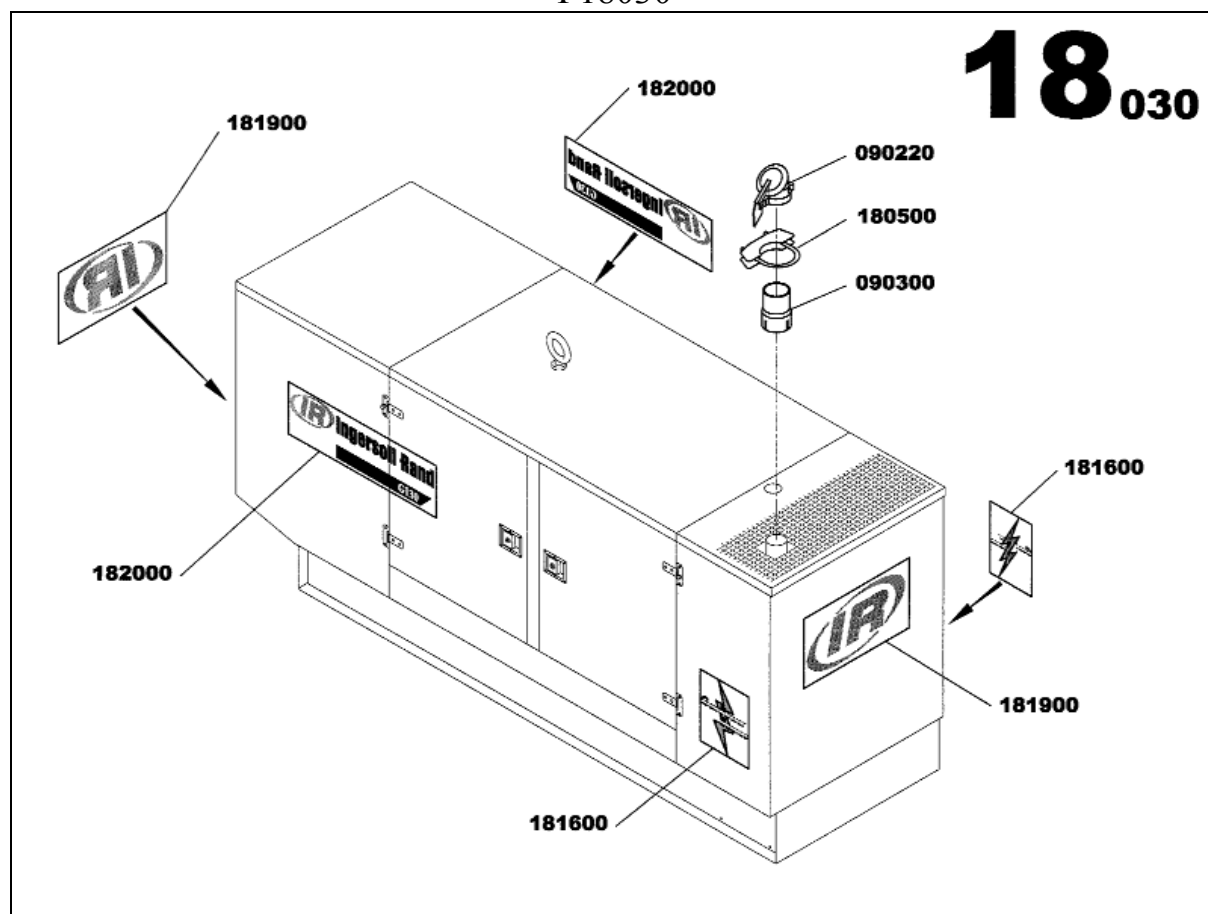
FRAME M216BESI JD 6068 ASSEMBLY F13013



| Item | Part number | Description | Quantity | Units |
|--------|-------------|-------------------------------------|----------|-------|
| 130410 | 85404895 | M216ESI FRAME TANK FOR JD 6CYL | 1.0 | UN |
| 130420 | 85401883 | ANTI-VIBRATION MOUNT 330daN 3.5mm | 4.0 | UN |
| 130250 | 85405207 | ENGINE SUPPORT 4045 6068 LEFT SIDE | 1.0 | UN |
| 130260 | 85405215 | ENGINE SUPPORT 4045 6068 RIGHT SIDE | 1.0 | UN |

G130 DECALS

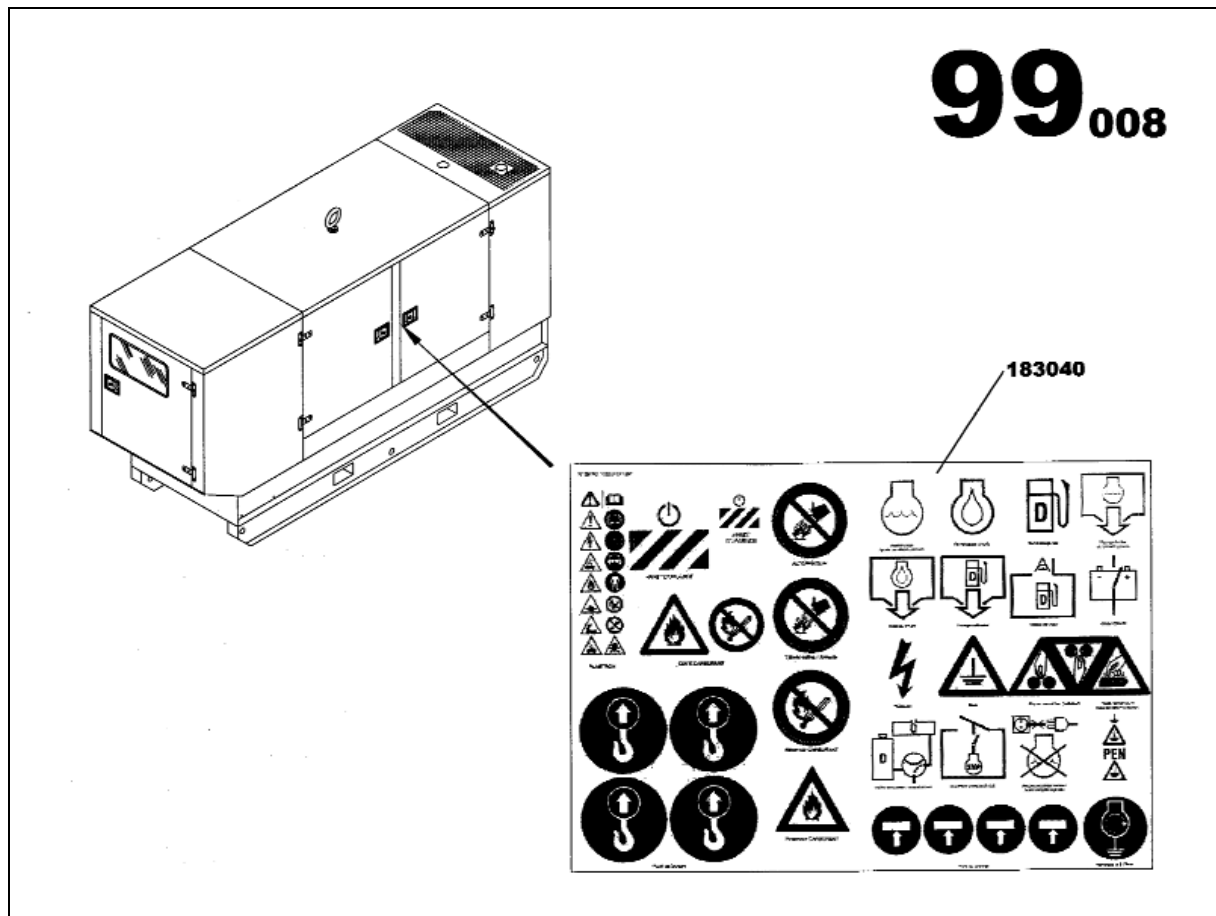
F18030



| Item | Part number | Description | Quantity | Units |
|--------|-------------|------------------------------|----------|-------|
| 090300 | 85422772 | MUFFLER EXTENSION D114XL170 | 1.0 | UN |
| 090220 | 85404341 | EXHAUST RAIN FLAP D114 | 1.0 | UN |
| 180500 | 85409381 | HOSE CLAMP D120 | 1.0 | UN |
| 181600 | 85428019 | RECTANGULAR STICKER 450x600 | 1.0 | UN |
| 181900 | 85500213 | ROUND STICKER D385 | 2.0 | UN |
| 182000 | 85503829 | RECTANGULAR STICKER 1100x325 | 2.0 | UN |

SAFETY DECALS ASSEMBLY

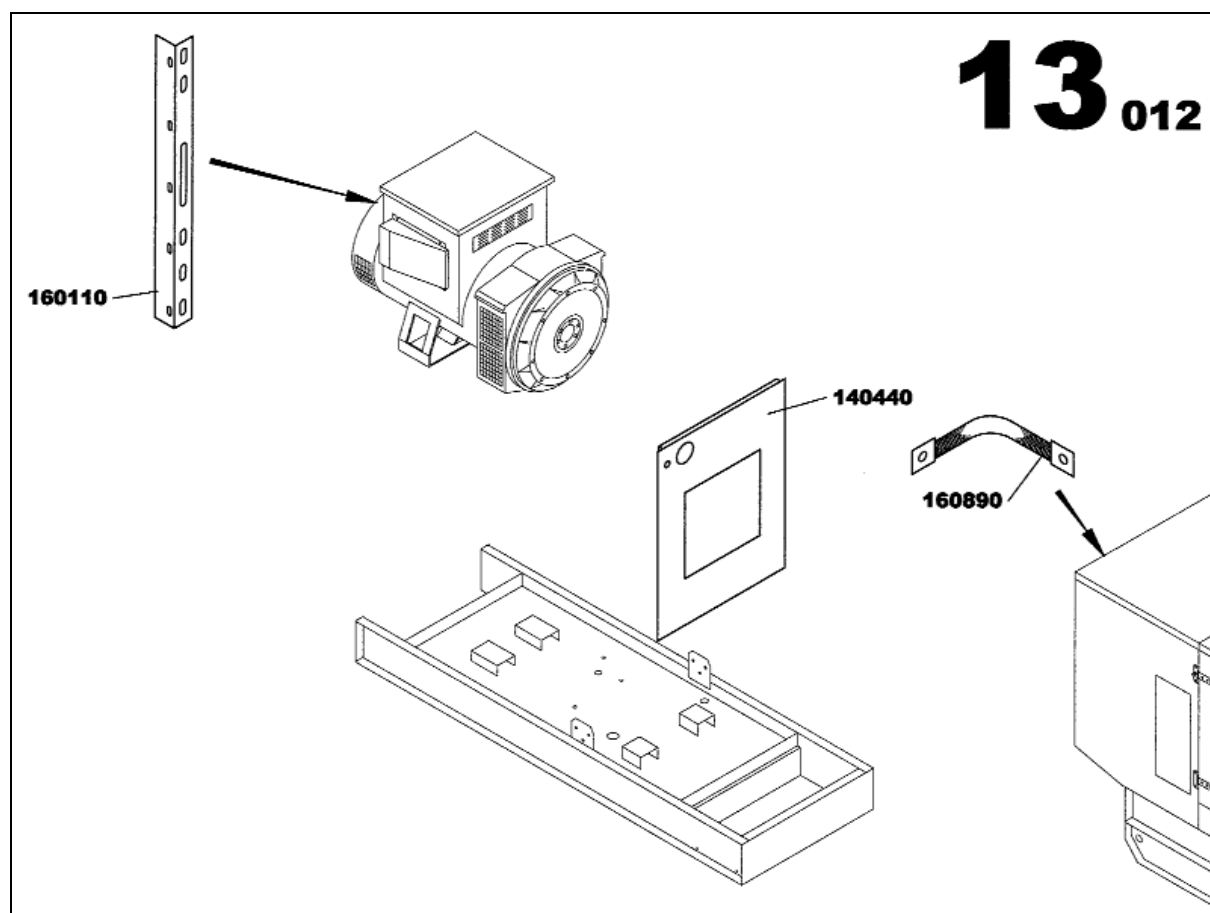
F99008



| Item | Part number | Description | Quantity | Units |
|--------|-------------|--------------|----------|-------|
| 183040 | 85506467 | SAFETY DECAL | 1.0 | UN |

MISCELLANEOUS CANOPY ASSEMBLY

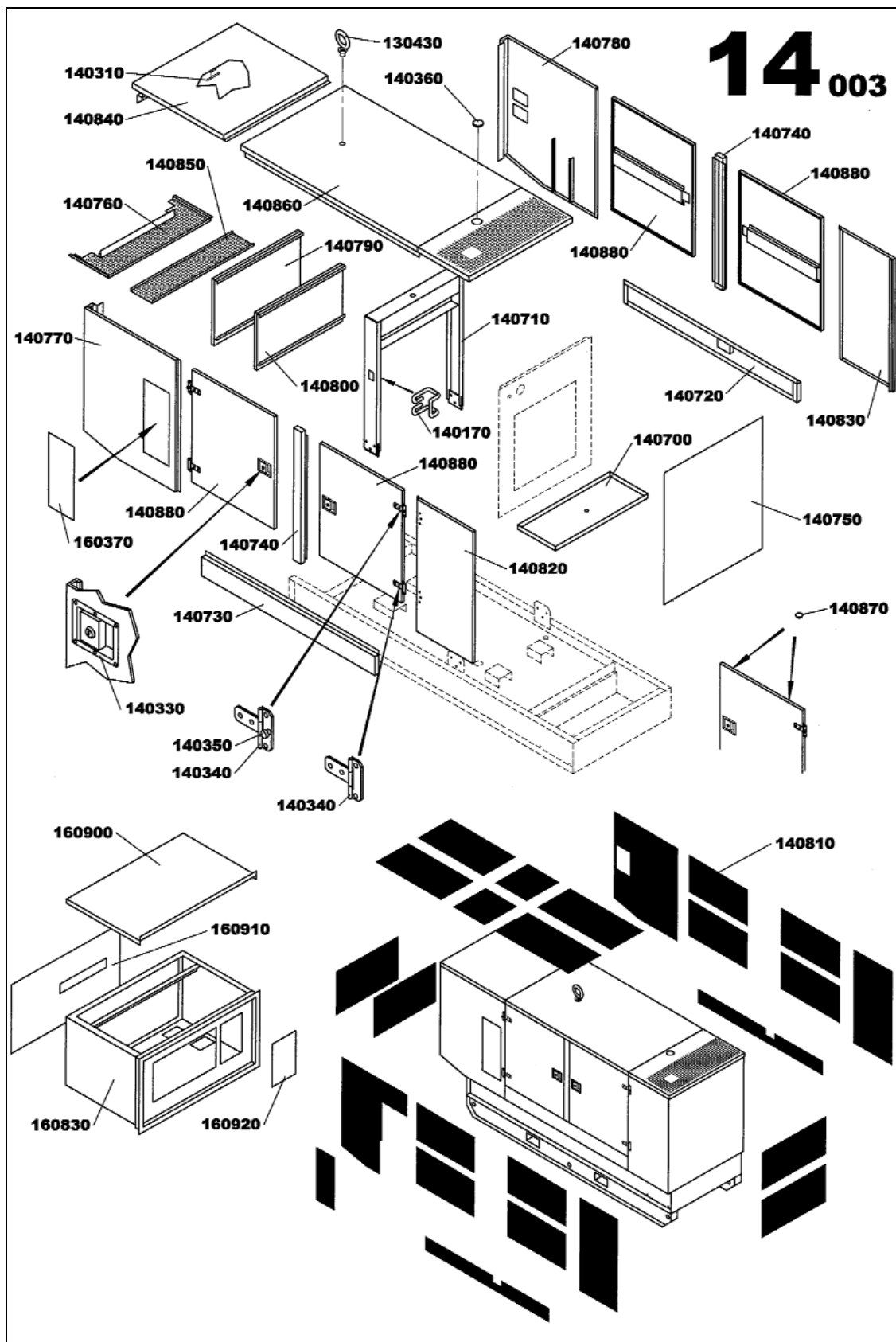
F13012



| Item | Part number | Description | Quantity | Units |
|--------|-------------|------------------------------------|----------|-------|
| 140440 | 85405710 | RADIATOR PANEL M216ESI JD 6068T | 1.0 | UN |
| 160890 | 85406460 | GROUND WIRES 16mm2 | 4.0 | UN |
| 130405 | 85404861 | HIRETECH RETENTION BUND M216 BESIL | 1.0 | UN |

M216BESIL CANOPY ASSEMBLY

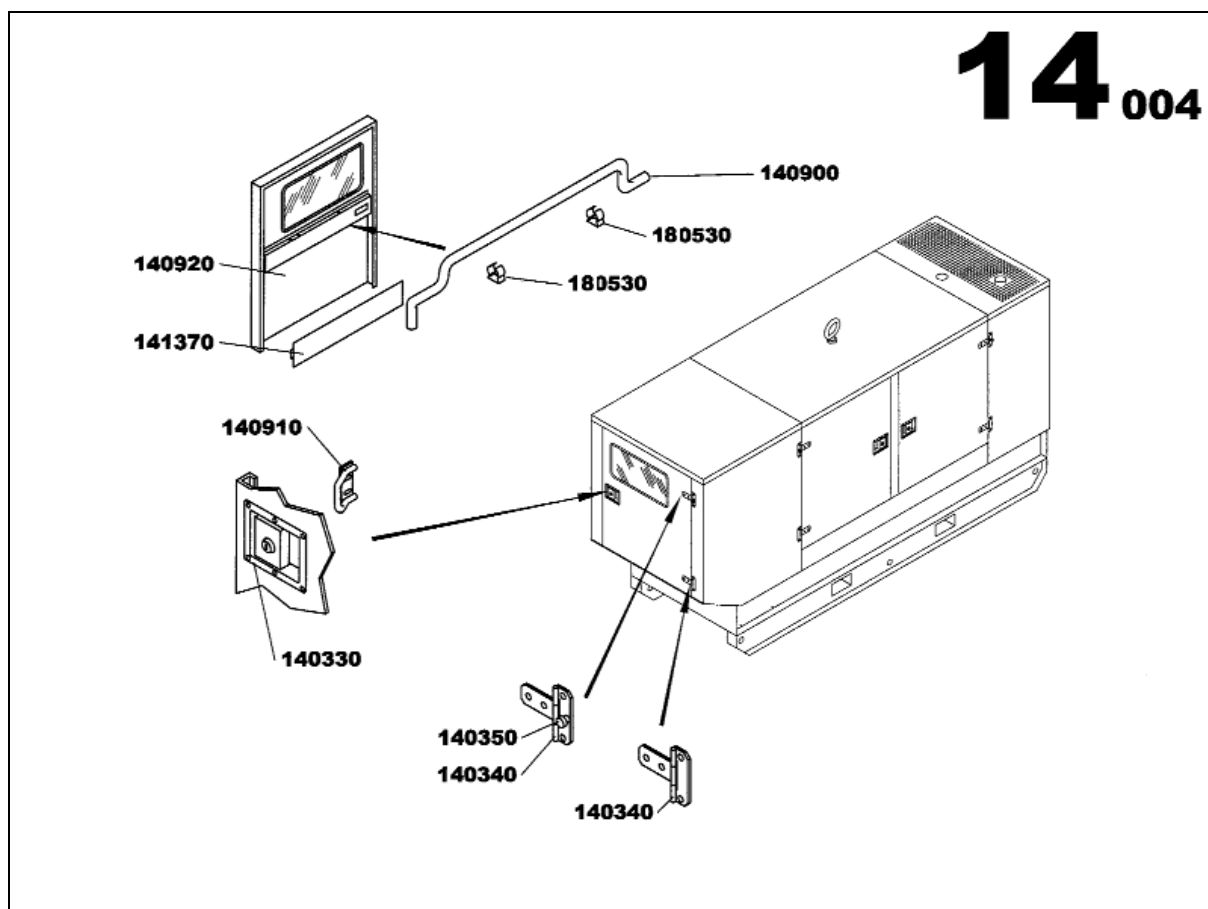
F14003



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---|-----------------|--------------|
| 130430 | 85491892 | LIFTING EYE D61 3150daN | 1.0 | UN |
| 140700 | 85405561 | AIR DEFLECTOR M216BESIL FRONT | 1.0 | UN |
| 140710 | 85405645 | M216BESI SUPPORT ARCH | 1.0 | UN |
| 140720 | 85405652 | CANOPY LATERAL PANEL LOWER RIGHT M216BESI | 1.0 | UN |
| 140730 | 85405660 | CANOPY LATERAL PANEL LOWER LEFT M216BESI | 1.0 | UN |
| 140740 | 85405678 | CENTER UPRIGHT DOOR M216BESI DOOR SEPARATOR | 2.0 | UN |
| 140750 | 85405702 | FRONT HOOD CLOSURE PANEL | 1.0 | UN |
| 140760 | 85405769 | AIR INLET LOUVER M216ESI | 1.0 | UN |
| 140770 | 85405868 | CANOPY REAR RIGHTUPRIGHT M216BESI | 1.0 | UN |
| 140780 | 85405876 | CANOPY REAR LEFT UPRIGHT M216BESI | 1.0 | UN |
| 140790 | 85405884 | AIR DEFLECTOR M216BESIL REAR | 1.0 | UN |
| 140800 | 85405892 | AIR DEFLECTOR M216BESIL REAR | 1.0 | UN |
| 140810 | 85405900 | SOUNDPROOF PANELS BATCH M216BESI | 1.0 | UN |
| 140820 | 85405918 | CANOPY FRONT RIGHT UPRIGHT M216BESI | 1.0 | UN |
| 140830 | 85405926 | CANOPY FRONT LEFT UPRIGHT M216BESI | 1.0 | UN |
| 140840 | 85405934 | CANOPY REAR TOP PANEL M216BESI | 1.0 | UN |
| 140850 | 85410215 | AIR INLET LOUVER M216ESI | 1.0 | UN |
| 140310 | 85406098 | CANOPY TOP ISOLATION BRACKET M223/214/M216 | 5.0 | UN |
| 140860 | 85406114 | CANOPY TOP M216BESI | 1.0 | UN |
| 140330 | 85406148 | CANOPY DOOR LOCK KEY LOCK | 4.0 | UN |
| 140340 | 85406155 | DOOR HINGE h100XL125 | 8.0 | UN |
| 140350 | 85406189 | ANTI-VIBRATION MOUNT 140daN 15mm | 4.0 | UN |
| 140360 | 85406205 | PLUG D100 | 1.0 | UN |
| 140870 | 85406213 | PLUG D6.9 | 8.0 | UN |
| 142430 | 85492460 | STRIKER PLATE M223/216 CANOPY DOOR | 4.0 | UN |
| 140880 | 85406346 | CANOPY DOOR M216BESI | 4.0 | UN |
| 160900 | 85406437 | CONTROL PANEL HOUSING | 1.0 | UN |
| 160910 | 85406445 | REAR PLATE M403 CONTROL PANEL HOUSING | 1.0 | UN |
| 160920 | 85407138 | RACK CLOSURE PANEL | 1.0 | UN |
| 160370 | 85407302 | TERMINAL CONNECTIONS CLOSURE PANEL M216ESI | 1.0 | UN |
| 160930 | 85407369 | CONTROL PANEL HOUSING R3000 | 1.0 | UN |

CONTROL PANEL DOOR M216/413ESIL ASSEMBLY

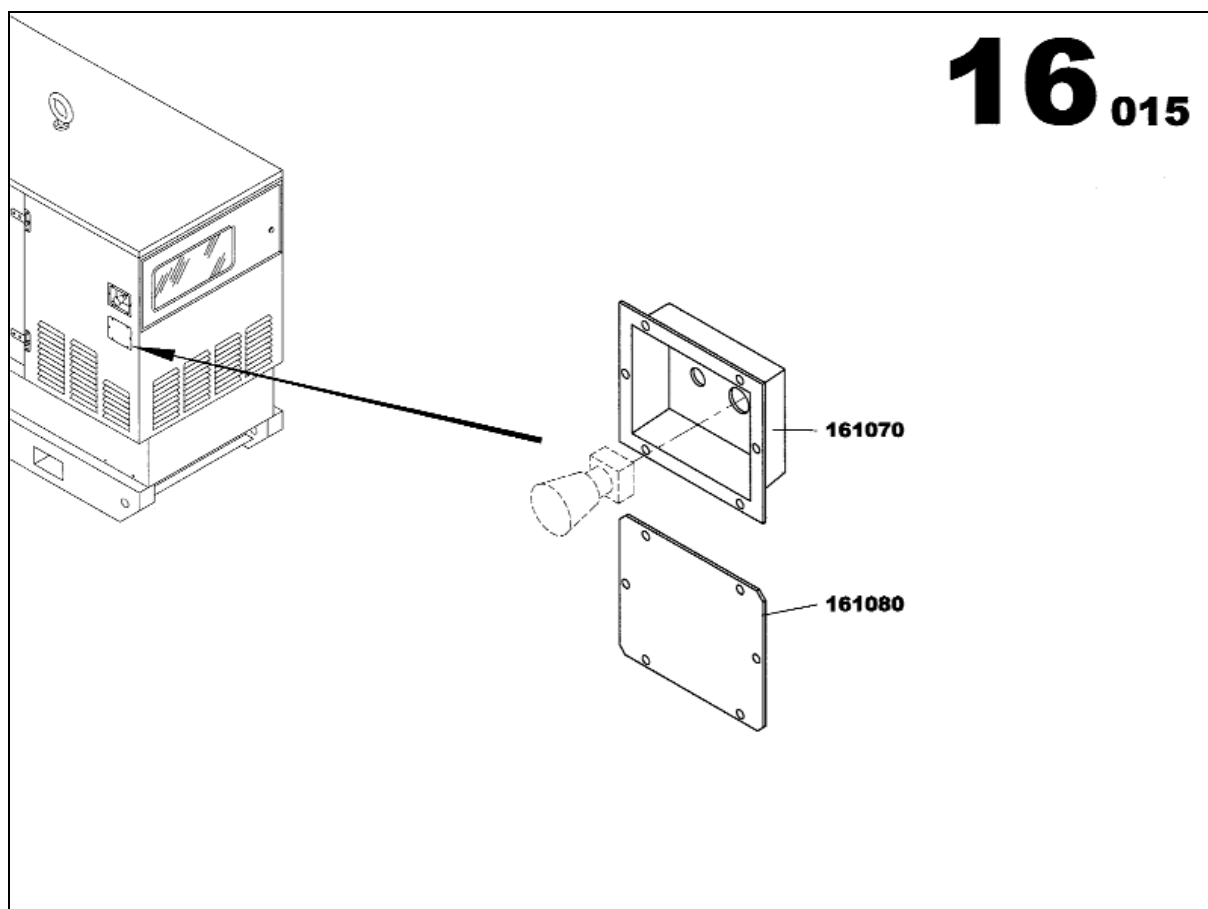
F14004



| Item | Part number | Description | Quantity | Units |
|--------|-------------|---|----------|-------|
| 141370 | 85405454 | DOCUMENT FILE M403BSIL | 1.0 | UN |
| 140900 | 85405462 | DOOR STOP M400B | 1.0 | UN |
| 140330 | 85406148 | CANOPY DOOR LOCK KEY LOCK | 1.0 | UN |
| 140340 | 85406155 | DOOR HINGE h100XL125 | 2.0 | UN |
| 140350 | 85406189 | ANTI-VIBRATION MOUNT 140daN 15mm | 1.0 | UN |
| 140910 | 85406262 | STRIKER PLATE M216/413BL CANOPY MCPS DOOR | 1.0 | UN |
| 140920 | 85406296 | CONTROL PANEL DOOR M216SIL | 1.0 | UN |
| 180530 | 85409498 | CLIP-ON BRACKET | 2.0 | UN |

EMERGENCY STOP PANEL ASSEMBLY

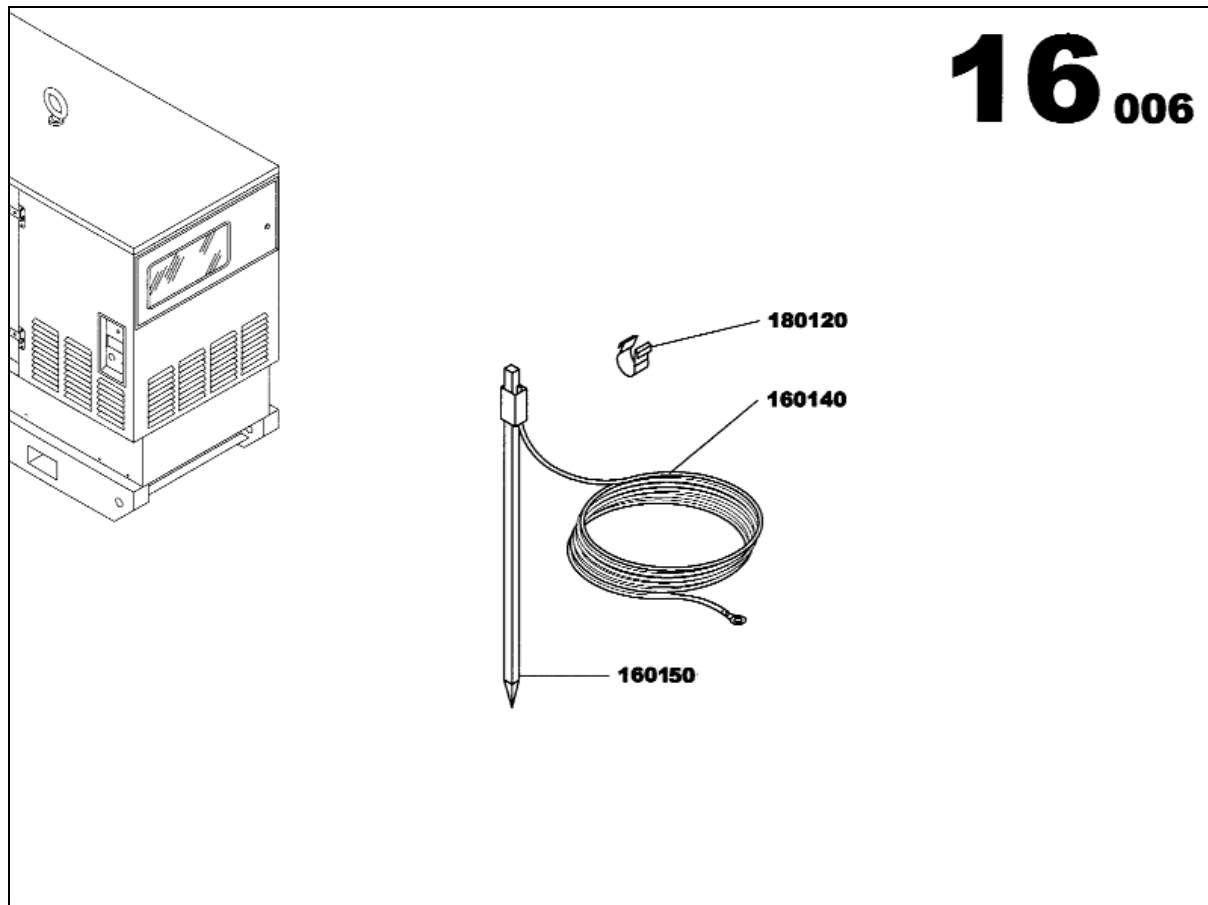
F16015



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------|-----------------|--------------|
| 161080 | 85406726 | BRACKET CLOSURE PANEL | 1.0 | UN |
| 161070 | 85407294 | EMERGENCY STOP PANEL | 1.0 | UN |

EARTH ROD WITH CABLE M100/200 CANOPY ASSEMBLY

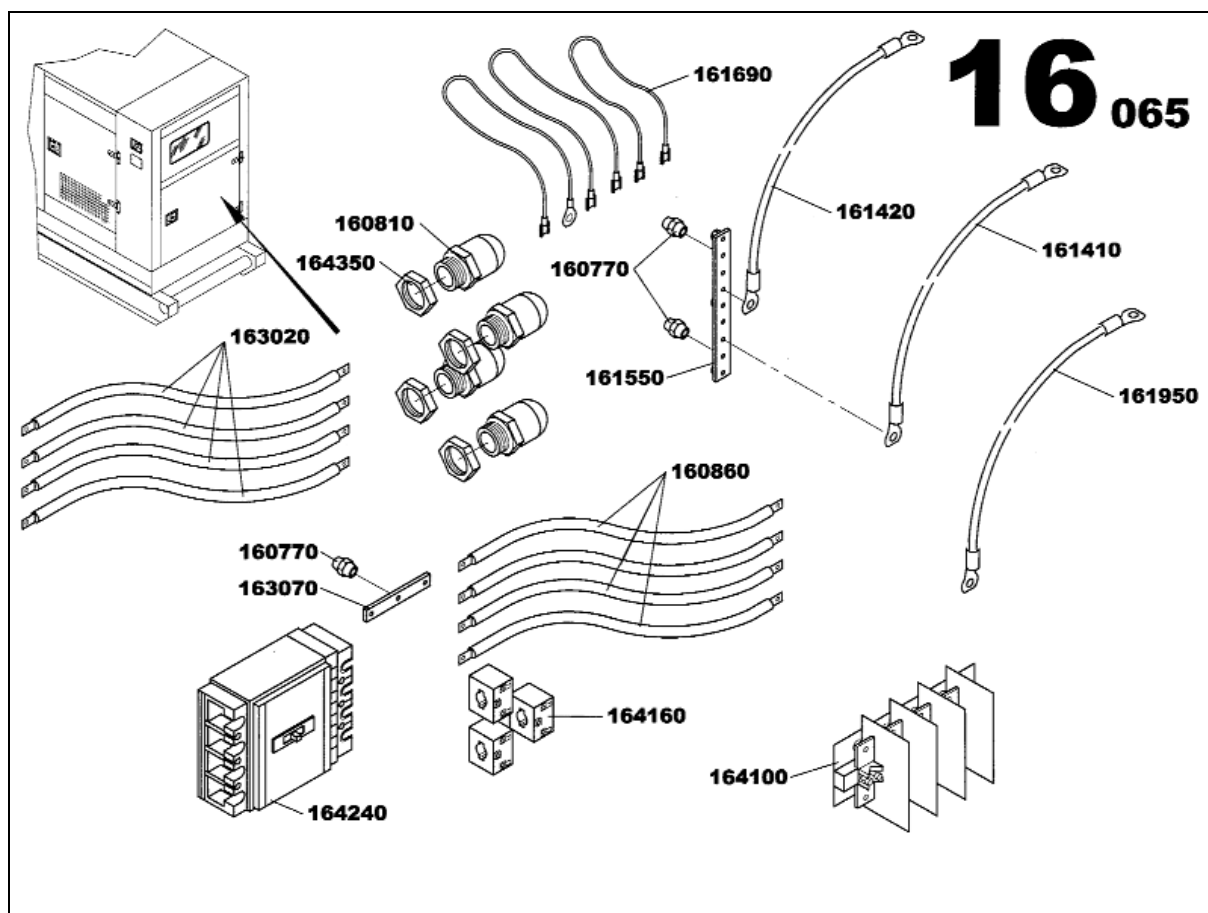
F16006



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---|-----------------|--------------|
| 160140 | 85408227 | NEUTRAL/EARTH SYSTEM CABLE 25mm2 L10000 Gr/Ye | 1.0 | UN |
| 160150 | 85408334 | EARTH ROD L1000 | 1.0 | UN |
| 180120 | 85409191 | CLIP-ON BRACKET | 2.0 | UN |

POWER TERMINAL CONNECTIONS 250A ASSEMBLY

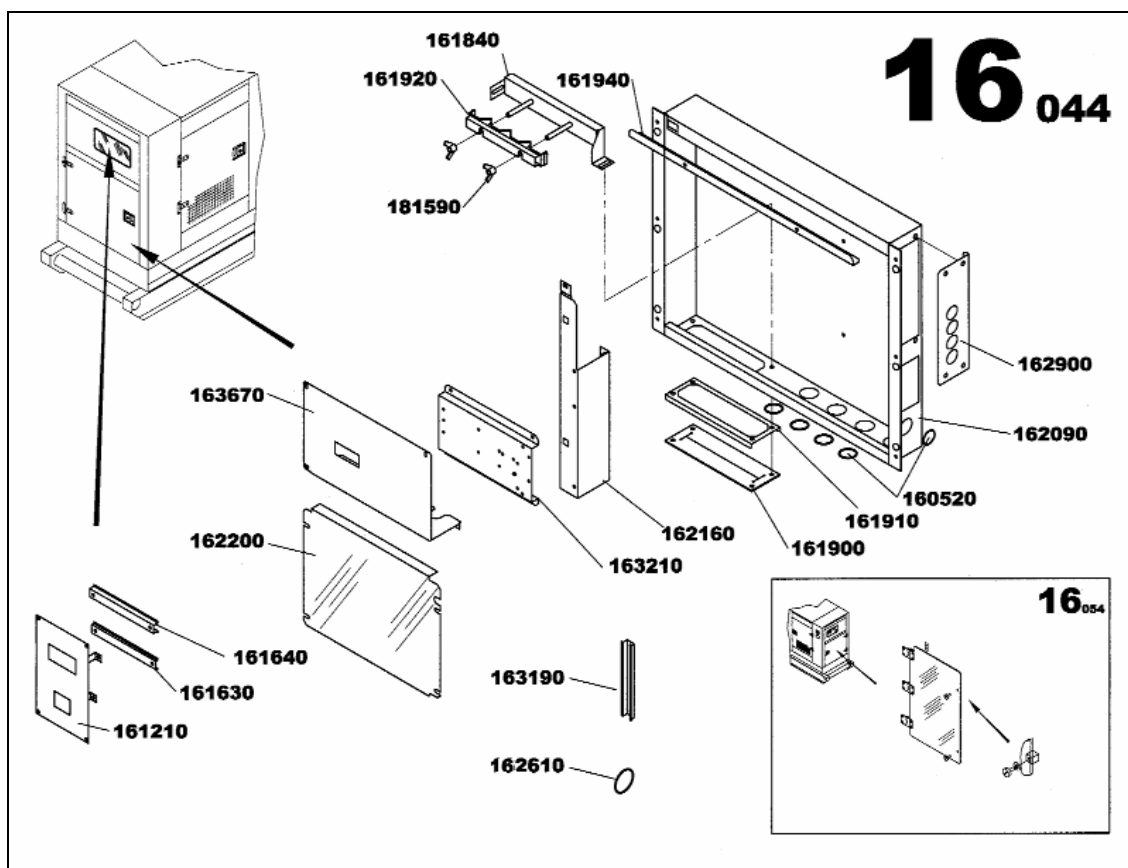
F16065



| Item | Part number | Description | Quantity | Units |
|--------|-------------|--|----------|-------|
| 161410 | 85417319 | EARTHING CABLE D8xD10 25mm2 L2500 Gr/Ye | 1.0 | UN |
| 161420 | 85406601 | EARTHING CABLE D8xD10 25mm2 L1800 Gr/Ye | 1.0 | UN |
| 163020 | 85427789 | POWER CABLE SINGLE CORE 50mm2 L1800 | 4.0 | UN |
| 163070 | 85427797 | COPPER BAR 5x25 L120 | 1.0 | UN |
| 161550 | 85416899 | COPPER BAR 5x25 L220 MCPS M400BL | 1.0 | UN |
| 161690 | 85406981 | CURRENT TRANSFORMER WIRING 2.5mm2 L350 Gr/Ye | 1.0 | UN |
| 161950 | 85417368 | NEUTRAL/EARTH SYSTEM CABLE 25mm2 L800 Gr/Ye | 1.0 | UN |
| 160860 | 85406635 | POWER CABLE SINGLE CORE 50mm2 | 0.2 | ML |
| 160860 | 85406635 | POWER CABLE SINGLE CORE 50mm2 | 0.3 | ML |
| 160860 | 85406635 | POWER CABLE SINGLE CORE 50mm2 | 0.4 | ML |
| 160860 | 85406635 | POWER CABLE SINGLE CORE 50mm2 | 0.5 | ML |
| 160770 | 85408342 | INSULATION PIN | 3.0 | UN |
| 164100 | 85427912 | HIRETECH POWER CONNECTION BLOCK | 1.0 | UN |
| 164160 | 85427920 | CURRENT TRANSFORMER 250/5 | 3.0 | UN |
| 164240 | 85427938 | COMPACT CIRCUIT BREAKER 4x250A | 1.0 | UN |
| 160810 | 85408631 | GLAND NUT PG21 | 4.0 | UN |
| 164350 | 85408672 | GLAND NUT PG21 | 4.0 | UN |

TERMINAL BLOCK HOUSING I≤250A ASSEMBLY

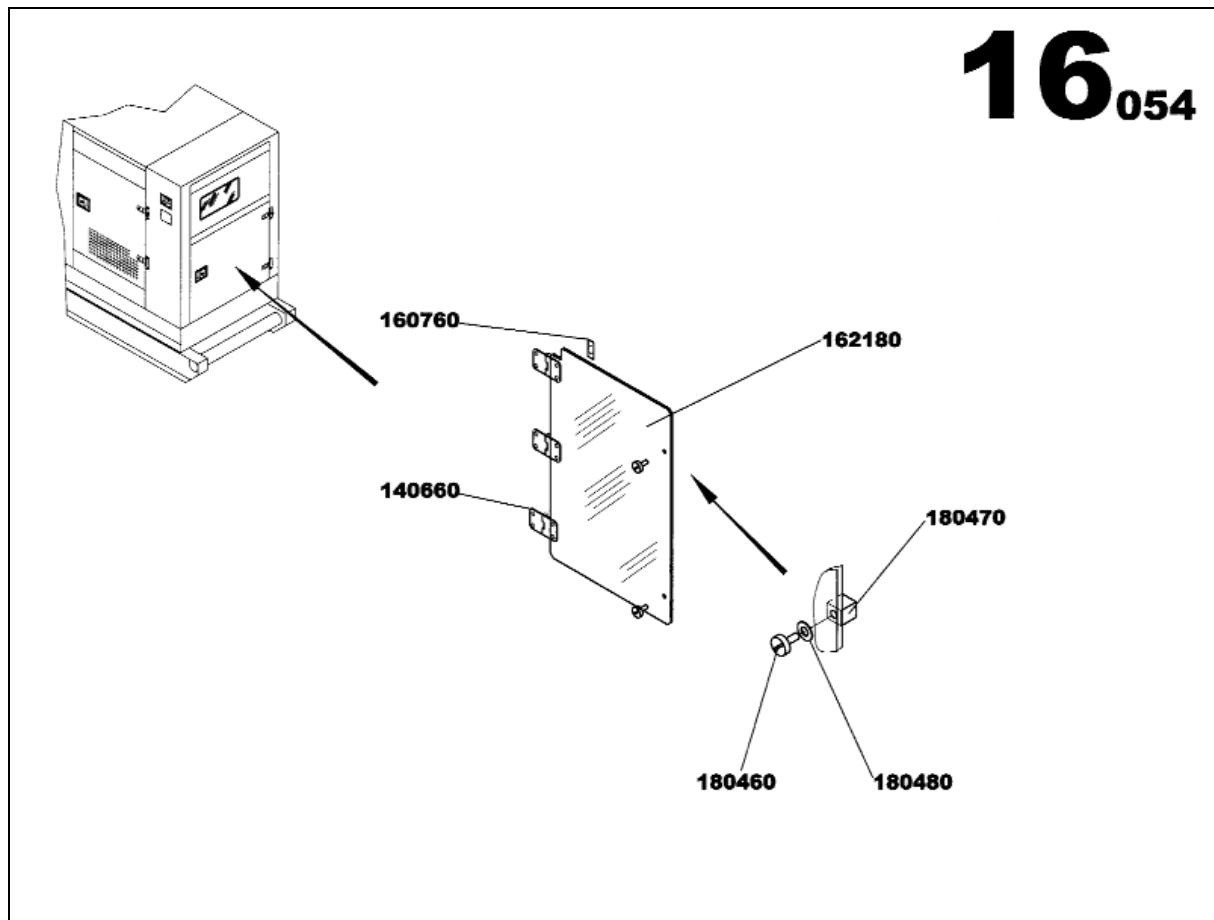
F16044



| Item | Part number | Description | Quantity | Units |
|--------|-------------|--------------------------------------|----------|-------|
| 163190 | 85427805 | ELECTRIC DIN RAIL 35x15 | 1.0 | UN |
| 161900 | 85417111 | CABLE OUTPUT RUBBER SCREEN | 1.0 | UN |
| 161910 | 85423739 | WIRE BIB OUTPUT BRACKET M403BL | 1.0 | UN |
| 161940 | 85417822 | PANEL ANGLE BAR M403BL | 1.0 | UN |
| 163210 | 85427813 | CIRCUIT BREAKER BRACKET M403BL | 1.0 | UN |
| 161630 | 85423341 | ELECTRIC DIN RAIL 35x7.5 | 1.0 | UN |
| 161640 | 85423358 | ELECTRIC DIN RAIL 35x7.5 | 1.0 | UN |
| 161210 | 85423812 | DIFFERENTIAL CIRCUIT BREAKER BRACKET | 1.0 | UN |
| 162090 | 85423796 | CIRCUIT BREAKER BRACKET M403BL | 1.0 | UN |
| 163670 | 85427870 | CIRCUIT BREAKER PROTECTION PANEL | 1.0 | UN |
| 162160 | 85424620 | ISOLATION PANEL MCPS 250A | 0.0 | UN |
| 162160 | 85424612 | ISOLATION PANEL MCPS 250A | 1.0 | UN |
| 161840 | 85423937 | CABLE FIXING BRACKET MCPS M403BL | 1.0 | UN |
| 161920 | 85423945 | CABLE FIXING BRACKET MCPS M403BL | 1.0 | UN |
| 181590 | 85418085 | WING NUT | 2.0 | UN |
| 162200 | 85418051 | CIRCUIT BREAKER PROTECTION PLATE | 1.0 | UN |
| 160520 | 85408391 | RUBBER GROMMET D47 | 5.0 | UN |
| 162610 | 85422442 | RUBBER GROMMET D79 | 1.0 | UN |

PANEL DOOR M403BL ASSEMBLY

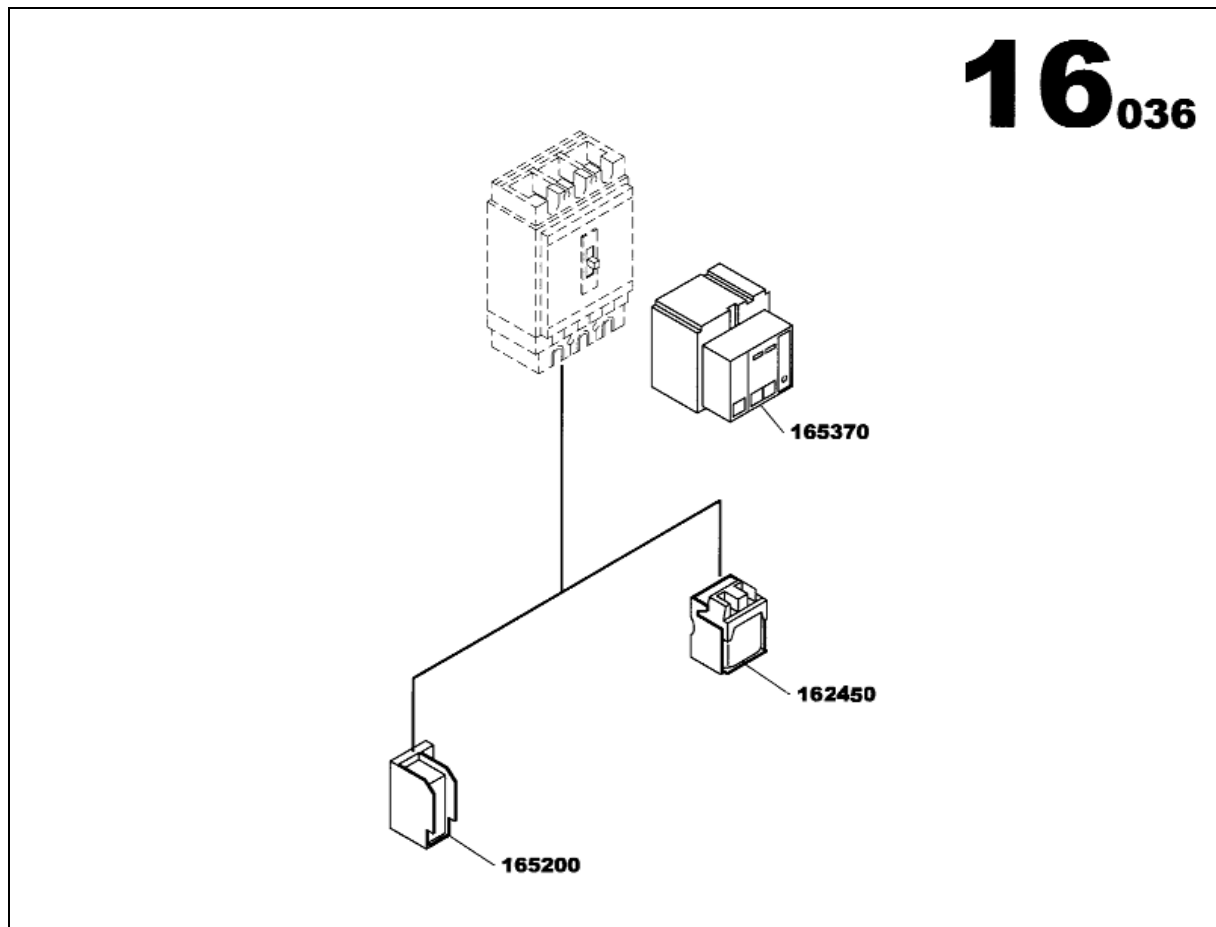
F16054



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 140660 | 85406130 | DOOR HINGE h50XL50 | 3.0 | UN |
| 162180 | 85422756 | TERMINAL CONNECTION DOOR M403BL CANOPY | 1.0 | UN |
| 160760 | 85407708 | HINGE FIXING PLATE M214BL | 3.0 | UN |
| 180460 | 85409225 | 1/4 TURN SCREW D9 | 2.0 | UN |
| 180470 | 85409233 | CAPTIVE NUT FOR 1/4 TURN BOLT | 2.0 | UN |
| 180480 | 85409241 | WASHER FOR 1/4 TURN FASTENER | 2.0 | UN |

CIRCUIT BREAKER ACCESSORIES

F16036

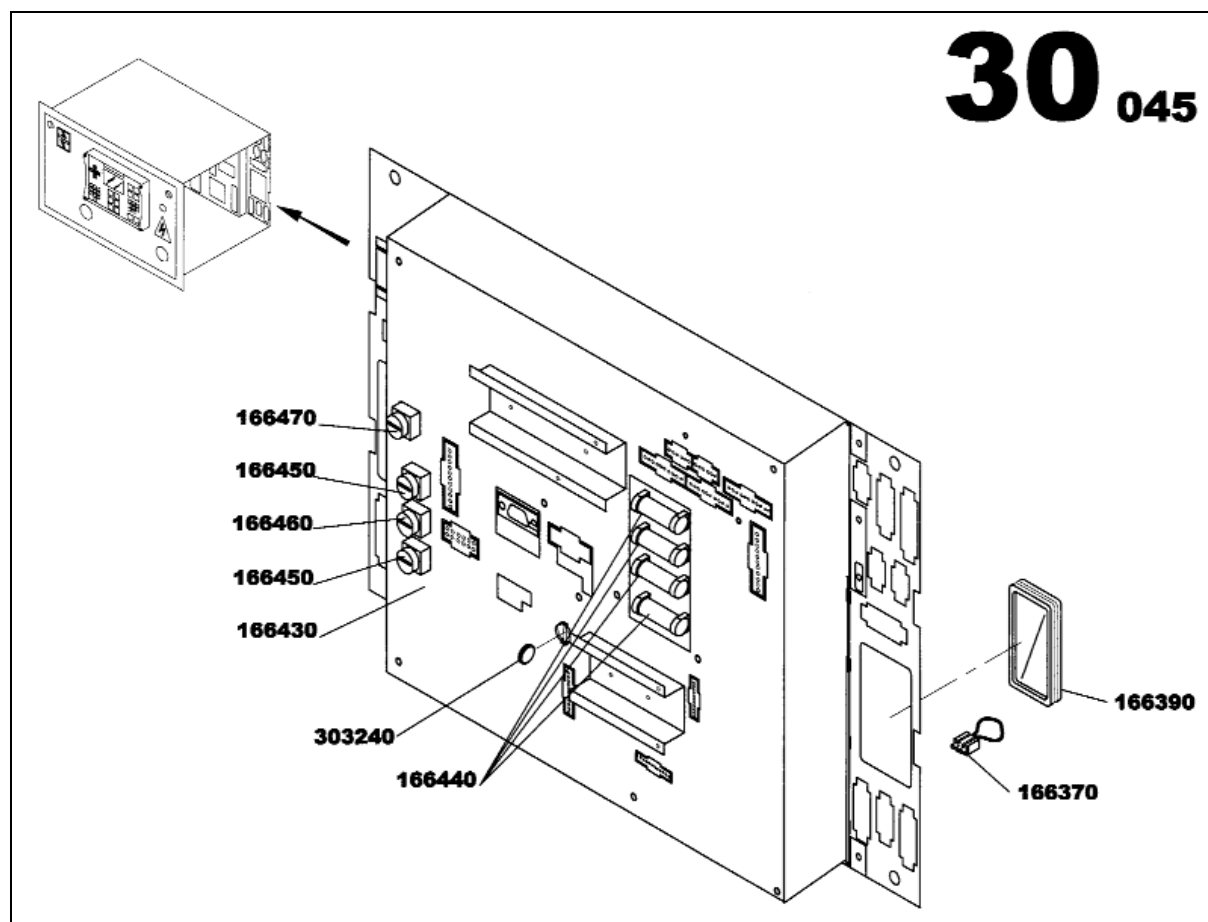


| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---|-----------------|--------------|
| 162450 | 85408573 | CIRCUIT BREAKER SHUNT RELEASE COIL 200/280VAC | 1.0 | UN |

Part number listed is the only part used in this model.

INTELLISYS™ OPTION CB12 CARD

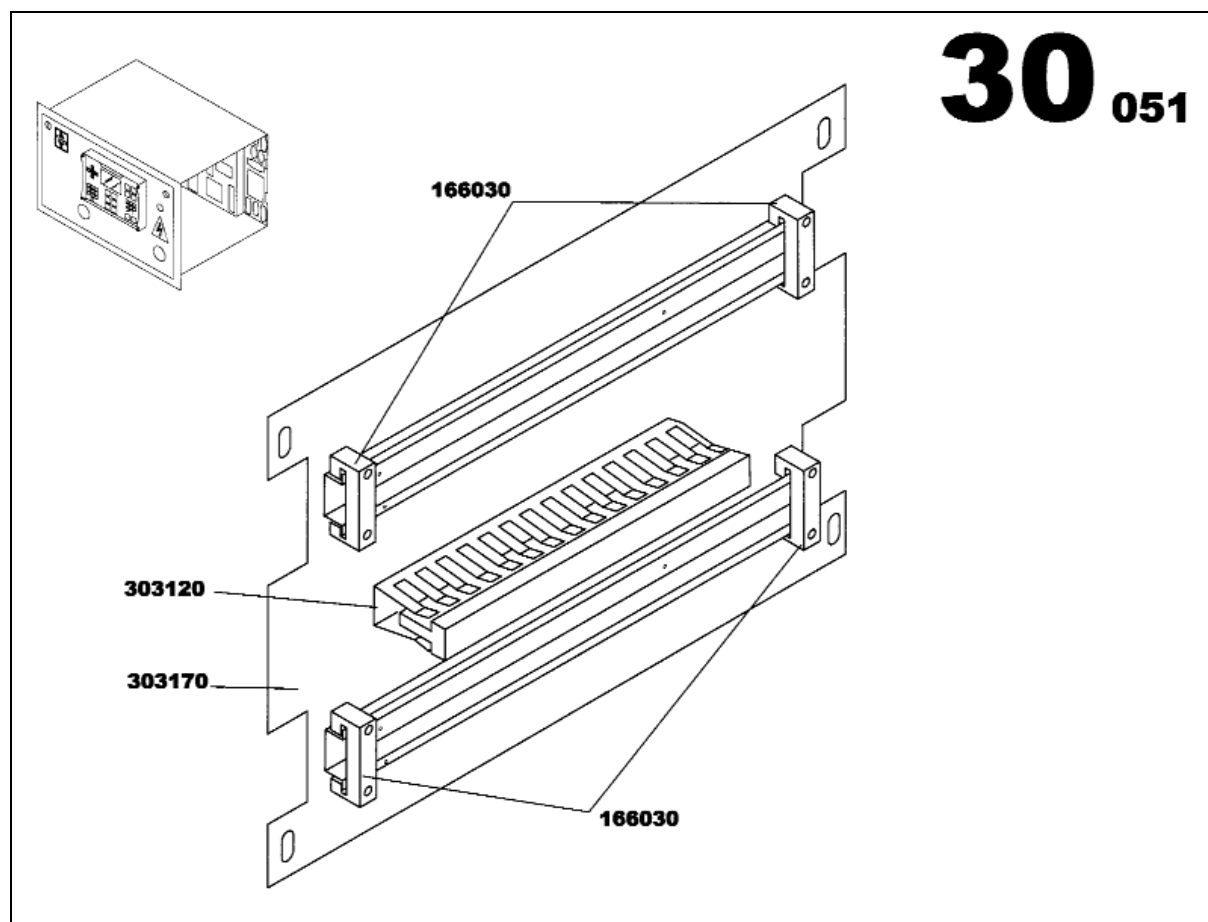
F30045



| Item | Part number | Description | Quantity | Units |
|--------|-------------|--------------------------------|----------|-------|
| 166390 | 85504058 | PASSE FIL RECTANGULAIRE | 1.0 | UN |
| 166430 | 85402592 | CARTE INTELLISYS™ CB12 | 1.0 | UN |
| 166370 | 85504033 | FAISCEAU C35S | 1.0 | UN |
| 166440 | 85426112 | FUSIBLE FN/F1/F2/F3 CARTE CB13 | 4.0 | UN |
| 166470 | 85426120 | FUSIBLE F5 CARTE CB12 | 1.0 | UN |
| 166450 | 85426138 | FUSIBLE F6 ET F8 CARTE CB12 | 1.0 | UN |
| 166460 | 85426146 | FUSIBLE F7 CARTE CB12 | 1.0 | UN |
| 166450 | 85426138 | FUSIBLE F6 ET F8 CARTE CB12 | 1.0 | UN |

INTELLISYS™ OPTION USING PLATEN

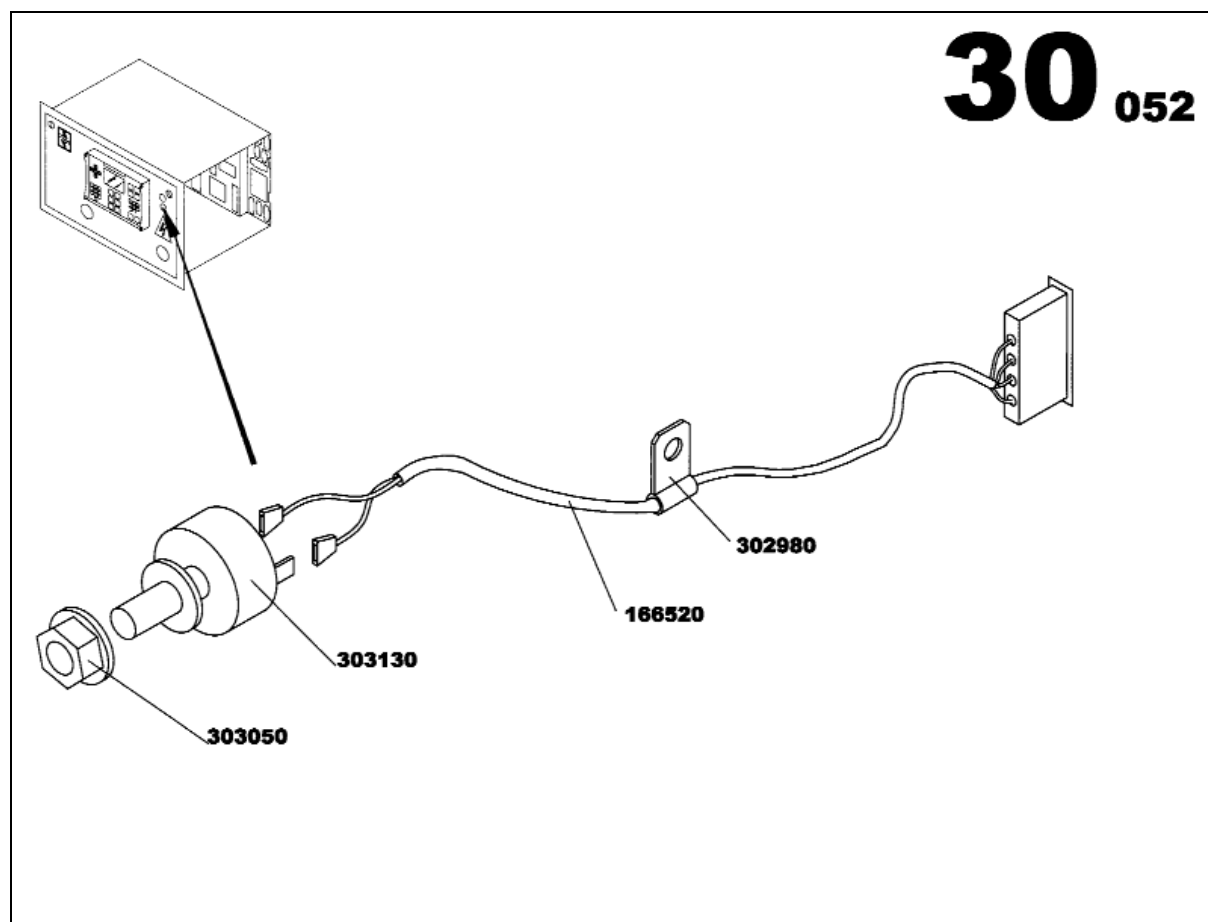
F30051



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------------|-----------------|--------------|
| 166030 | 85408854 | STOP | 4.0 | UN |
| 303120 | 85504256 | WIRING LOOM SUPPORT L40XW80 | 0.21 | UN |
| 303170 | 85504306 | USING TERMINAL | 1.0 | UN |

INTELLISYS™ OPTION TENSION POTENTIOMETER

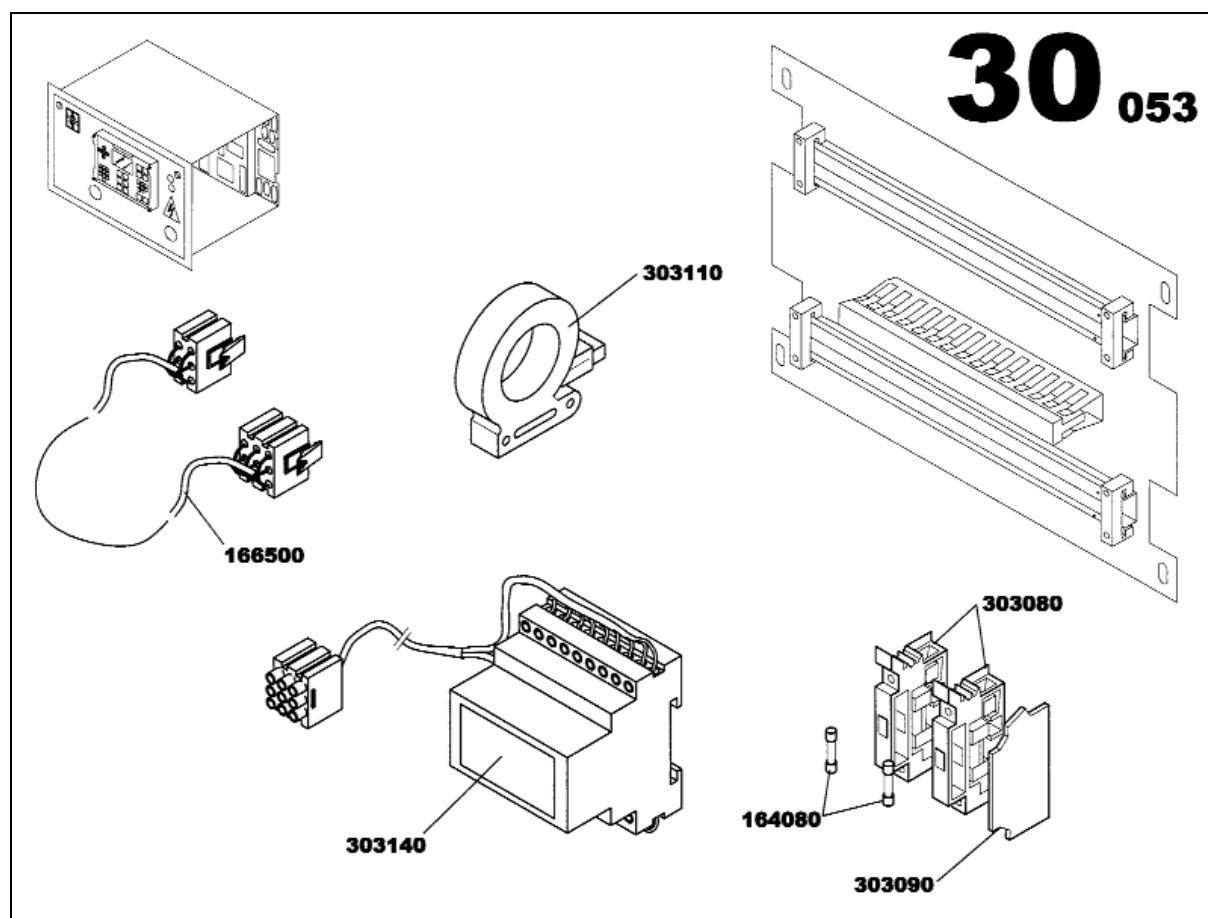
F30052



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------------------|-----------------|--------------|
| 302980 | 85504207 | CLAMP D4.7 | 1.0 | UN |
| 303050 | 85504215 | LOCK AXE SYSTEM | 1.0 | UN |
| 166520 | 85504009 | INTELLISYS™ WIRING LOOM C106 L560 | 1.0 | UN |
| 303130 | 85504264 | POTENTIOMETER 1KOHMS | 1.0 | UN |

INTELLISYS™ OPTION EARTH LEAKAGE RELAY

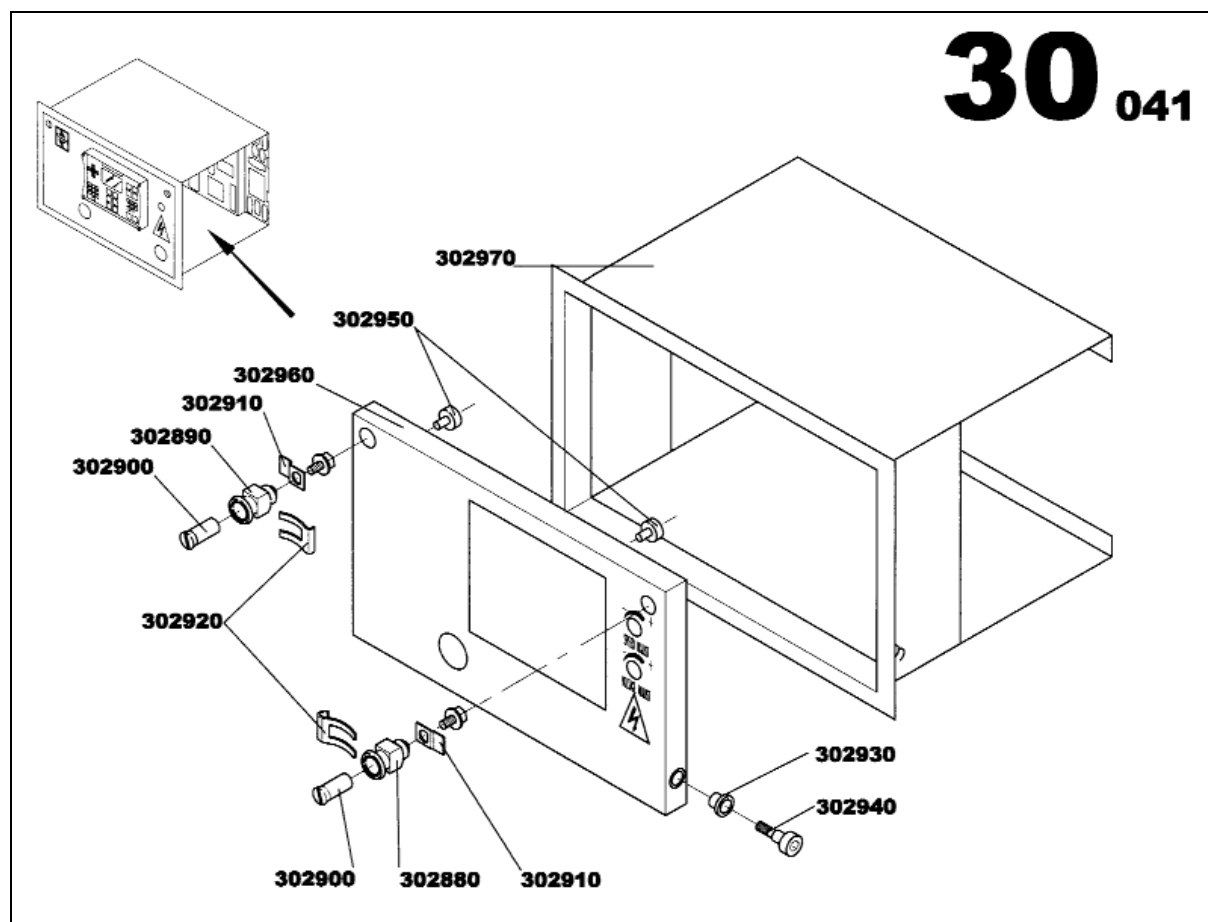
F30053



| Item | Part number | Description | Quantity | Units |
|--------|-------------|-------------------------|----------|-------|
| 303090 | 85504249 | FLASQUE | 1.0 | UN |
| 164080 | 85413482 | FUSIBLE CYLINDRIQUE 5A | 2.0 | UN |
| 166500 | 85503985 | FAISCEAU C39 L2000 | 1.0 | UN |
| 303140 | 85504272 | RELAIS DIFFERENTIEL 12V | 1.0 | UN |
| 303110 | 85423473 | TORE MG 50437 | 1.0 | UN |
| 303080 | 85504231 | BORNE PORTE FUSIBLE | 2.0 | UN |

INTELLISYS™ PANEL SHEET METAL ASSEMBLY

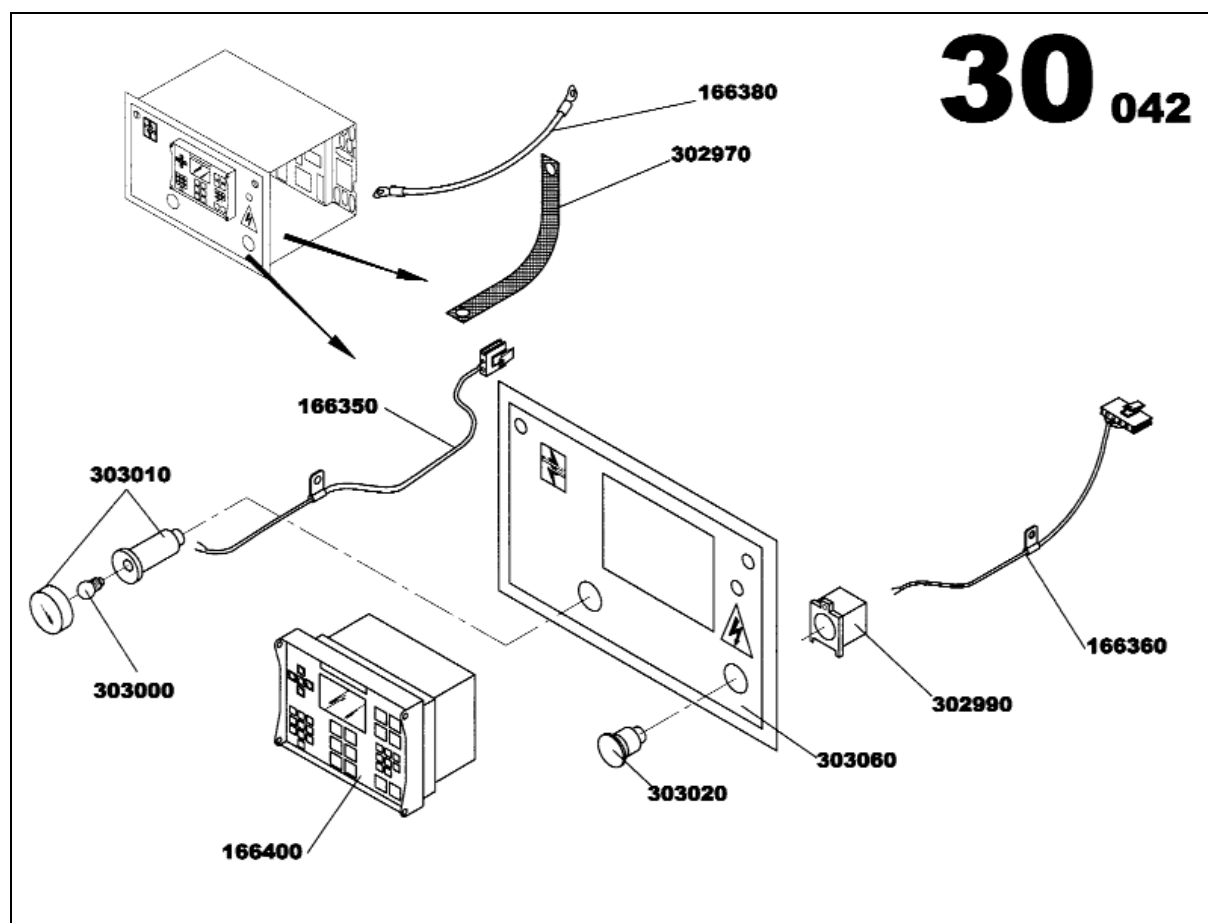
F30041



| Item | Part number | Description | Quantity | Units |
|--------|-------------|----------------------|----------|-------|
| 302880 | 85504108 | RIGHT HOUSING | 1.0 | UN |
| 302890 | 85504116 | LEFT HOUSING | 1.0 | UN |
| 302900 | 85504124 | ROTOR | 2.0 | UN |
| 302910 | 85504132 | SLAM SHUT DOOR LATCH | 2.0 | UN |
| 302920 | 85504140 | LOCK PLATE | 2.0 | UN |
| 302930 | 85504157 | RING | 2.0 | UN |
| 302940 | 85504165 | SCREW M6X16 | 2.0 | UN |
| 302950 | 85504173 | STOP | 2.0 | UN |
| 302960 | 85504181 | DOOR | 1.0 | UN |
| 302970 | 85504199 | GROUND WIRES 10mm2 | 1.0 | UN |

INTELLISYS™ PANEL 12VDC ASSEMBLY

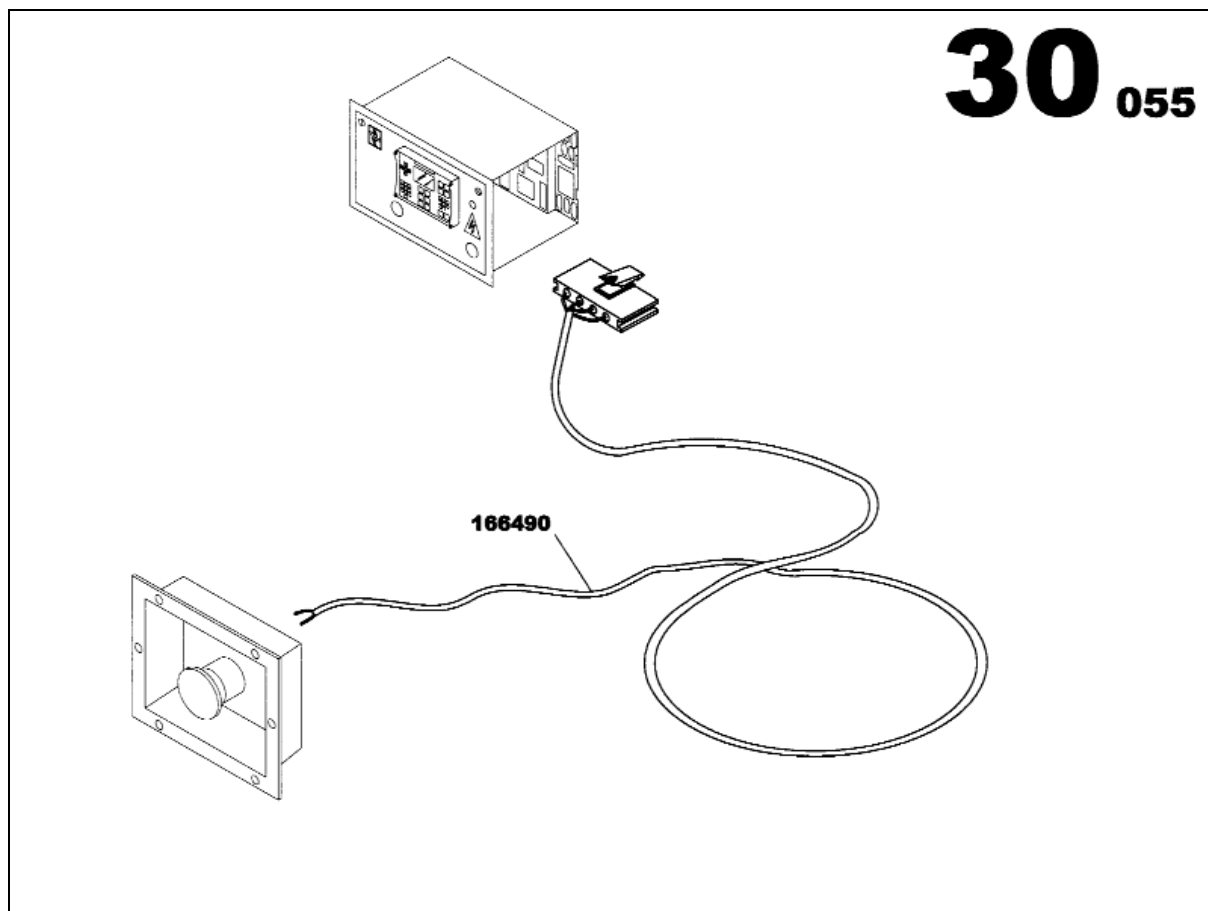
F30042



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|----------------------------------|-----------------|--------------|
| 302990 | 85426781 | EMERGENCY STOP SWITCH | 1.0 | UN |
| 302970 | 85504199 | GROUND WIRES 10mm2 | 1.0 | UN |
| 166350 | 85504017 | INTELLISYS™ WIRING LOOM C3 L810 | 1.0 | UN |
| 166360 | 85504025 | INTELLISYS™ WIRING LOOM C11 L460 | 1.0 | UN |
| 303060 | 85504983 | INTELLISYS™ PLASTIC PLATE | 1.0 | UN |
| 166380 | 85504041 | EARTHING INTELLISYS™ WIRING LOOM | 1.0 | UN |
| 166400 | 85412021 | INTELLISYS™ DISPLAY LEXAN IR | 1.0 | UN |
| 303000 | 85402519 | LAMP | 1.0 | UN |
| 303010 | 85503522 | WARNING LIGHT CYLINDRIC D22 | 1.0 | UN |
| 303020 | 85426773 | EMERGENCY STOP BUTTON | 1.0 | UN |

INTELLISYS™ OPTION EMERGENCY STOP

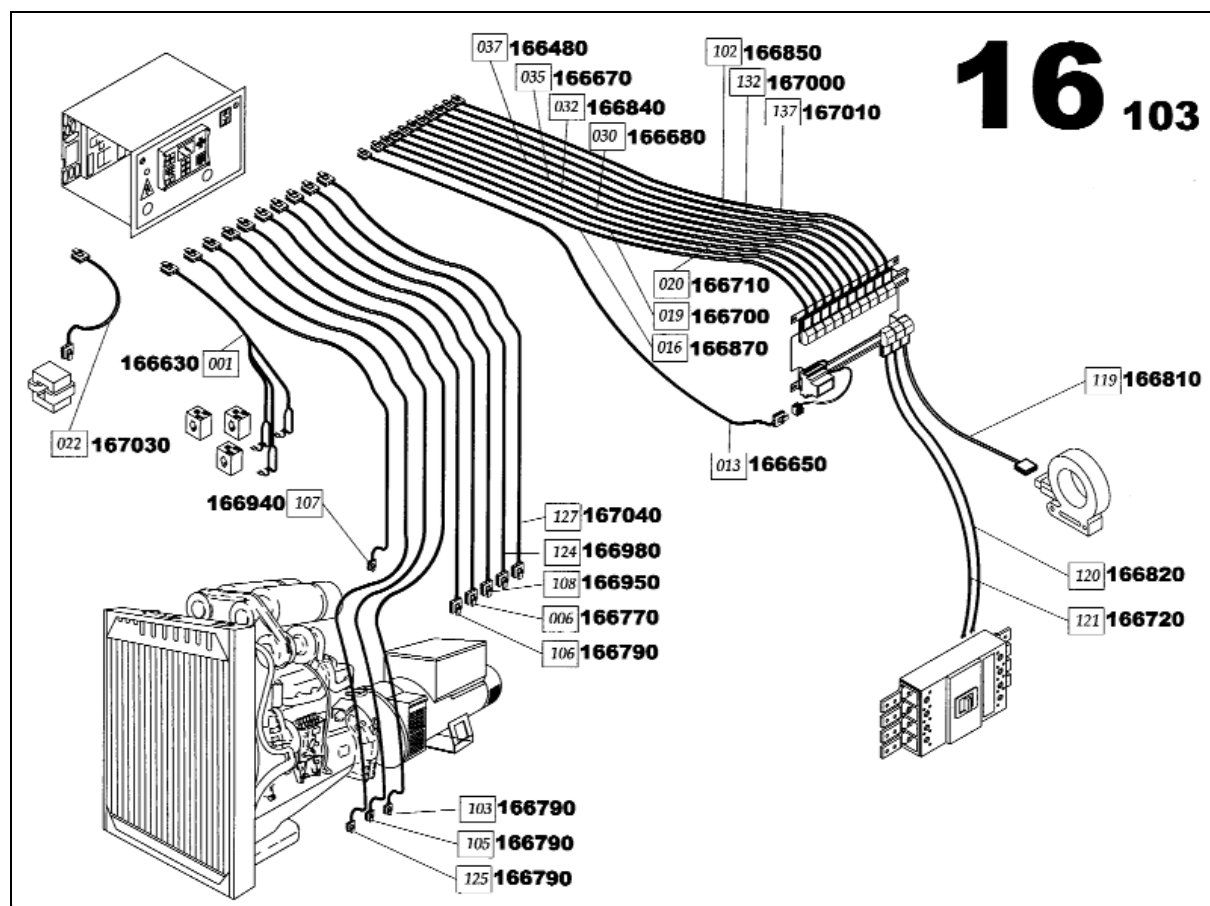
F30055



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------------------|-----------------|--------------|
| 166490 | 85503977 | INTELLISYS™ WIRING LOOM C11 L2000 | 1.0 | UN |

INTELLISYS™ WIRING LOOM

F16103



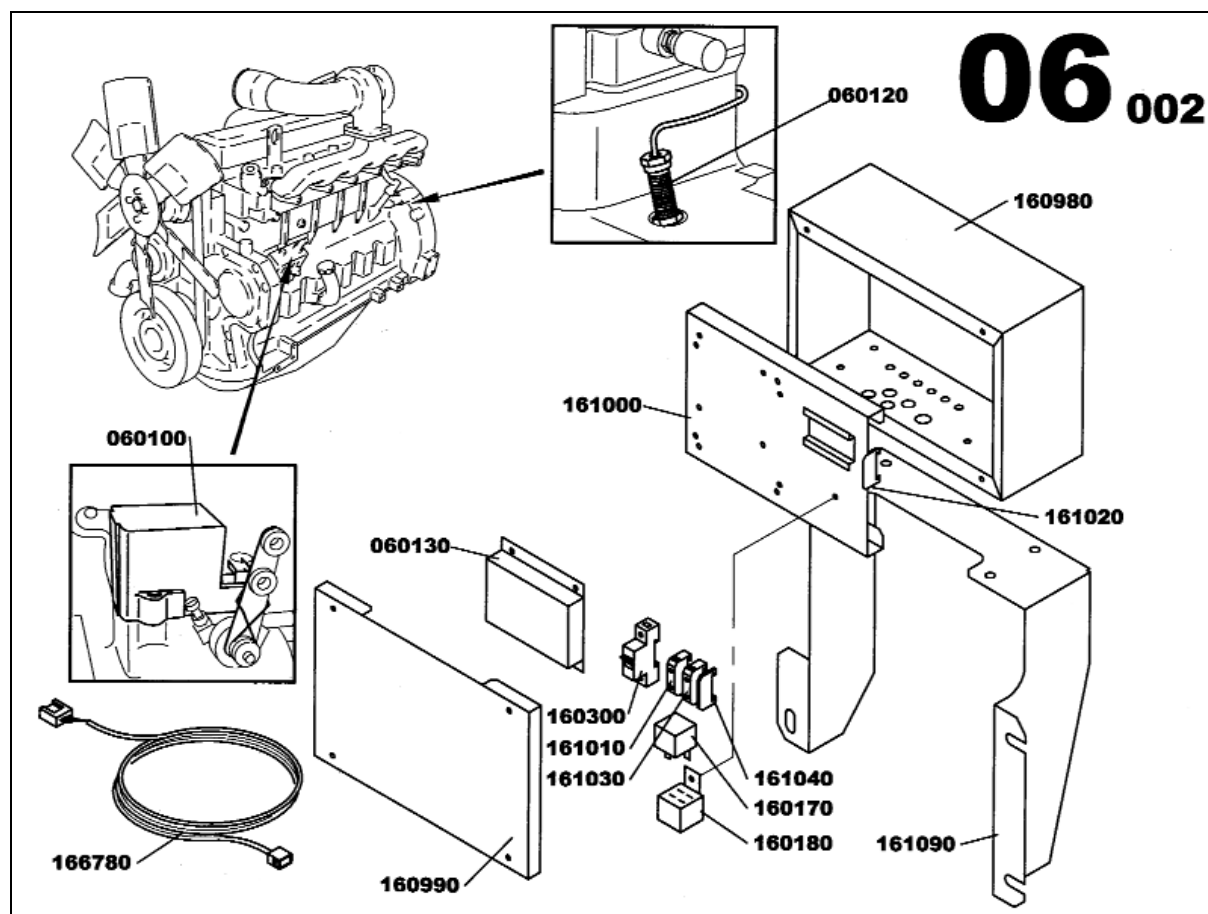
| Item | Part number | Description | Quantity | Units |
|--------|-------------|---------------------------------|----------|-------|
| 166480 | 85411221 | INTELLISYS™ WIRING LOOM 037/041 | 1.0 | UN |
| 166630 | 85410546 | INTELLISYS™ WIRING LOOM 001 | 1.0 | UN |
| 166790 | 85427979 | INTELLISYS™ WIRING LOOM 106 | 1.0 | UN |
| 166770 | 85410520 | INTELLISYS™ WIRING LOOM 006 | 1.0 | UN |
| 166810 | 85417129 | INTELLISYS™ WIRING LOOM 119 | 1.0 | UN |
| 166820 | 85411460 | INTELLISYS™ WIRING LOOM 120 | 1.0 | UN |

Part numbers listed are the only parts used in this model.

ELECTRONIC REGULATION OPTION

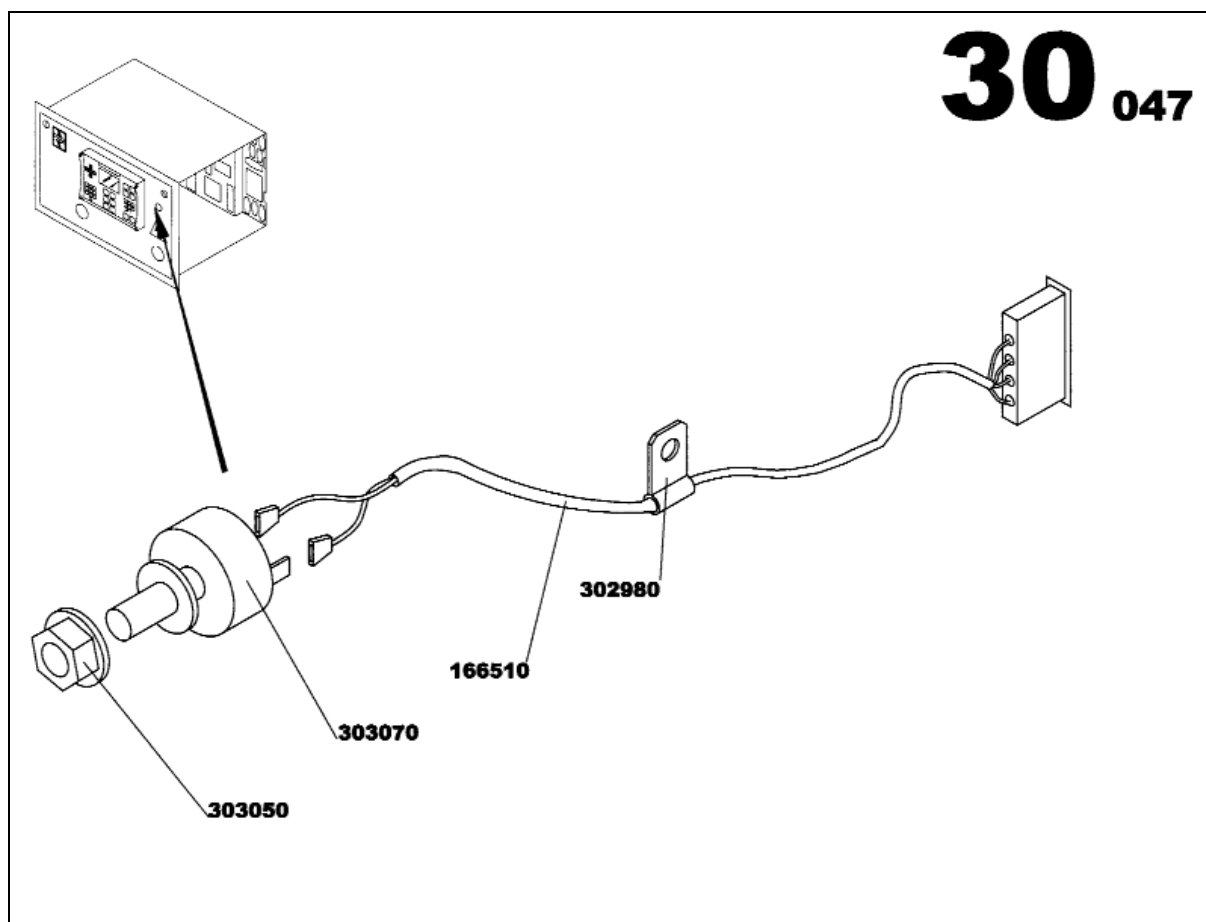
ELECTRONIC REGULATION ASSEMBLY

F06002



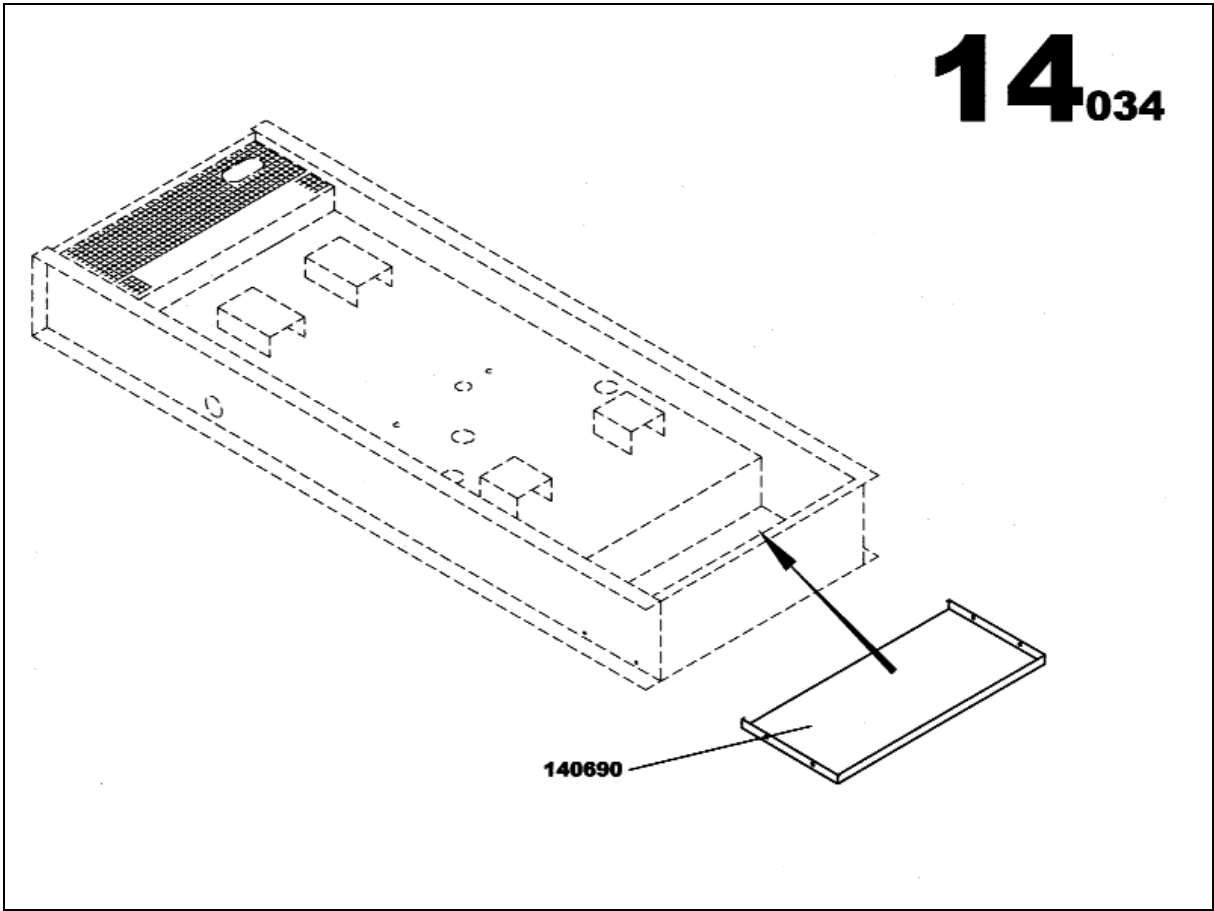
| Item | Part number | Description | Quantity | Units |
|--------|-------------|--------------------------------------|----------|-------|
| 060100 | 85403616 | ELECTRONIC ACTUATOR | 1.0 | UN |
| 060130 | 85426260 | ELECTRONIC GOVERNOR 12VCC | 1.0 | UN |
| 060120 | 85403632 | MAGNETIC SPEED SENSOR L75 3/4UNF | 1.0 | UN |
| 161090 | 85407328 | ELECTRONIC REGULATOR HOUSING BRACKET | 1.0 | UN |
| 166780 | 85411445 | INTELLISYS™ WIRING LOOM 105 L3900 | 1.0 | UN |
| 160980 | 85407237 | ELECTRONIC REGULATION HOUSING | 1.0 | UN |
| 160990 | 85407245 | HOUSING ELECTRONIC REGULATION | 1.0 | UN |
| 161000 | 85407336 | ELECTRONIC REGULATOR BRACKET | 1.0 | UN |
| 161010 | 85408375 | TERMINAL BLOCK 1X2.5mm2 GREY | 3.0 | UN |
| 161020 | 85408706 | STOP | 1.0 | UN |
| 161030 | 85408789 | TERMINAL BLOCK 1X4mm2 GREY | 1.0 | UN |
| 160170 | 85408896 | RELAY 12V 20/30A | 1.0 | UN |
| 160180 | 85408912 | AUTOMOBILE RELAY BASE | 1.0 | UN |
| 160300 | 85408920 | MOULDED CASE CIRCUIT BREAKER 1x16A | 1.0 | UN |
| 161040 | 85410116 | PLASTIC COVER TERMINAL BLOCK | 1.0 | UN |

INTELLISYS™ OPTION SPEED POTENTIOMETER
F30047



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------------------|-----------------|--------------|
| 302980 | 85504207 | CLAMP D4.7 | 1.0 | UN |
| 303050 | 85504215 | LOCK AXE SYSTEM | 1.0 | UN |
| 166510 | 85503993 | INTELLISYS™ WIRING LOOM C105 L540 | 1.0 | UN |
| 303070 | 85504223 | POTENTIOMETER 4.7KOHMS | 1.0 | UN |

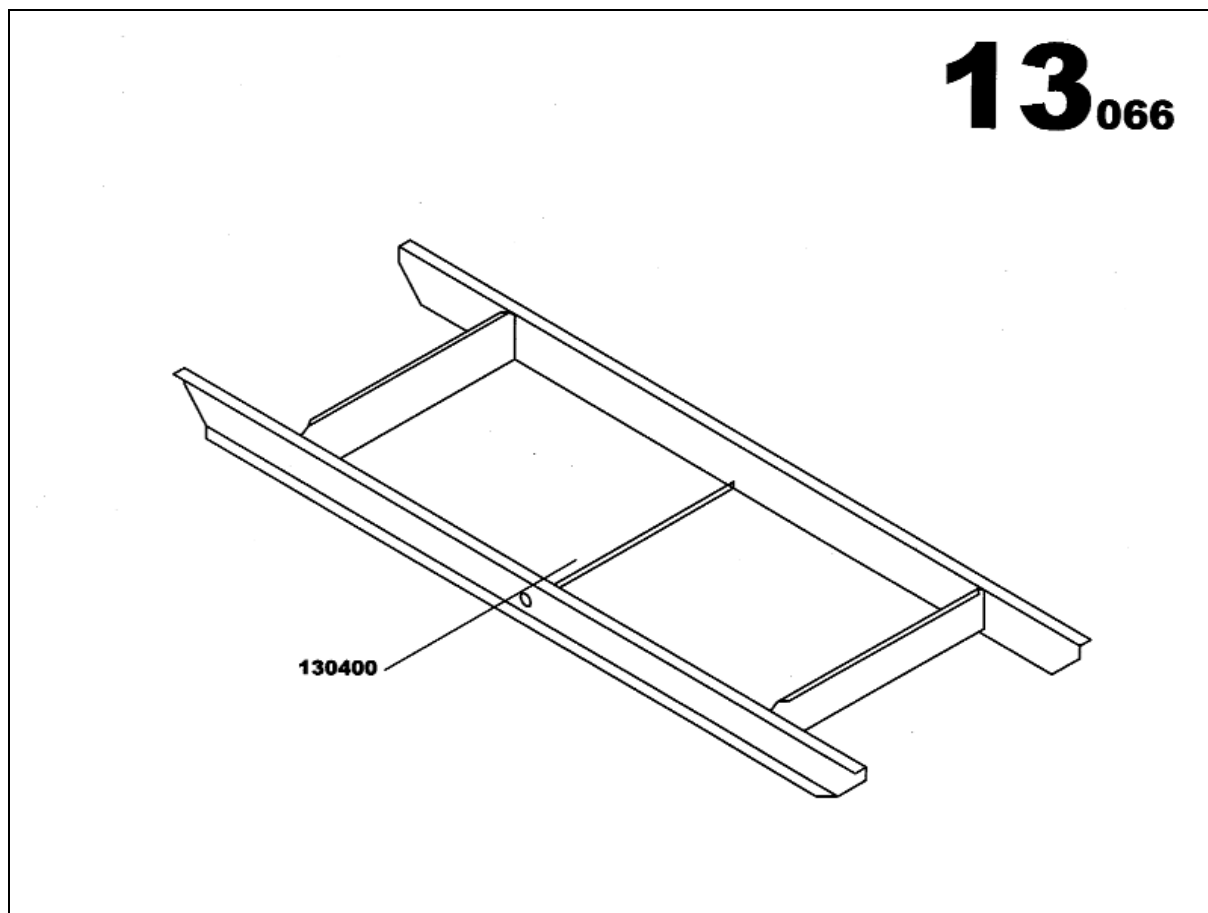
SINGLE BASE PLATE OPTION
F14034



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-------------------------|-----------------|--------------|
| 140690 | 85405553 | HOOD UNDERSHEETING M216 | 1.0 | UN |

SIMPLIFIED RETENTION TANK AND BASE PLATE OPTION

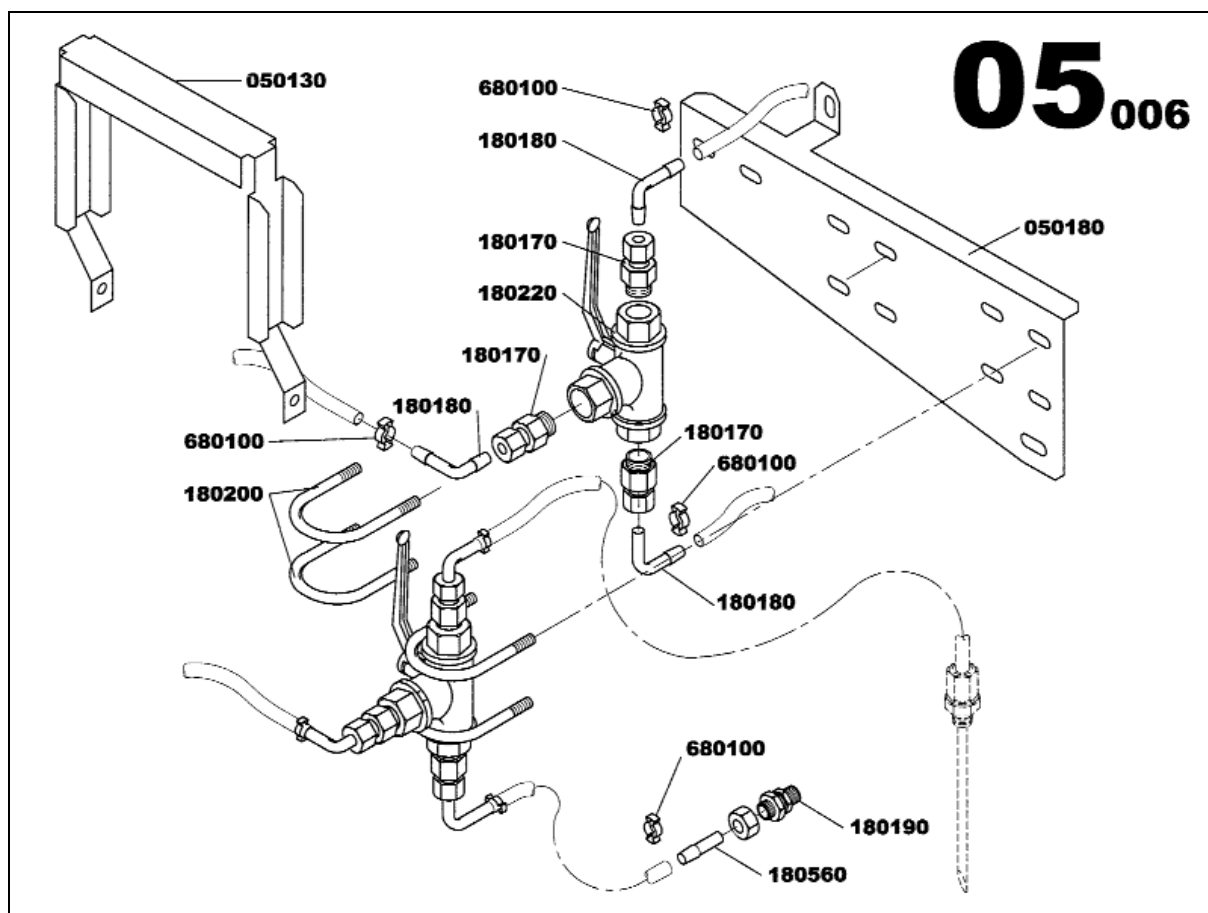
F13066



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-------------------------|-----------------|--------------|
| 130400 | 85404846 | RETENTION BUND M216BESI | 1.0 | UN |

3-WAY FUEL VALVE OPTION

F05006

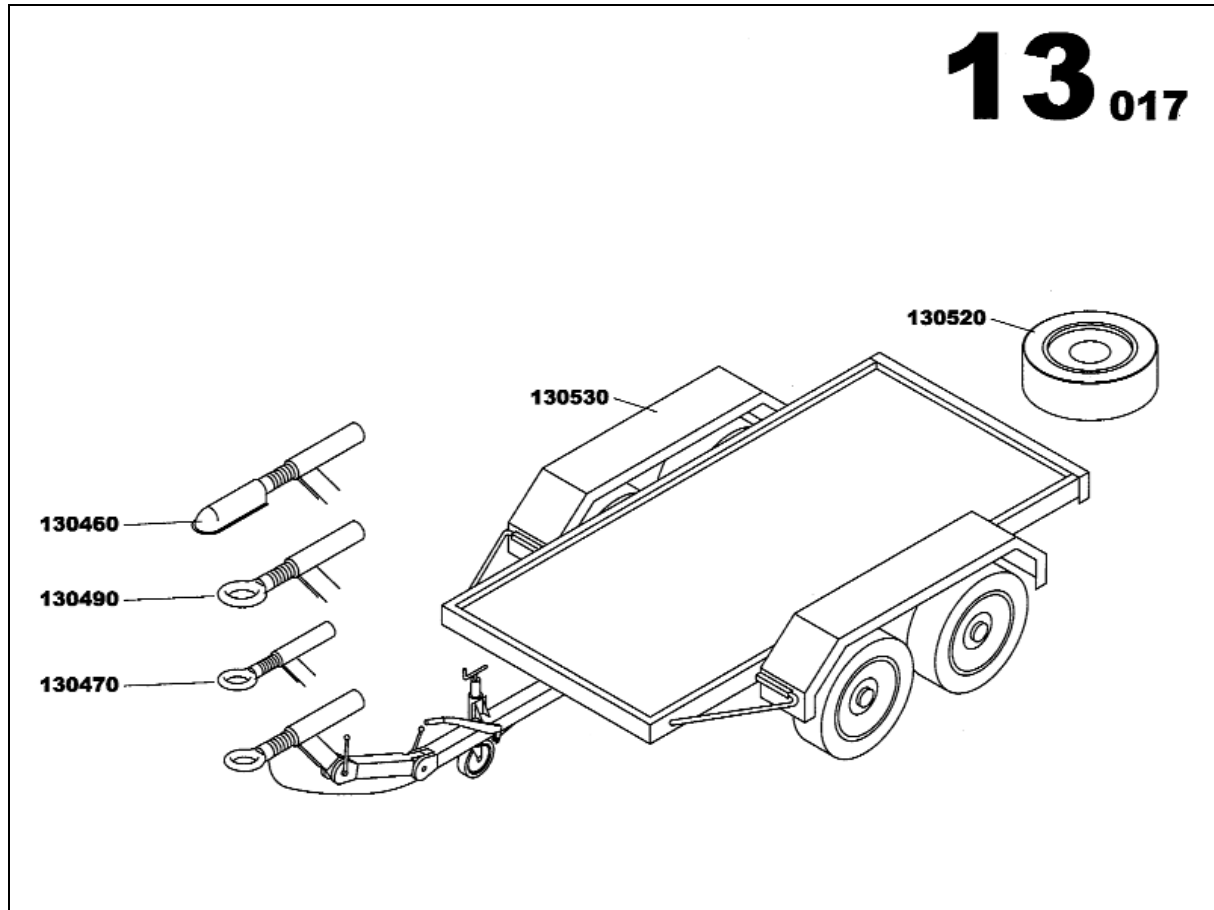


| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--------------------------------------|-----------------|--------------|
| 050180 | 85403566 | 3 WAY FUEL VALVE BRACKET ALL JD | 1.0 | UN |
| 050130 | 85403491 | 3 WAY FUEL VALVE LEVER 3/8G | 1.0 | UN |
| 180170 | 85409266 | PIPE UNION REDUCER MAL/FEM 3/8G D08 | 6.0 | UN |
| 180560 | 85426377 | PIPE UNION REDUCER MAL/MAL | 2.0 | UN |
| 180180 | 85409290 | PIPE UNION REDUCER ELBOW MAL/MAL D08 | 6.0 | UN |
| 180190 | 85409332 | PIPE UNION FEM/FEM D08 | 2.0 | UN |
| 180200 | 85409464 | HOSE CLAMP D36 | 4.0 | UN |
| 180220 | 85409530 | 3 WAY FUEL VALVE | 2.0 | UN |
| 680100 | 85410090 | HOSE CLIP | 10.0 | UN |

ROAD TRAILER M216 OPTION

ROAD TRAILER M216

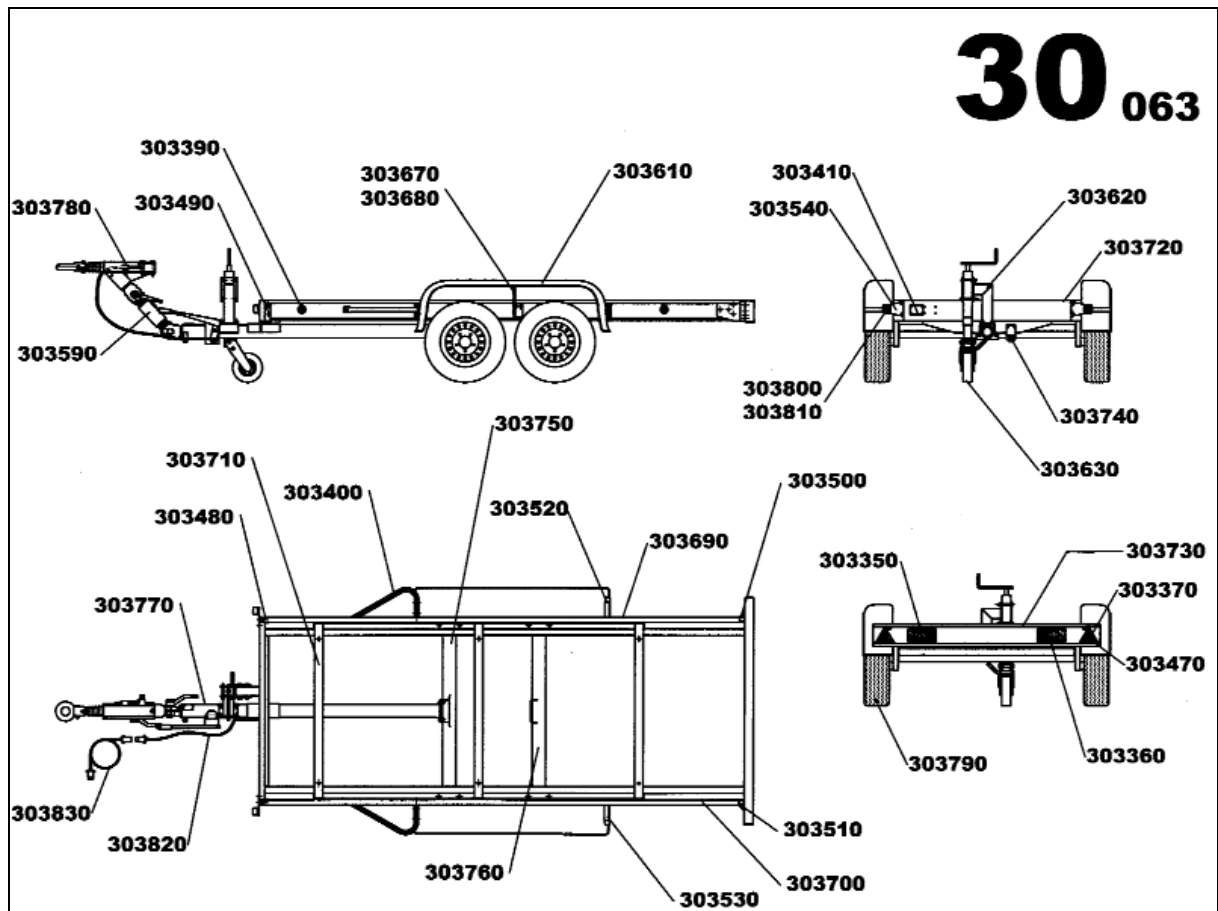
F13017



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---------------------------------------|-----------------|--------------|
| 130460 | 85405249 | TOWING BALL D50 | 1.0 | UN |
| 130490 | 85405223 | TOWING EYE 76x42 | 1.0 | UN |
| 130470 | 85405231 | TOWING EYE DIN 40 | 1.0 | UN |
| 130530 | 85405306 | ROAD TRAILER M216ESI | 1.0 | UN |
| 130520 | 85405363 | SPARE WHEEL 3T5 ROAD TRAILER ASSEMBLY | 2.0 | UN |

ROAD TRAILER 130530 DETAIL

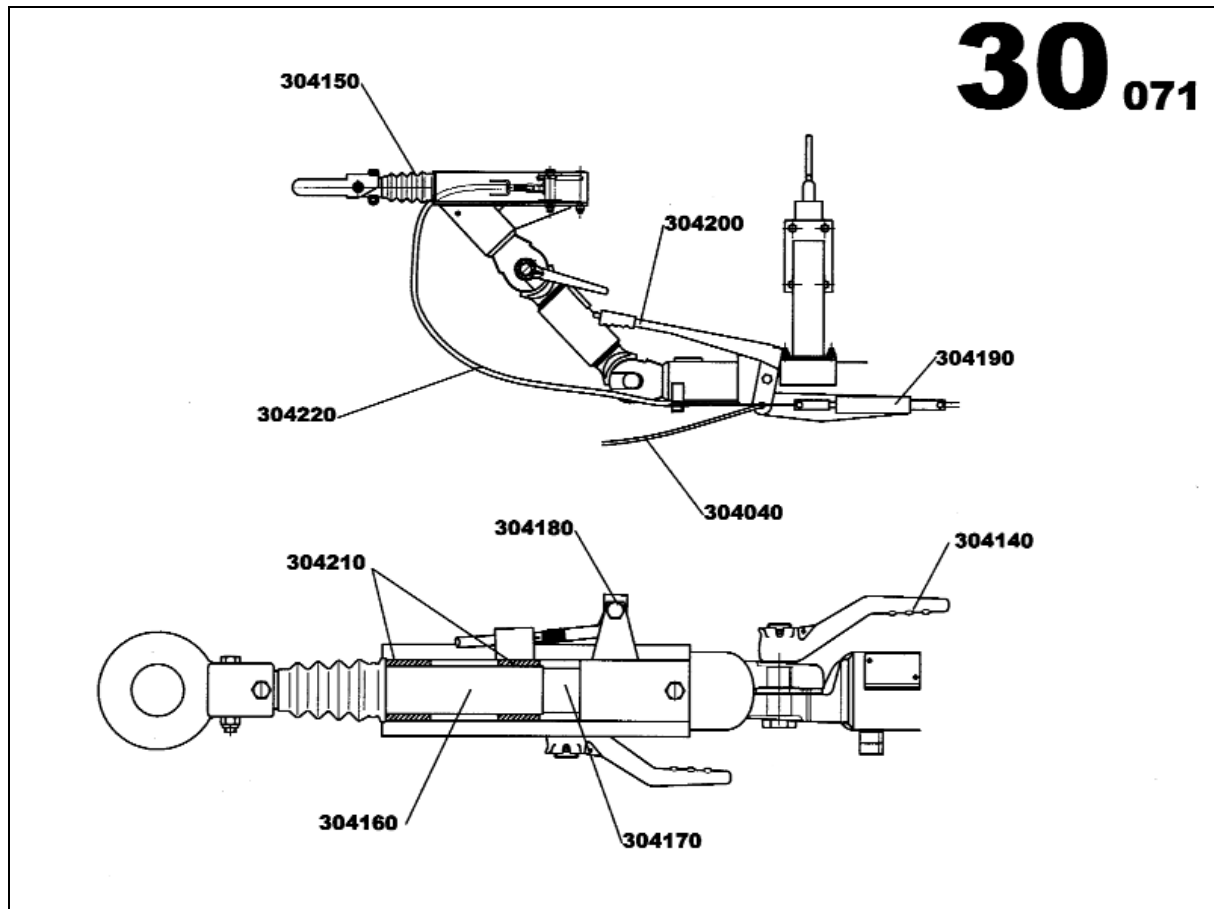
F30063



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 303690 | 85504769 | RIGHT SPECIAL SIDE MEMBER | 1.0 | UN |
| 303700 | 85504777 | LEFT SPECIAL SIDE MEMBER | 1.0 | UN |
| 303710 | 85504785 | SOLDERED PROCESSING FRAME | 1.0 | UN |
| 303720 | 85504793 | FRONT CROSS MEMBER | 1.0 | UN |
| 303730 | 85504801 | LIGHTS CROSS MEMBER | 1.0 | UN |
| 303470 | 85504546 | TRIANGLE SUPPORT | 2.0 | UN |
| 303480 | 85504553 | RIGHT FRONT BOUNDING | 1.0 | UN |
| 303490 | 85504561 | LEFT FRONT BOUNDING | 1.0 | UN |
| 303500 | 85504579 | RIGHT REAR BOUNDING | 1.0 | UN |
| 303510 | 85504587 | LEFT REAR BOUNDING | 1.0 | UN |
| 303520 | 85504595 | RIGHT MUDGUARD FIXATION | 1.0 | UN |
| 303530 | 85504603 | LEFT MUDGUARD FIXATION | 1.0 | UN |
| 303540 | 85504611 | FIXING CLIP WHITE LIGHT | 2.0 | UN |
| 303400 | 85504470 | STANDARD GALVANIZED CYCLIST-GUARD | 2.0 | UN |
| 303670 | 85504744 | REINFORCEMENT OF RIGHT TANDEM MUDGUARD | 1.0 | UN |
| 303680 | 85504751 | REINFORCEMENT OF LEFT TANDEM MUDGUARD | 1.0 | UN |
| 303740 | 85504819 | SOCKET SUPPORT | 1.0 | UN |
| 303750 | 85504827 | FRONT AXLE | 1.0 | UN |
| 303760 | 85504835 | REAR AXLE | 1.0 | UN |
| 303770 | 85504843 | POLE | 1.0 | UN |
| 303590 | 85504660 | INTERMEDIARY ARMS | 1.0 | UN |
| 303780 | 85504850 | BRAKE GEAR | 1.0 | UN |
| 303610 | 85504686 | GALVANIZED MUDGUARD | 2.0 | UN |
| 303620 | 85504694 | SQUARE JOCKEY WHEEL SUPPORT | 1.0 | UN |
| 303630 | 85504702 | SQUARE JOCKEY WHEEL | 1.0 | UN |
| 303790 | 85504868 | COMPLETE WHEEL | 4.0 | UN |
| 303800 | 85504876 | WHITE SQUARE LIGHT WITH REFLECTOR | 2.0 | UN |
| 303810 | 85504884 | SHUTTLE LAMP | 2.0 | UN |
| 303370 | 85504447 | TRIANGULAR REFLECTOR | 2.0 | UN |
| 303390 | 85504462 | ROUND STICKY REFLECTOR ORANGE | 4.0 | UN |
| 303410 | 85504488 | ECIM PRODUCER PLATE | 1.0 | UN |
| 303820 | 85504892 | ELECTRIC BEAM | 1.0 | UN |
| 303360 | 85504439 | RIGHT REAR LIGHT | 1.0 | UN |
| 303350 | 85504421 | LEFT REAR LIGHT | 1.0 | UN |
| 303830 | 85504900 | ELECTRIC BEAM OF TRAILER TOWING BAR | 1.0 | UN |

BRAKE GEAR 303780 DETAIL

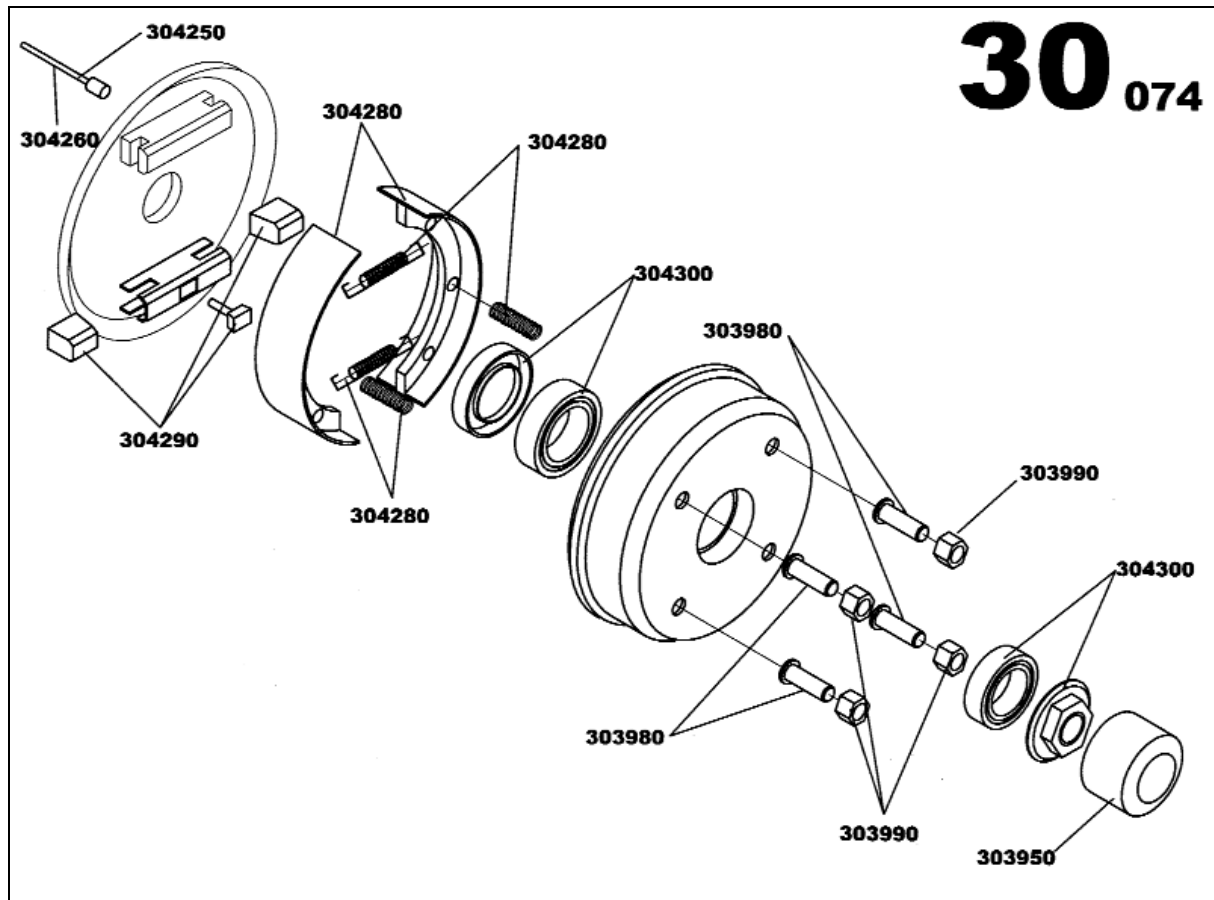
F30071



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---------------------|-----------------|--------------|
| 304150 | 85505378 | BELLOW | 1.0 | UN |
| 304160 | 85505386 | TRACTION TUBE | 1.0 | UN |
| 304170 | 85505394 | SHOCK ABSORBER | 1.0 | UN |
| 304180 | 85505402 | CONNECTING ROD | 1.0 | UN |
| 304040 | 85505261 | BREAK DOWN CABLE | 1.0 | UN |
| 304190 | 85505410 | COMPENSATOR | 1.0 | UN |
| 304200 | 85505428 | HANDBRAKE LEVER | 1.0 | UN |
| 304210 | 85505436 | FRICTION COLLAR KIT | 1.0 | UN |
| 304220 | 85505444 | TRANSMISSION CABLE | 1.0 | UN |
| 304140 | 85505360 | LEVER AND AXLE | 1.0 | UN |

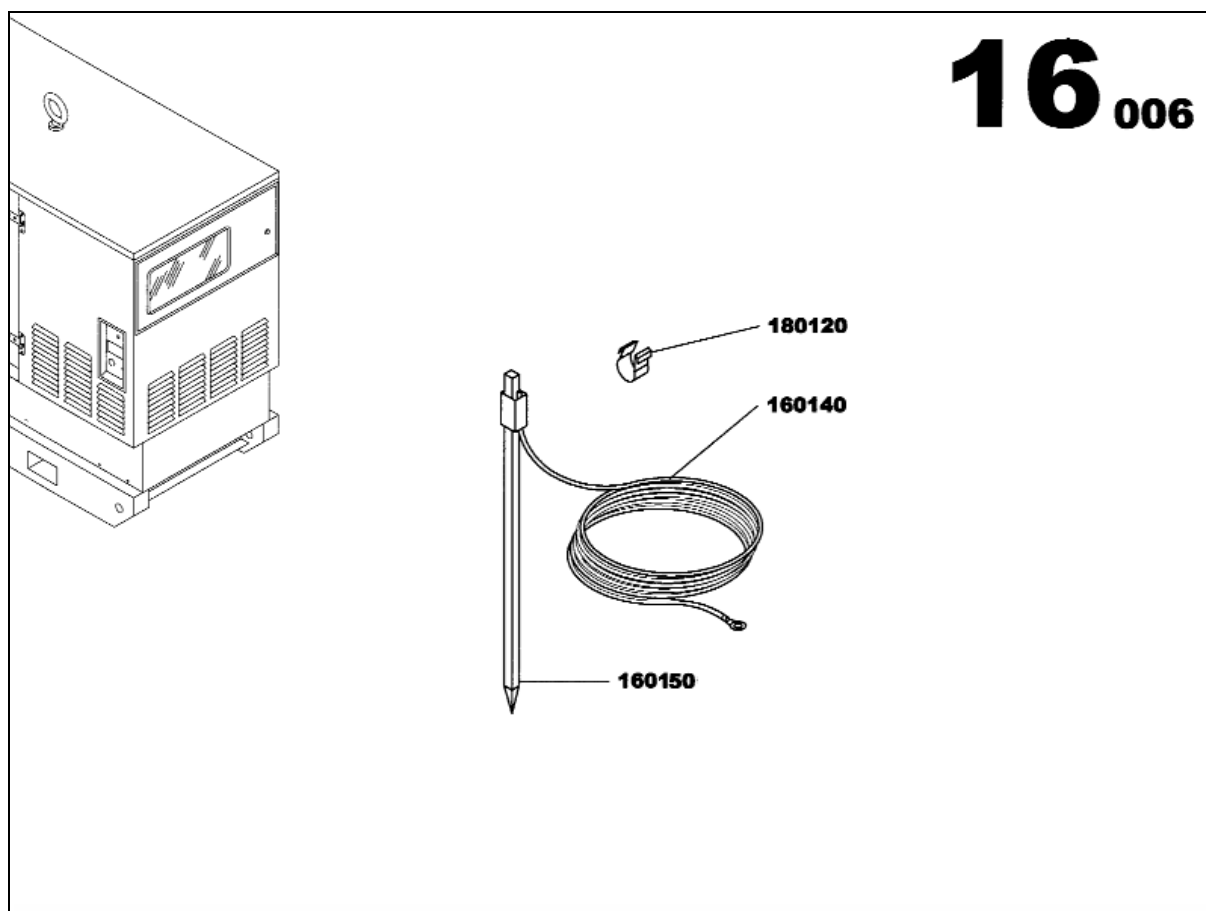
AXLE 303750 AND 303760 DETAIL

F30074



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------|-----------------|--------------|
| 303950 | 85505170 | HUB CAP | 1.0 | UN |
| 304300 | 85505535 | BEARING KIT | 1.0 | UN |
| 303980 | 85505204 | BOLTS KIT | 1.0 | UN |
| 303990 | 85505212 | NUTS KIT | 1.0 | UN |
| 304280 | 85505519 | BRAKE KIT | 1.0 | UN |
| 304290 | 85505527 | ADJUSTMENT KIT | 1.0 | UN |
| 304250 | 85505477 | BRAKE CABLE 1,40m KIT | 1.0 | UN |
| 304260 | 85505485 | BRAKE CABLE 1,60m KIT | 1.0 | UN |

EARTH ROD WITH CABLE M100/200 CANOPY ASSEMBLY
F16006

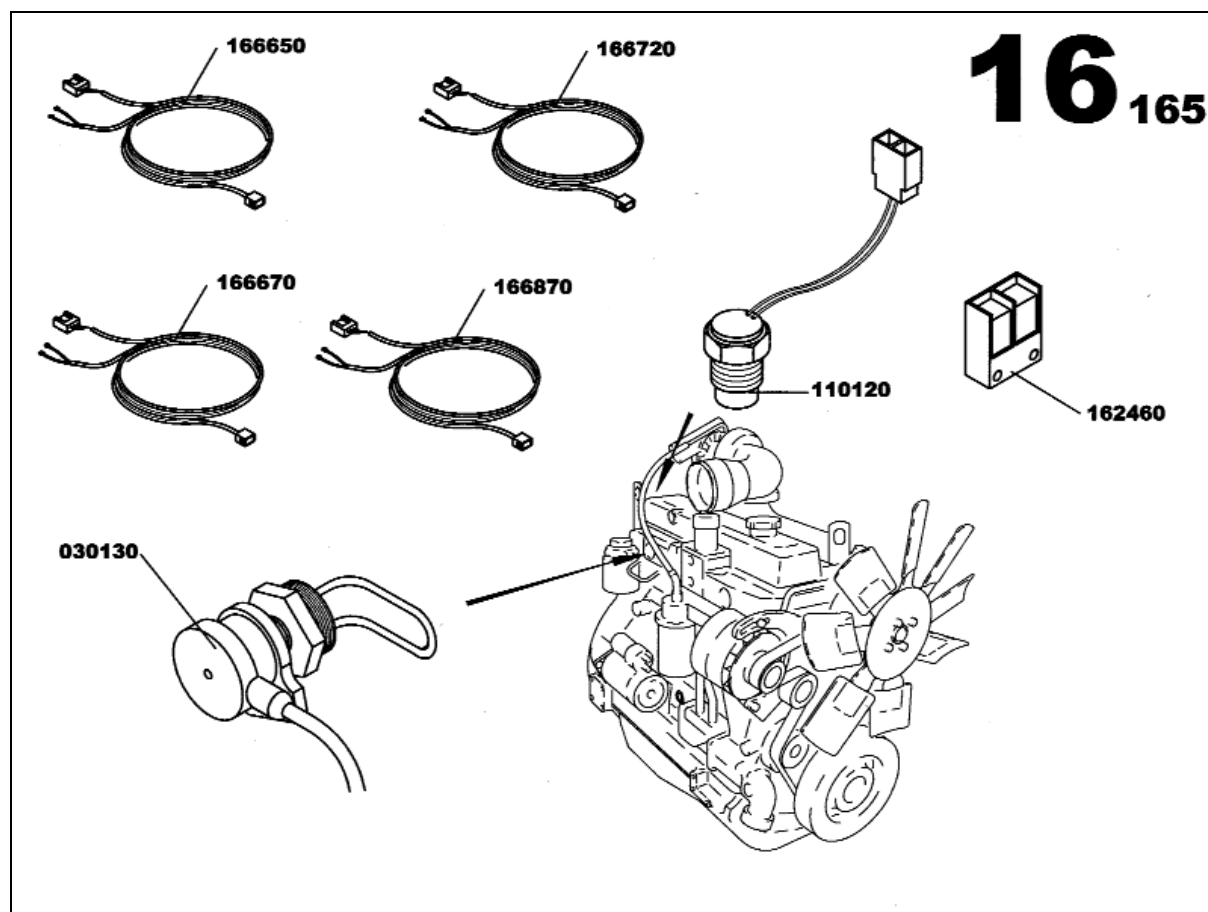


| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---|-----------------|--------------|
| 160140 | 85408227 | NEUTRAL/EARTH SYSTEM CABLE 25mm2 L10000 Gr/Ye | 1.0 | UN |
| 160150 | 85408334 | EARTH ROD L1000 | 1.0 | UN |
| 180120 | 85409191 | CLIP-ON BRACKET | 2.0 | UN |

AUTO START OPTION

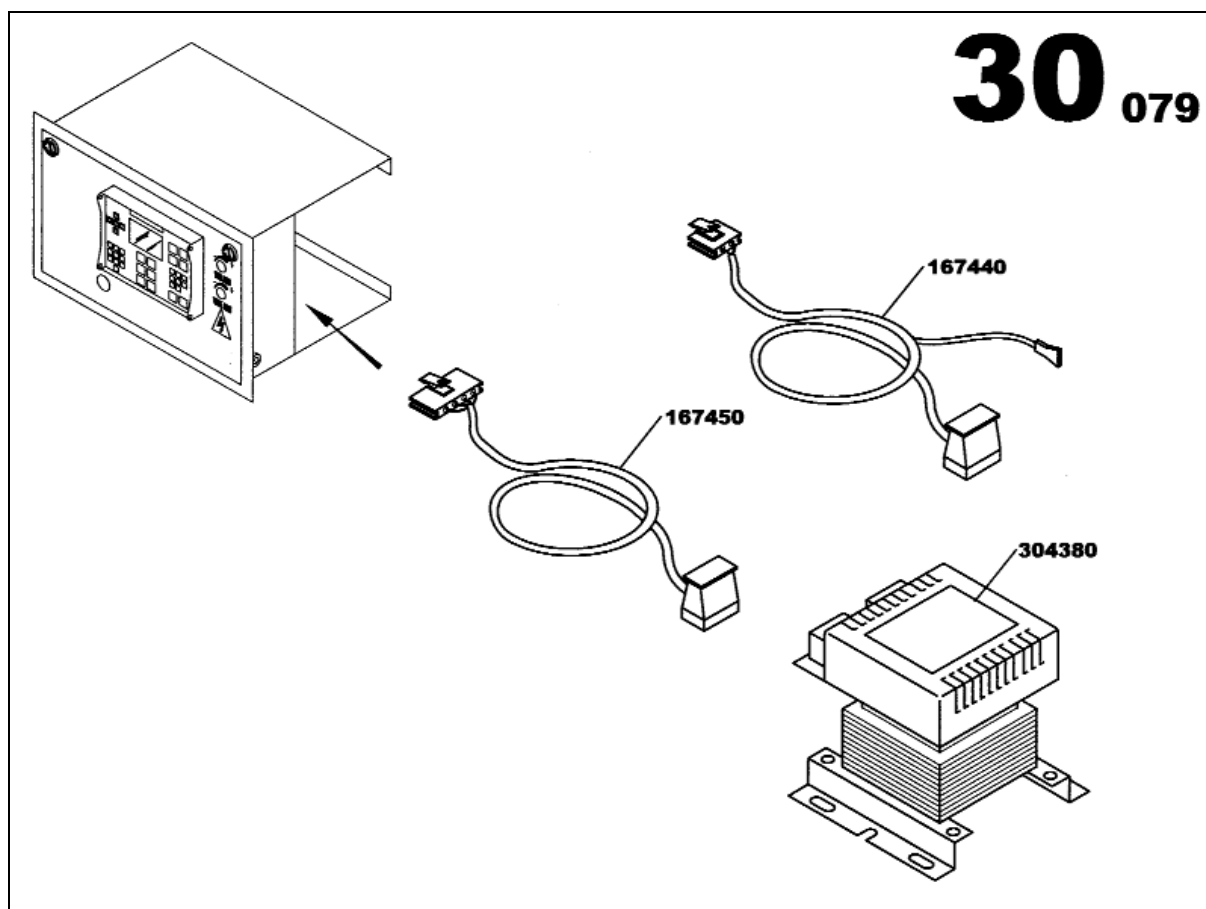
AUTO START ASSEMBLY

F16165



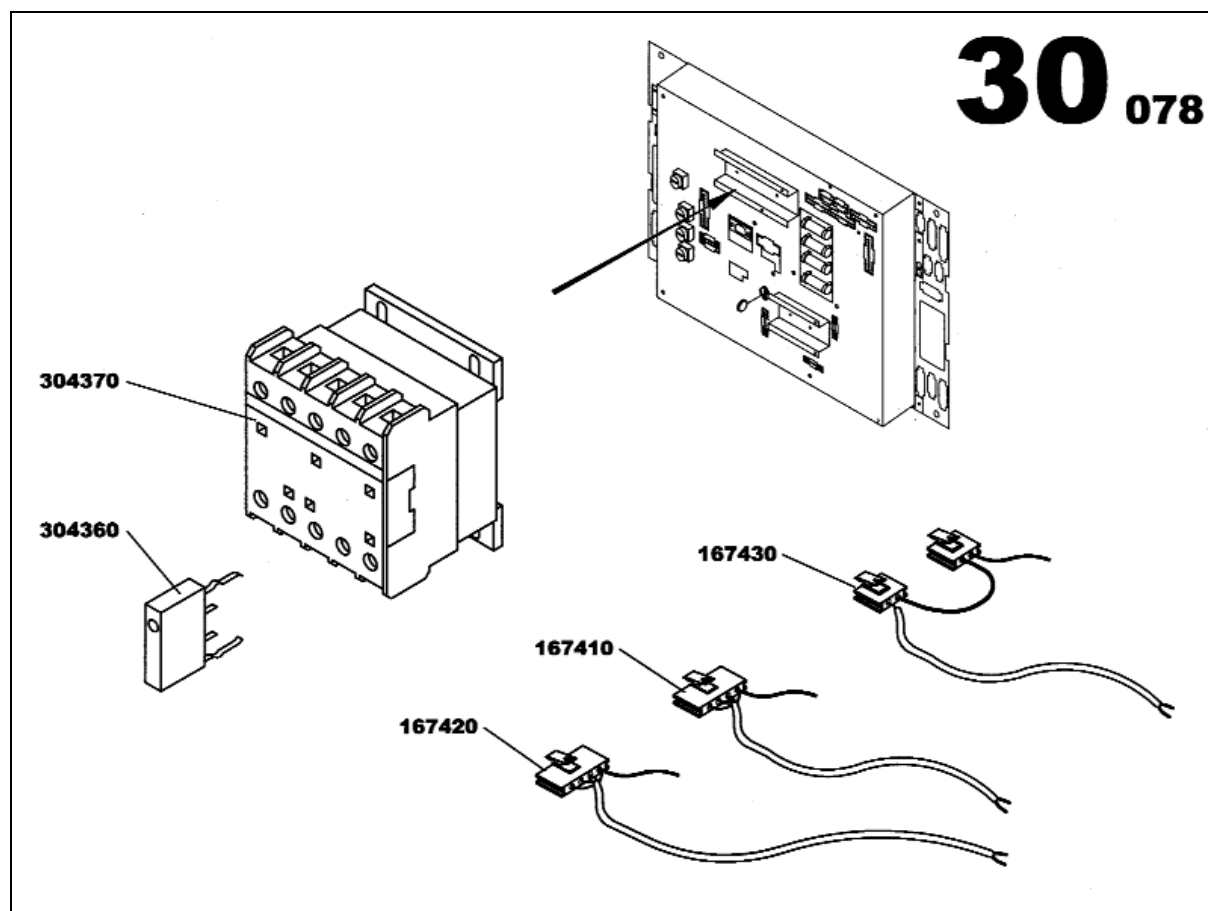
| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--------------------------------------|-----------------|--------------|
| 030130 | 85401081 | COOLANT HEATER RESISTANCE 1000W 240V | 1.0 | UN |
| 110120 | 85404655 | TEMPERATURE SWITCH 35/45° | 1.0 | UN |
| 162460 | 85408581 | AUXILARY CONTACT | 1.0 | UN |
| 166670 | 85411163 | INTELLISYS™ WIRING LOOM 035 | 1.0 | UN |
| 166650 | 85410835 | INTELLISYS™ WIRING LOOM 013 | 1.0 | UN |
| 166870 | 85426948 | INTELLISYS™ WIRING LOOM 016 | 1.0 | UN |
| 166720 | 85411486 | INTELLISYS™ WIRING LOOM 121 | 1.0 | UN |

INTELLISYS™ OPTION BATTERY CHARGER 12V/2.5A
F30079



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|---------------------------------|-----------------|--------------|
| 304380 | 85507622 | CHARGER | 1.0 | UN |
| 167440 | 85506541 | INTELLISYS™ WIRING LOOM 022/024 | 1.0 | UN |
| 167450 | 85506558 | INTELLISYS™ WIRING LOOM 009 | 1.0 | UN |

INTELLISYS™ OPTION WATER PREHEATING F30078

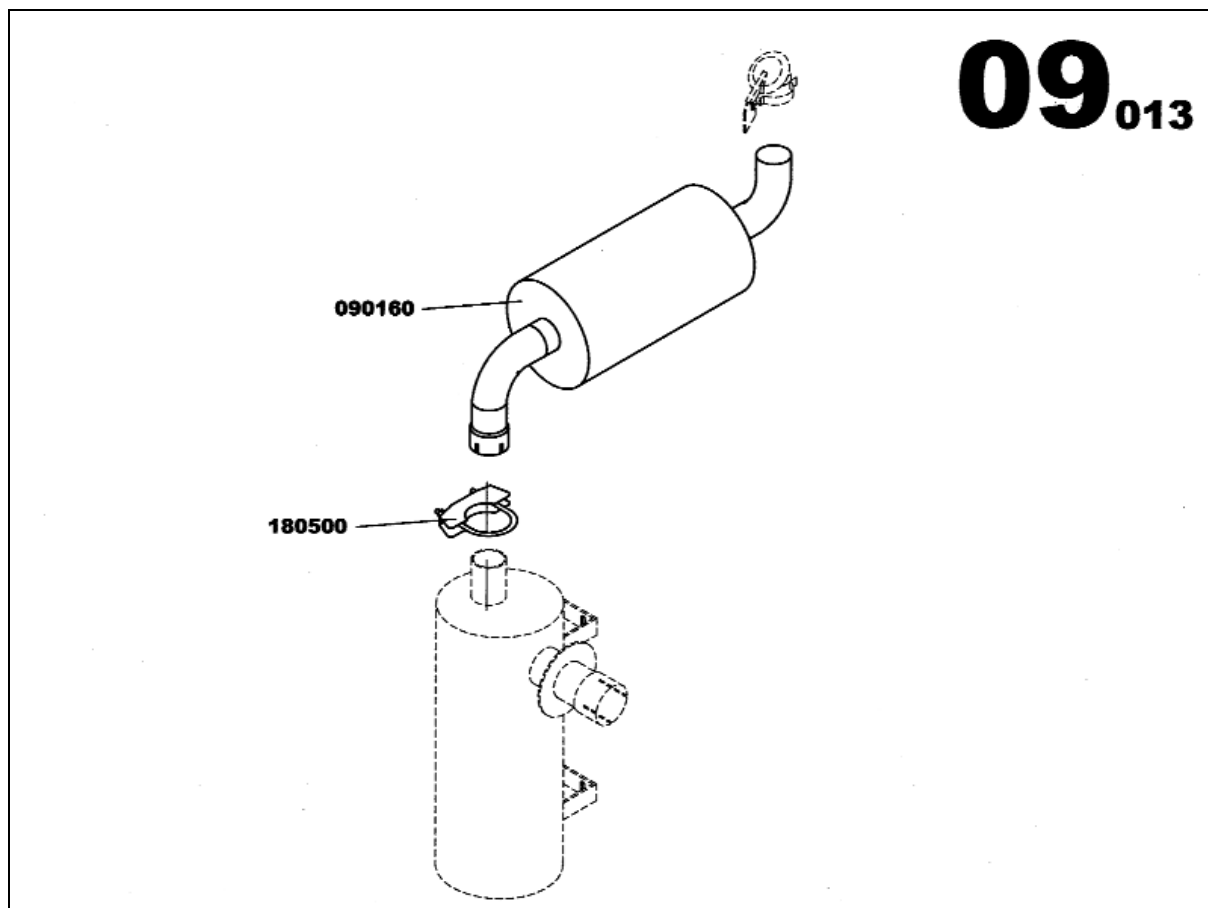


| Item | Part number | Description | Quantity | Units |
|--------|-------------|-----------------------------------|----------|-------|
| 167410 | 85506517 | INTELLISYS™ WIRING LOOM 031/33/34 | 1.0 | UN |
| 167420 | 85506525 | INTELLISYS™ WIRING LOOM 100 | 1.0 | UN |
| 167430 | 85506533 | INTELLISYS™ WIRING LOOM 027 | 1.0 | UN |
| 304360 | 85506640 | SURGE SUPPRESSOR BLOCK | 1.0 | UN |
| 304370 | 85506657 | RELAY | 1.0 | UN |

EXPLOSIVE ATMOSPHERE OPTION

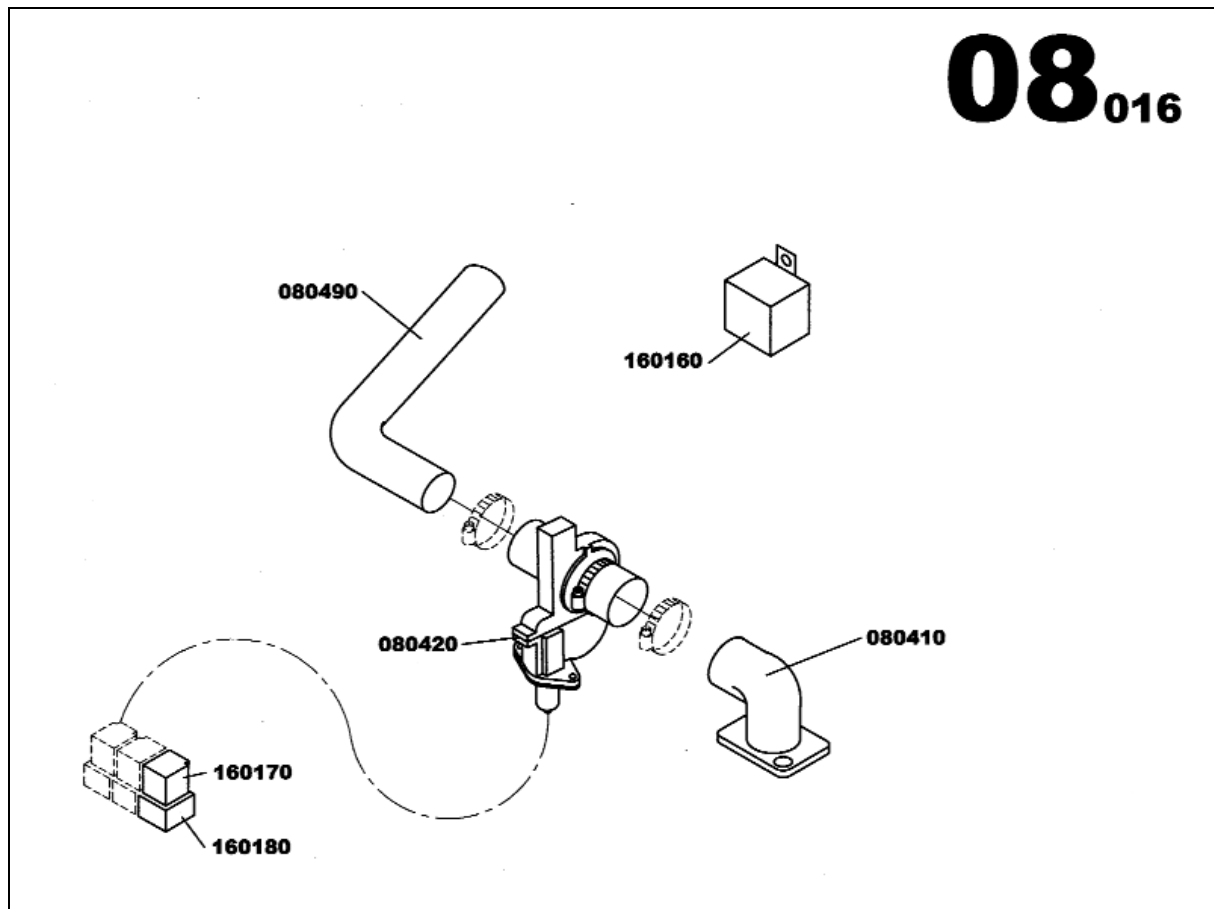
SPARK ARRESTER INERIS DN100 ASSEMBLY

F09013



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------------|-----------------|--------------|
| 090160 | 85404325 | INERIS SPARK ARRESTER DN100 | 1.0 | UN |
| 180500 | 85409381 | HOSE CLAMP D120 | 1.0 | UN |

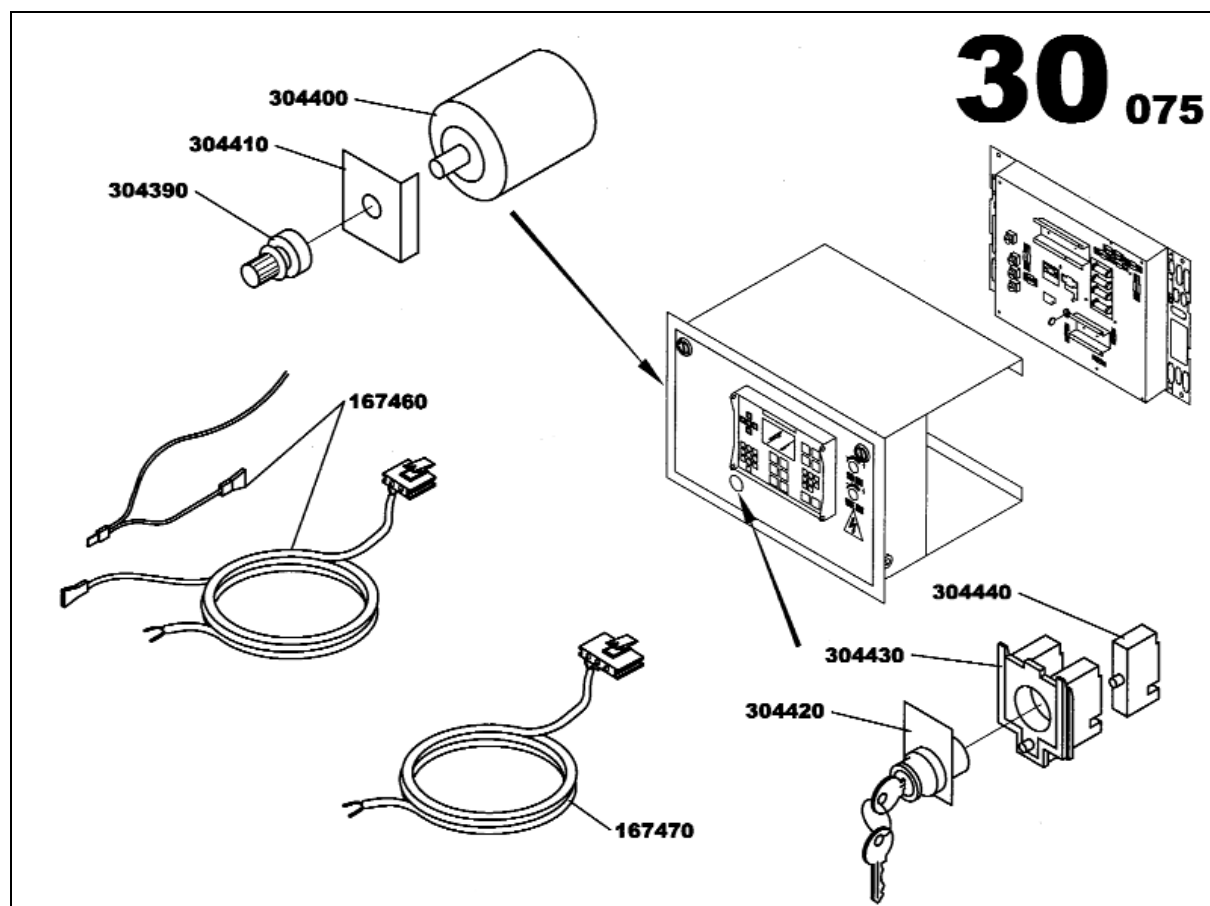
AIR SHUT OFF VALVE JD 6068T ASSEMBLY
F08016



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--------------------------------------|-----------------|--------------|
| 080410 | 85410223 | FILTER INLET PIPE D50 JD 4045T/6068T | 1.0 | UN |
| 080490 | 85410231 | FILTER INLET PIPE D50 JD 6068T | 1.0 | UN |
| 080420 | 85410249 | AIR SHUT OFF VALVE D51 | 1.0 | UN |
| 160160 | 85408367 | RELAY 12V/24V 75A | 1.0 | UN |
| 160170 | 85408896 | RELAY 12V 20/30A | 1.0 | UN |
| 160180 | 85408912 | AUTOMOBILE RELAY BASE | 1.0 | UN |

INTELLISYS™ OPTION DUAL FREQUENCY

F30075

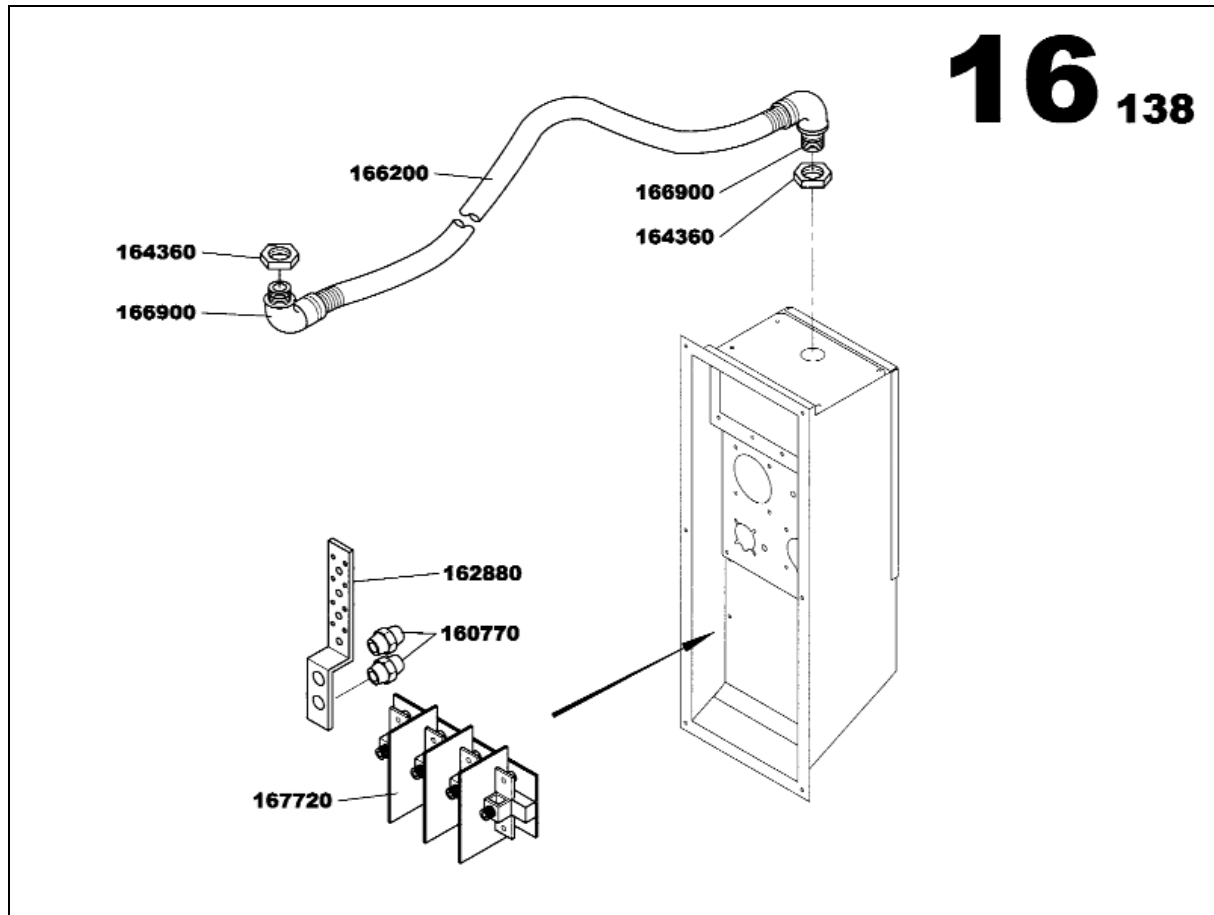


| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|-----------------------------|-----------------|--------------|
| 304390 | 85506673 | BUTTON | 1.0 | UN |
| 304400 | 85506681 | POTENTIOMETER 200kOHMS | 1.0 | UN |
| 167460 | 85506566 | INTELLISYS™ WIRING LOOM 124 | 1.0 | UN |
| 167470 | 85506574 | INTELLISYS™ WIRING LOOM 125 | 1.0 | UN |
| 304410 | 85506699 | POTENTIOMETER SUPPORT | 1.0 | UN |
| 304420 | 85506707 | KEY BUTTON | 1.0 | UN |
| 304430 | 85506582 | EMERGENCY STOP SWITCH | 1.0 | UN |
| 304440 | 85506715 | SWITCH | 1.0 | UN |

SOCKETS TYPE 2 OPTION

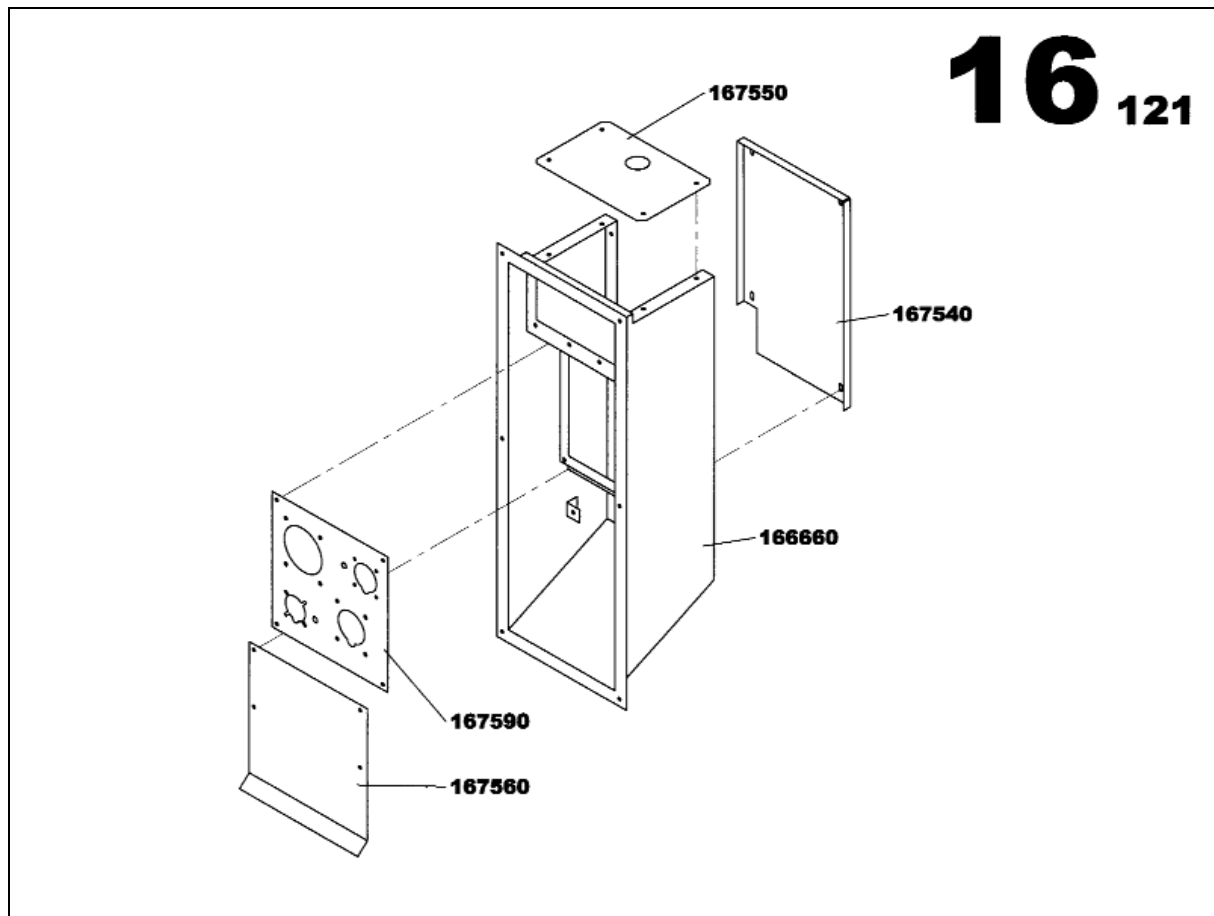
SOCKETS ASSEMBLY

F16138



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|----------------------------------|-----------------|--------------|
| 162880 | 85406429 | COPPER BAR 5x25 COMMON EARTH BAR | 1.0 | UN |
| 166200 | 85499440 | ELECTRICAL SHAFT D36 | 1.5 | ML |
| 160770 | 85408342 | INSULATION PIN | 2.0 | UN |
| 167720 | 85408607 | HIRETECH POWER CONNECTION BLOCK | 1.0 | UN |
| 164360 | 85408680 | GLAND NUT PG36 | 2.0 | UN |
| 166900 | 85499689 | PIPE UNION ELBOW 90° PG36 | 2.0 | UN |

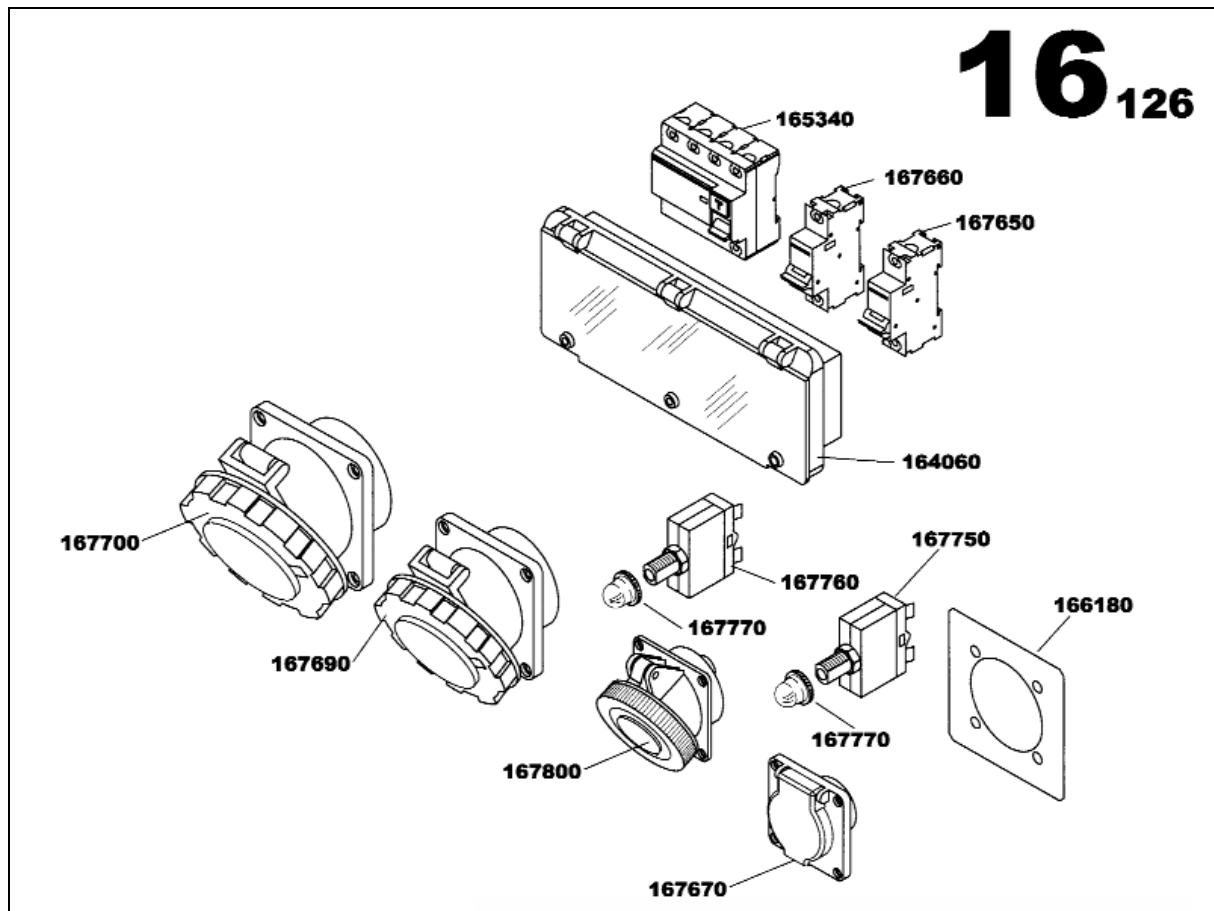
SOCKETS PANEL T2-T6-T9 M216 ASSEMBLY
F16121



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 166660 | 85427334 | SOCKETS PANEL EC M223-214-216BESI- | 1.0 | UN |
| 167540 | 85407765 | REAR PLATE M223/215BEZSI CONTROL PANEL HOUSING | 1.0 | UN |
| 167550 | 85407773 | GLAND NUT PLATE M204B/205B | 1.0 | UN |
| 167560 | 85407781 | REAR PLATE M216BESI CONTROL PANEL HOUSING | 1.0 | UN |
| 167590 | 85505832 | SOCKETS BRACKET PANEL | 1.0 | UN |

SOCKETS ASSEMBLY

F16126

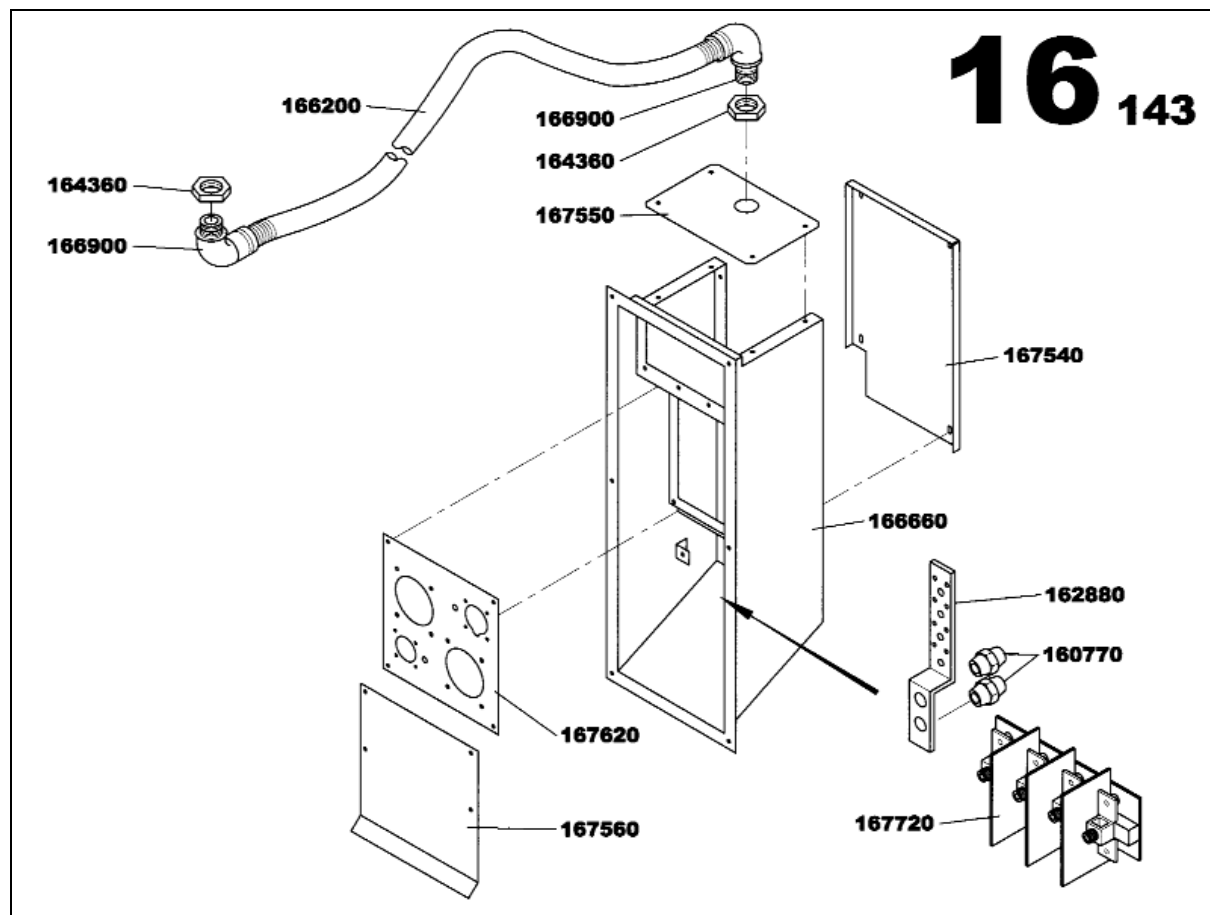


| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 167750 | 85408748 | COMPACT CIRCUIT BREAKER 1x10A | 1.0 | UN |
| 167770 | 85408763 | CIRCUIT BREAKER PROTECTION | 1.0 | UN |
| 167760 | 85413169 | COMPACT CIRCUIT BREAKER 1x15A | 1.0 | UN |
| 167770 | 85408763 | CIRCUIT BREAKER PROTECTION | 1.0 | UN |
| 166180 | 85501542 | SOCKETS ADAPTATION PLATE | 2.0 | UN |
| 167650 | 85506020 | MOULDED CASE CIRCUIT BREAKER 4x32A | 1.0 | UN |
| 167660 | 85506038 | MOULDED CASE CIRCUIT BREAKER 4x63A | 1.0 | UN |
| 164060 | 85408284 | CIRCUIT BREAKER SUPPORT PLATE 12 MODULES | 1.0 | UN |
| 167670 | 85408300 | SOCKET GERMAN 230V 16A 2S+G | 1.0 | UN |
| 167690 | 85408326 | EC SOCKET 400V 32A 3S+N+G | 1.0 | UN |
| 167700 | 85506046 | EC SOCKET 400V 63A 3S+N+G | 1.0 | UN |
| 165340 | 85408771 | DIFFERENTIAL SWITCH L 4P 63A 30mA | 1.0 | UN |
| 167800 | 85506103 | SOCKET EC 230V 16A 2S+G | 1.0 | UN |

SOCKETS TYPE 4 OPTION

SOCKETS ASSEMBLY

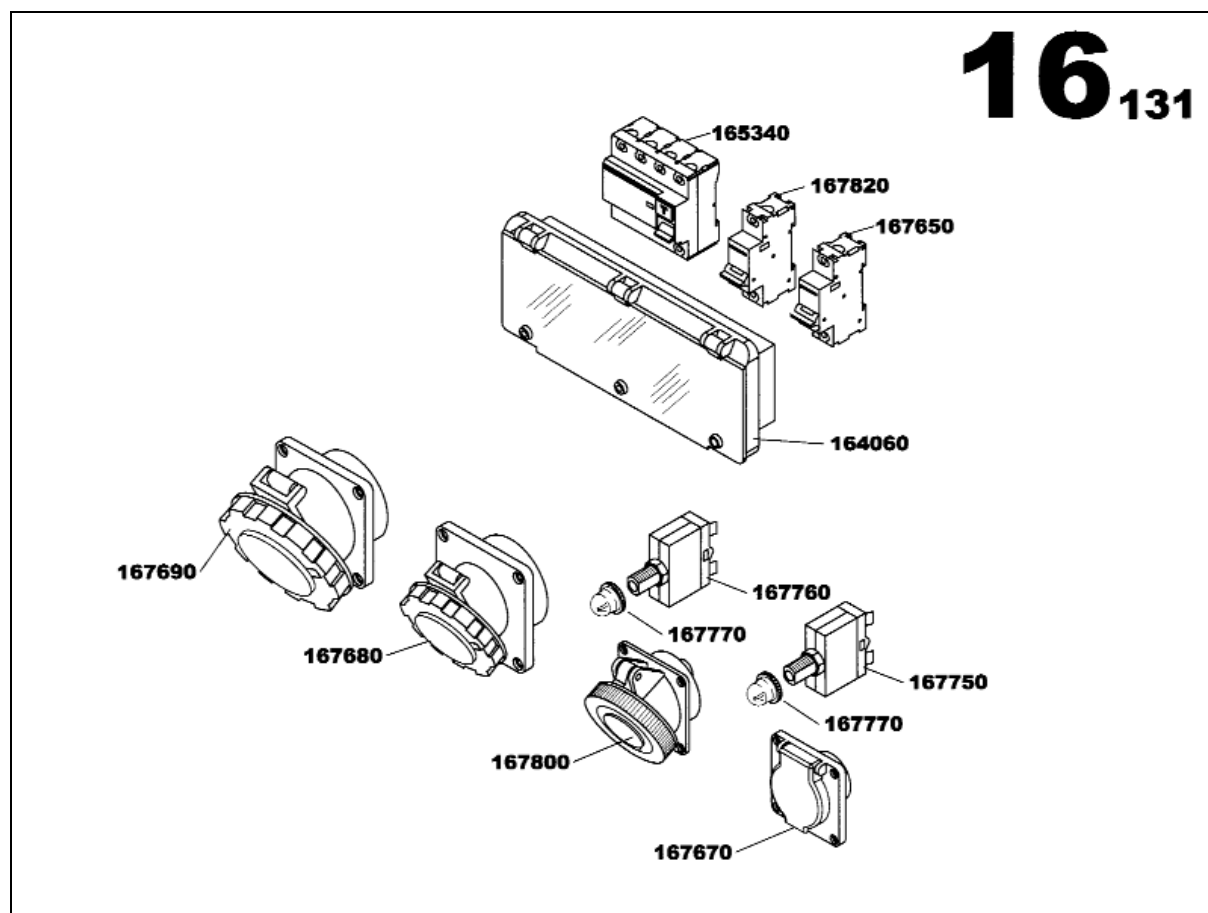
F16143



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 162880 | 85406429 | COPPER BAR 5x25 COMMON EARTH BAR | 1.0 | UN |
| 166660 | 85427334 | SOCKETS PANEL EC M223-214-216BESI- | 1.0 | UN |
| 167540 | 85407765 | REAR PLATE M223/215BEZSI CONTROL PANEL HOUSING | 1.0 | UN |
| 167550 | 85407773 | GLAND NUT PLATE M204B/205B | 1.0 | UN |
| 167560 | 85407781 | REAR PLATE M216BESI CONTROL PANEL HOUSING | 1.0 | UN |
| 167620 | 85505972 | SOCKETS BRACKET PANEL | 1.0 | UN |
| 166200 | 85499440 | ELECTRICAL SHAFT D36 | 1.5 | ML |
| 160770 | 85408342 | INSULATION PIN | 2.0 | UN |
| 167720 | 85408607 | HIRETECH POWER CONNECTION BLOCK | 1.0 | UN |
| 164360 | 85408680 | GLAND NUT PG36 | 2.0 | UN |
| 166900 | 85499689 | PIPE UNION ELBOW 90° PG36 | 2.0 | UN |

SOCKETS ASSEMBLY

F16131

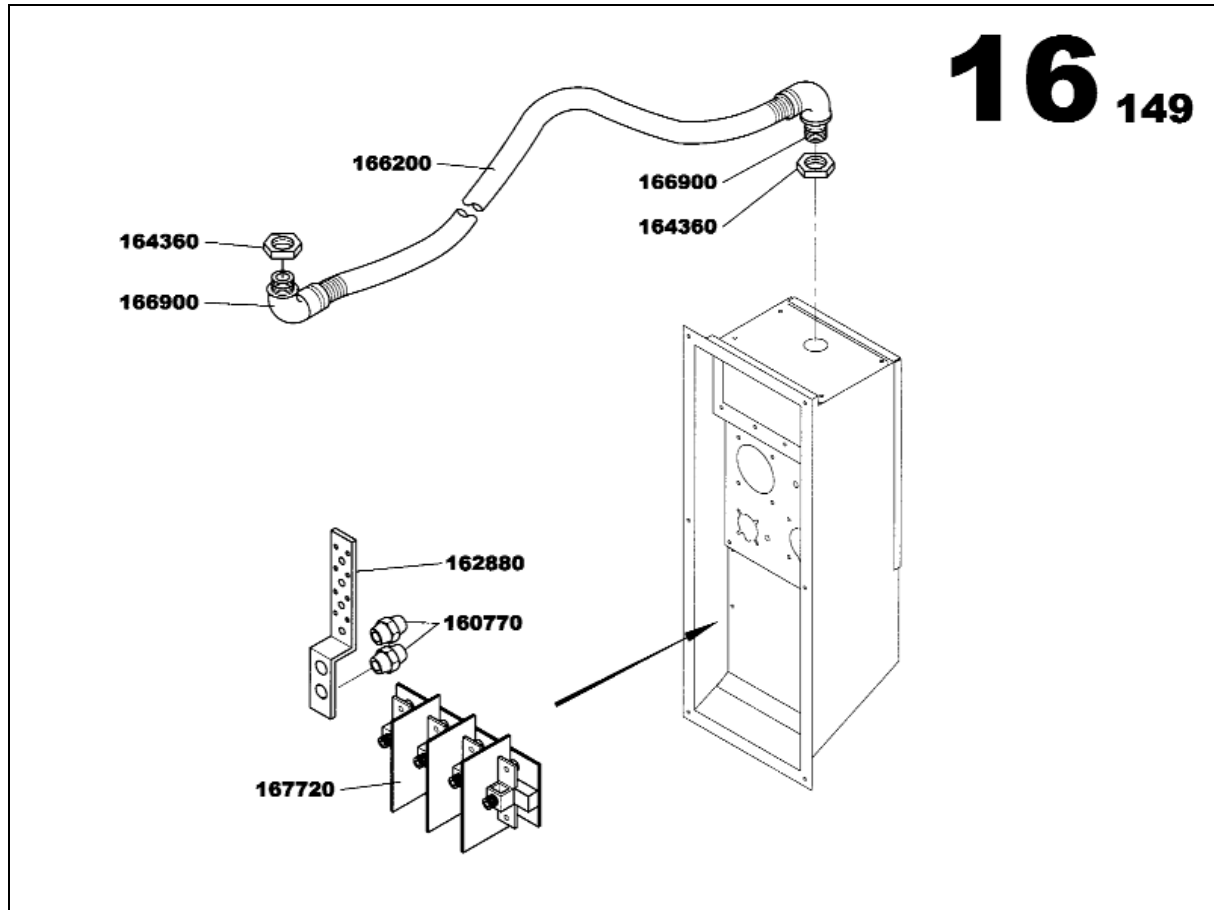


| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 167750 | 85408748 | COMPACT CIRCUIT BREAKER 1x10A | 1.0 | UN |
| 167760 | 85413169 | COMPACT CIRCUIT BREAKER 1x15A | 1.0 | UN |
| 167770 | 85408763 | CIRCUIT BREAKER PROTECTION | 2.0 | UN |
| 167650 | 85506020 | MOULDED CASE CIRCUIT BREAKER 4x32A | 1.0 | UN |
| 164060 | 85408284 | CIRCUIT BREAKER SUPPORT PLATE 12 MODULES | 1.0 | UN |
| 167670 | 85408300 | SOCKET GERMAN 230V 16A 2S+G | 1.0 | UN |
| 167680 | 85408318 | EC SOCKET 400V 16A 3S+N+G | 1.0 | UN |
| 167690 | 85408326 | EC SOCKET 400V 32A 3S+N+G | 1.0 | UN |
| 165340 | 85408771 | DIFFERENTIAL SWITCH L 4P 63A 30mA | 1.0 | UN |
| 167800 | 85506103 | SOCKET EC 230V 16A 2S+G | 1.0 | UN |
| 167820 | 85506434 | MOULDED CASE CIRCUIT BREAKER 4x16A | 1.0 | UN |

SOCKETS TYPE 6 OPTION

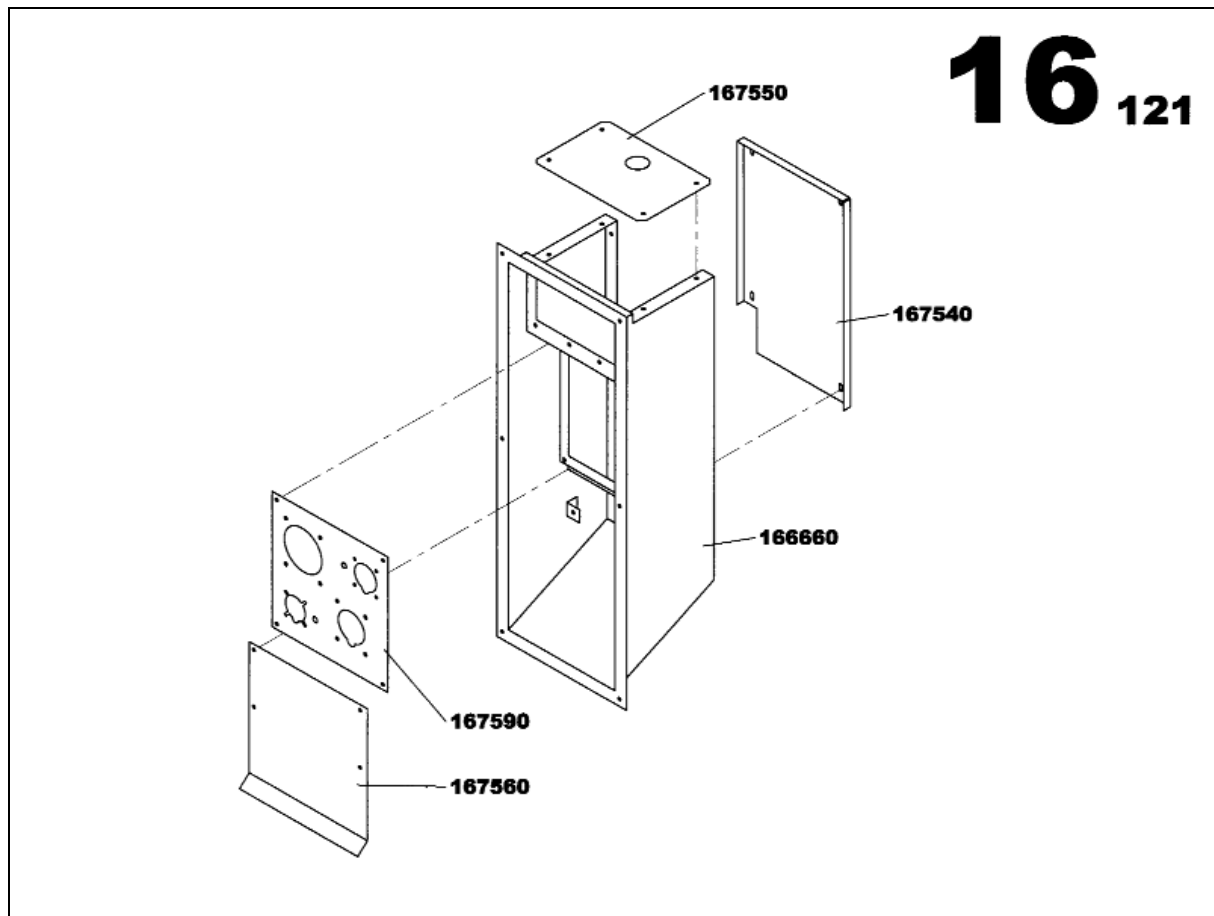
SOCKETS ASSEMBLY

F16149



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|----------------------------------|-----------------|--------------|
| 162880 | 85406429 | COPPER BAR 5x25 COMMON EARTH BAR | 1.0 | UN |
| 166200 | 85499440 | ELECTRICAL SHAFT D36 | 1.5 | ML |
| 160770 | 85408342 | INSULATION PIN | 2.0 | UN |
| 167720 | 85408607 | HIRETECH POWER CONNECTION BLOCK | 1.0 | UN |
| 164360 | 85408680 | GLAND NUT PG36 | 2.0 | UN |
| 166900 | 85499689 | PIPE UNION ELBOW 90° PG36 | 2.0 | UN |

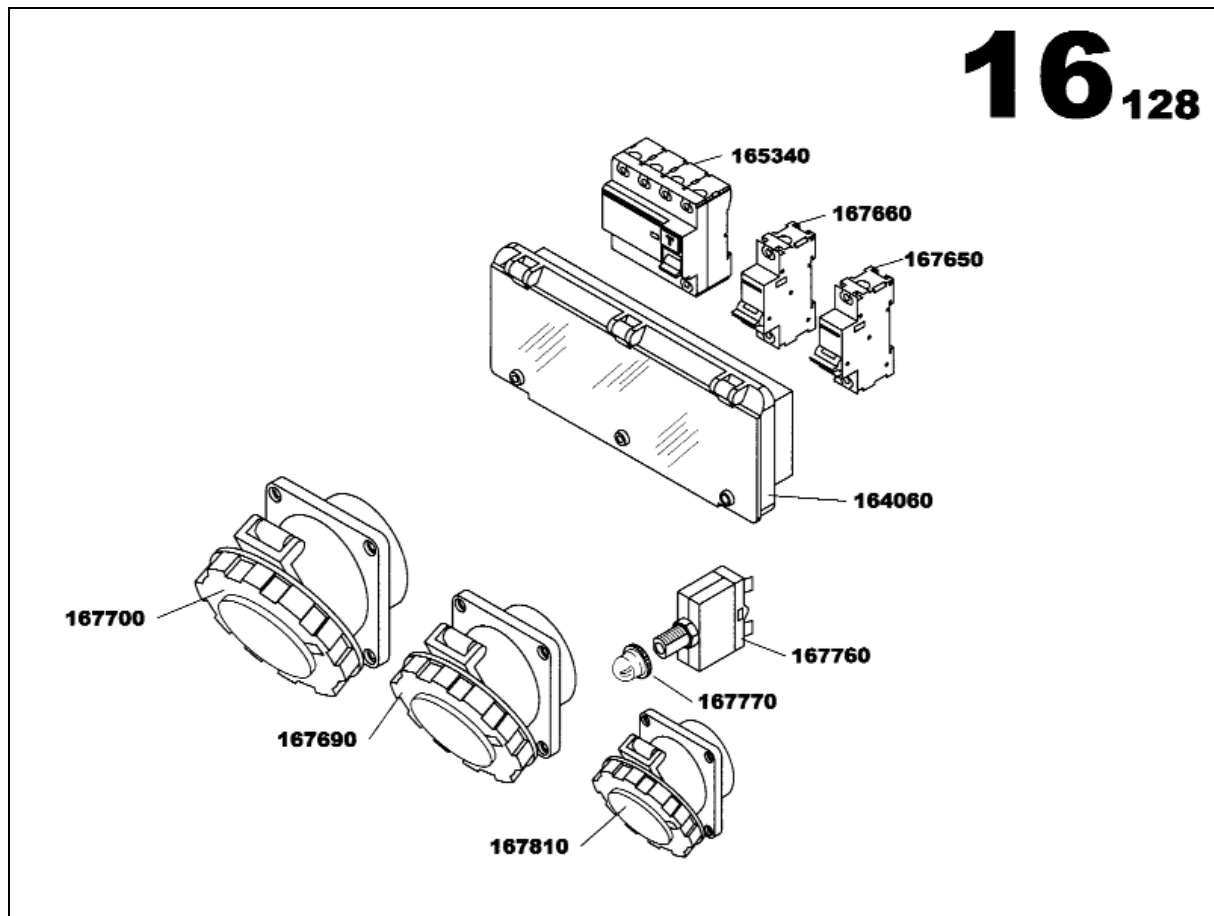
SOCKETS PANEL T2-T6-T9 M216 ASSEMBLY
F16121



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 166660 | 85427334 | SOCKETS PANEL EC M223-214-216BESI- | 1.0 | UN |
| 167540 | 85407765 | REAR PLATE M223/215BEZSI CONTROL PANEL HOUSING | 1.0 | UN |
| 167550 | 85407773 | GLAND NUT PLATE M204B/205B | 1.0 | UN |
| 167560 | 85407781 | REAR PLATE M216BESI CONTROL PANEL HOUSING | 1.0 | UN |
| 167590 | 85505832 | SOCKETS BRACKET PANEL | 1.0 | UN |

SOCKETS ASSEMBLY

F16128

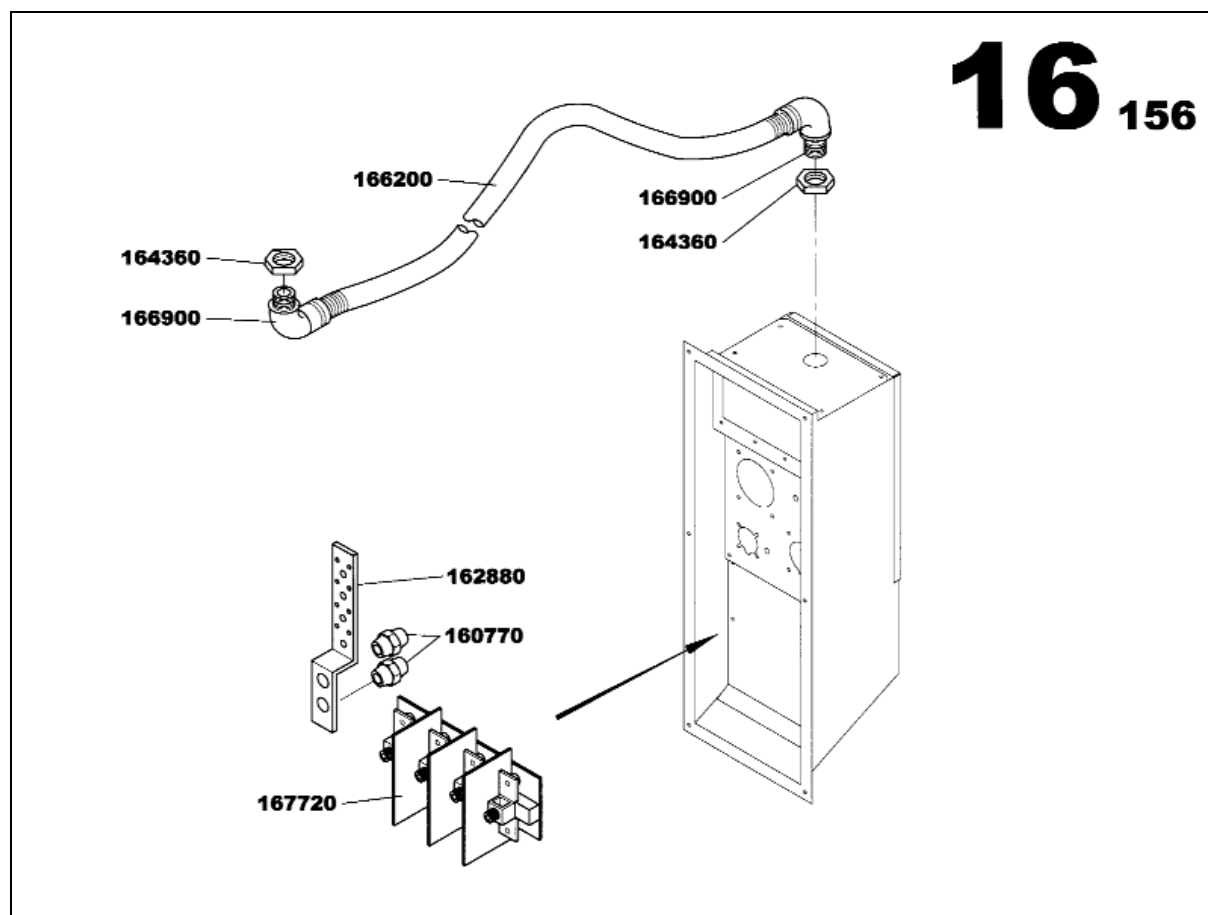


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|-------------|--------------------|--|-----------------|--------------|
| 167760 | 85413169 | COMPACT CIRCUIT BREAKER 1x15A | 1.0 | UN |
| 167770 | 85408763 | CIRCUIT BREAKER PROTECTION | 1.0 | UN |
| 167650 | 85506020 | MOULDED CASE CIRCUIT BREAKER 4x32A | 1.0 | UN |
| 167660 | 85506038 | MOULDED CASE CIRCUIT BREAKER 4x63A | 1.0 | UN |
| 164060 | 85408284 | CIRCUIT BREAKER SUPPORT PLATE 12 MODULES | 1.0 | UN |
| 167690 | 85408326 | EC SOCKET 400V 32A 3S+N+G | 1.0 | UN |
| 167700 | 85506046 | EC SOCKET 400V 63A 3S+N+G | 1.0 | UN |
| 165340 | 85408771 | DIFFERENTIAL SWITCH L 4P 63A 30mA | 1.0 | UN |
| 167810 | 85506111 | SOCKET EC 110V 16A 2S+G | 2.0 | UN |

SOCKETS TYPE 9 OPTION

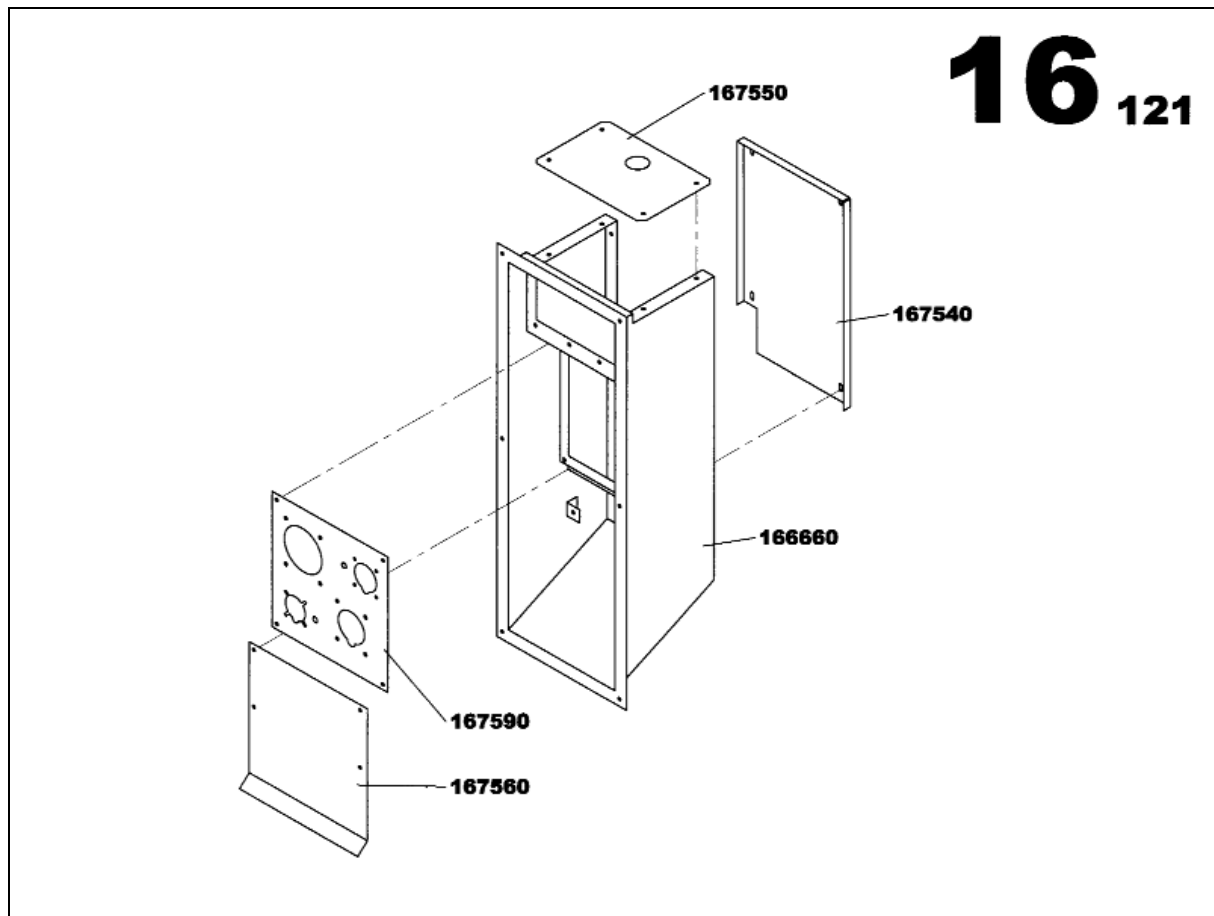
SOCKETS ASSEMBLY

F16156



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|----------------------------------|-----------------|--------------|
| 162880 | 85406429 | COPPER BAR 5x25 COMMON EARTH BAR | 1.0 | UN |
| 166200 | 85499440 | ELECTRICAL SHAFT D36 | 1.5 | ML |
| 160770 | 85408342 | INSULATION PIN | 2.0 | UN |
| 167720 | 85408607 | HIRETECH POWER CONNECTION BLOCK | 1.0 | UN |
| 164360 | 85408680 | GLAND NUT PG36 | 2.0 | UN |
| 166900 | 85499689 | PIPE UNION ELBOW 90° PG36 | 2.0 | UN |

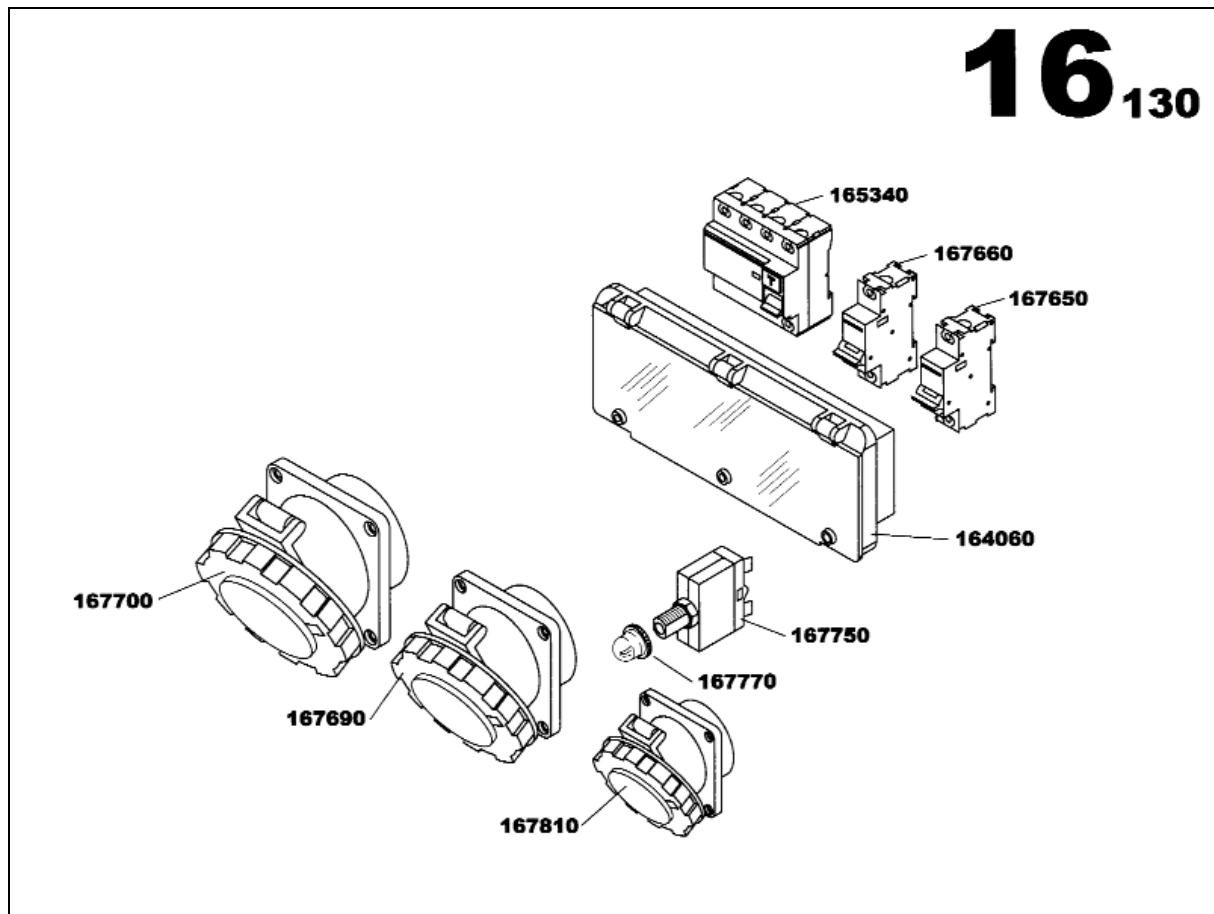
SOCKETS PANEL T2-T6-T9 M216 ASSEMBLY
F16121



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 166660 | 85427334 | SOCKETS PANEL EC M223-214-216BESI- | 1.0 | UN |
| 167540 | 85407765 | REAR PLATE M223/215BEZSI CONTROL PANEL HOUSING | 1.0 | UN |
| 167550 | 85407773 | GLAND NUT PLATE M204B/205B | 1.0 | UN |
| 167560 | 85407781 | REAR PLATE M216BESI CONTROL PANEL HOUSING | 1.0 | UN |
| 167590 | 85505832 | SOCKETS BRACKET PANEL | 1.0 | UN |

SOCKETS ASSEMBLY

F16130



| <i>Item</i> | <i>Part number</i> | <i>Description</i> | <i>Quantity</i> | <i>Units</i> |
|-------------|--------------------|--|-----------------|--------------|
| 167750 | 85408748 | COMPACT CIRCUIT BREAKER 1x10A | 1.0 | UN |
| 167770 | 85408763 | CIRCUIT BREAKER PROTECTION | 1.0 | UN |
| 167650 | 85506020 | MOULDED CASE CIRCUIT BREAKER 4x32A | 1.0 | UN |
| 167660 | 85506038 | MOULDED CASE CIRCUIT BREAKER 4x63A | 1.0 | UN |
| 164060 | 85408284 | CIRCUIT BREAKER SUPPORT PLATE 12 MODULES | 1.0 | UN |
| 167690 | 85408326 | EC SOCKET 400V 32A 3S+N+G | 1.0 | UN |
| 167700 | 85506046 | EC SOCKET 400V 63A 3S+N+G | 1.0 | UN |
| 165340 | 85408771 | DIFFERENTIAL SWITCH L 4P 63A 30mA | 1.0 | UN |
| 167810 | 85506111 | SOCKET EC 110V 16A 2S+G | 2.0 | UN |

Use and maintenance manual

Leroy Somer Alternators LSA 43.2/44.2 - 4 - Pole

Réf. constructeur :
3434 GB - 4.33/a - 03.01

Réf. GPAO : 33522016401 ind1

LSA 43.2/44.2 - 4-POLE ALTERNATORS

This manual concerns the alternator which you have just purchased.

The latest addition to a whole new generation of alternators, this range benefits from the experience of the world's leading manufacturer, using advanced technology and incorporating strict quality control.

We wish to draw your attention to the contents of this maintenance manual. By following certain important points during installation, use and servicing of your alternator, you can look forward to many years of trouble-free operation.

SAFETY MEASURES

Before using your machine for the first time, it is important to read the whole of this installation and maintenance manual.

All necessary operations and interventions on this machine must be performed by a qualified technician.

Our technical support service will be pleased to provide any additional information you may require.

The various operations described in this manual are accompanied by recommendations or symbols to alert the user to potential risk of accident. It is vital that you understand and take notice of the different warning symbols used.

CAUTION

Warning symbol for an operation capable of damaging or destroying the machine or surrounding equipment.



Warning symbol for general danger to personnel.

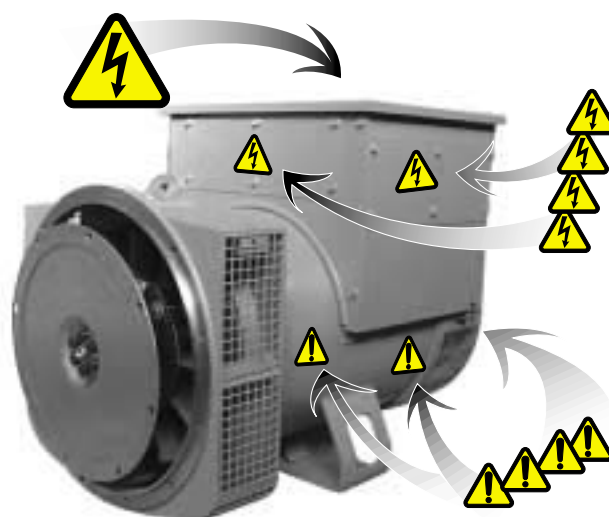


Warning symbol for electrical danger to personnel.

Note: LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

WARNING SYMBOLS

A set of self-adhesive stickers depicting the various warning symbols is included with this maintenance manual. They should be positioned as shown in the drawing below once the machine has been fully installed.



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LSA 43.2/44.2 - 4-POLE ALTERNATORS

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LSA 43.2/44.2 - 4-POLE ALTERNATORS

RECEIPT

1 - RECEIPT

1.1 - Standards and safety measures

Our alternators comply with most international standards and are compatible with:

- the recommendations of the

International Electrotechnical Commission

IEC 34-1, (EN 60034)

- the recommendations of the

International Standards Organisation ISO 8528

- the European Community directive 89/336/EEC on Electromagnetic Compatibility (EMC)

- the European Community directives

73/23/EEC and 93/68/EEC (Low Voltage Directive)

They are CE marked with regard to the LVD (Low Voltage Directive) in their role as a machine component. A declaration of incorporation can be supplied on request.

Before using your generator for the first time, read carefully the contents of this installation and maintenance manual, supplied with the machine. All operations performed on the generator should be undertaken by qualified personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components. This maintenance manual should be retained for the whole of the machine's life and be handed over with the contractual file.

The various operations described in this manual are accompanied by recommendations or symbols to alert the user to potential risks of accidents. It is vital that you understand and take notice of the different warning symbols used.

1.2 - Inspection

On receipt of your alternator, check that it has not suffered any damage in transit. If there are obvious signs of knocks, contact the transporter (you may be able to claim on their insurance) and after a visual check, turn the machine by hand to detect any malfunction.

1.3 - Identification

The alternator is identified by means of a nameplate glued to the frame.

Make sure that the nameplate on the machine conforms to your order.

The machine name is defined according to various criteria (see below).

Example of description: **LSA 43.2 M4 J6/4**

• LSA: Name used in the PARTNER range

• M: Marine

• C: Cogeneration

• T: Telecommunications

• 43.2: Machine type

• M4: Model

• J: Excitation system (C: AREP/J: SHUNT or PMG/E: COMPOUND)

• 6/4: Winding number/number of poles

Nameplate



So that you can identify your machine quickly and accurately, we suggest you fill in its specifications on the nameplate below.

1.4 - Storage

Prior to commissioning, machines should not be stored in humid conditions: at relative humidity levels greater than 90%, the machine insulation can drop very rapidly, to just above zero at around 100%. The state of the anti-rust protection on unpainted parts should be monitored.

For storage over an extended period, the machine can be placed in a sealed enclosure (heatshrink plastic for example) with dehydrating sachets inside, away from significant and frequent variations in temperature to avoid the risk of condensation during storage.

If the area is affected by vibration, try to reduce the effect of these vibrations by placing the generator on a damper support (rubber disc or similar) and turn the rotor a fraction of a turn once a fortnight to avoid marking the bearing rings.

| LEROY-SOMER | | ALTERNATEURS PARTNER ALTERNATORS | |
|---|-----------------------|--|--|
| LSA | Date | | |
| N | Hz | | |
| Min-1/R.P.M. | Protection | | |
| Cos Ø / P.F. | Cl. ther. / Th. class | | |
| Régulateur/A.V.R. | | | |
| Altitude | Masse / Weight | | |
| Rlt AV/D.E bearing | | | |
| Rlt AR/N.D.E bearing | | | |
| Graisse / Grease | | | |
| Valeurs excit / Excit. values | | | |
| en charge / full load | | | |
| à vide / at no load | | | |
| | | PUISSANCE / RATING Tension Voltage <input type="text"/> <input type="text"/> <input type="text"/> V Voltage <input type="text"/> <input type="text"/> <input type="text"/> Ph. Connex. <input type="text"/> <input type="text"/> <input type="text"/> Continue <input type="text"/> <input type="text"/> <input type="text"/> kVA Continuous <input type="text"/> <input type="text"/> <input type="text"/> kW 40 C <input type="text"/> <input type="text"/> <input type="text"/> A Secours <input type="text"/> <input type="text"/> <input type="text"/> kVA Std by <input type="text"/> <input type="text"/> <input type="text"/> kW 27 C <input type="text"/> <input type="text"/> <input type="text"/> A | |
|  LR 0021  | | Conforme à C.E.I 34-1(1994). According to I.E.C 34-1(1994). | |

Made by Leroy Somer - 1 024 930/b

LSA 43.2/44.2 - 4-POLE ALTERNATORS

TECHNICAL CHARACTERISTICS

2 - TECHNICAL CHARACTERISTICS

2.1 - Electrical characteristics

PARTNER LSA 43.2/44.2 alternators are machines without sliprings or revolving field brushes, wound as "2/3 pitch", 12-wire; the insulation is class H and the field excitation system is available in either "SHUNT", "AREP" or "PMG" versions (see sections 2.3, 2.4, 2.5). Interference suppression conforms to standard EN 55011, group 1, class B.

2.1.1 - Options

- Stator temperature detection probes
- Space heaters

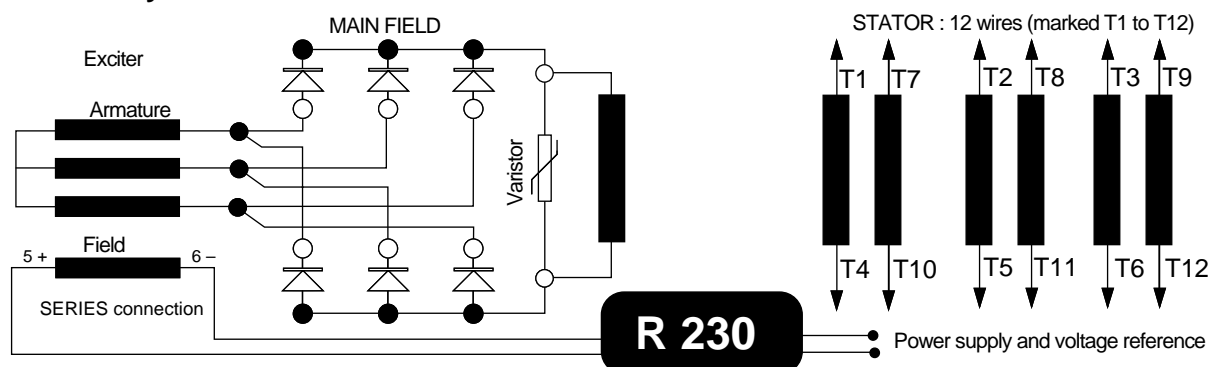
2.2 - Mechanical characteristics

- Steel frame
- End shields in cast iron
- Protected ball bearings, greased for life
- Mounting arrangements
- MD 35 STANDARD: Single-bearing with standard feet and SAE flanges/coupling discs
- B 34 STANDARD: standard feet with SAE flange and standard cylindrical shaft extension
- Drip-proof machine, self-cooled
- Degree of protection: IP 23

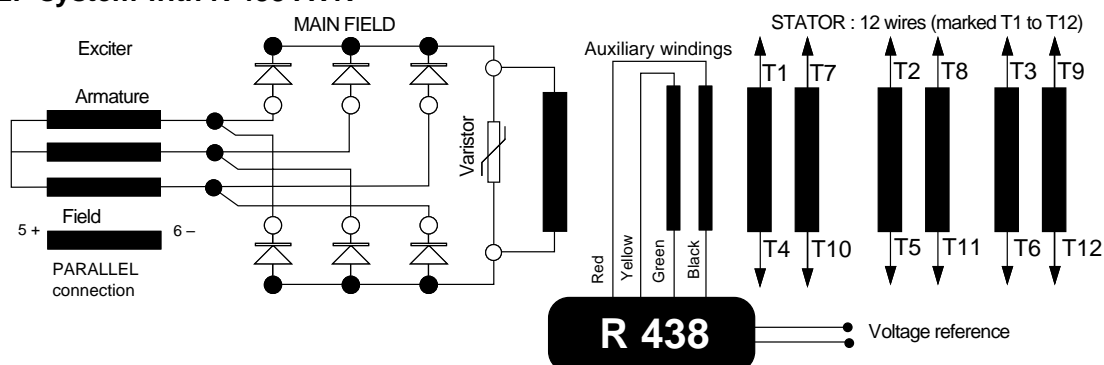
2.2.1 - Options

- Protection against harsh environments
 - Air inlet filter, air outlet labyrinth seals
- Alternators fitted with air inlet filters should be derated by 5% (power)
- To prevent excessive temperature rise caused by clogged filters, it is advisable to fit the stator winding with thermal sensors (PTC or PT100)

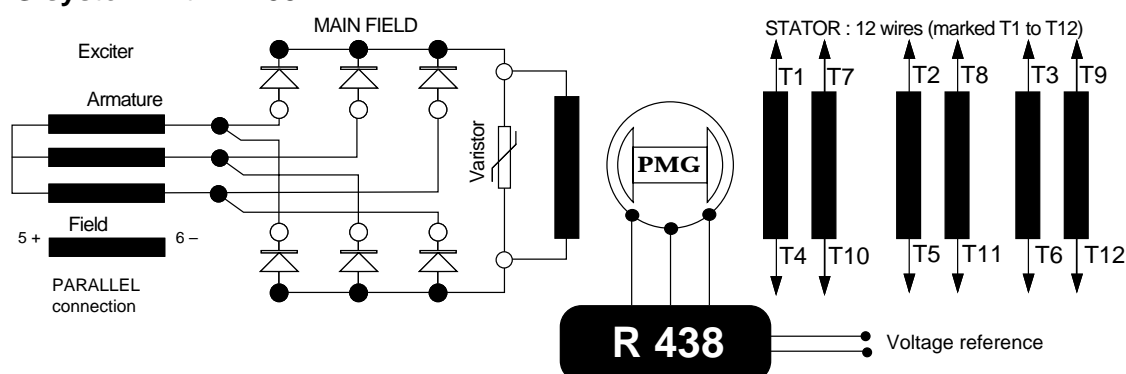
2.1.2 - SHUNT system with R 230 AVR



2.1.3 - AREP system with R 438 AVR



2.1.4 - PMG system with R 438 AVR



LSA 43.2/44.2 - 4-POLE ALTERNATORS

TECHNICAL CHARACTERISTICS

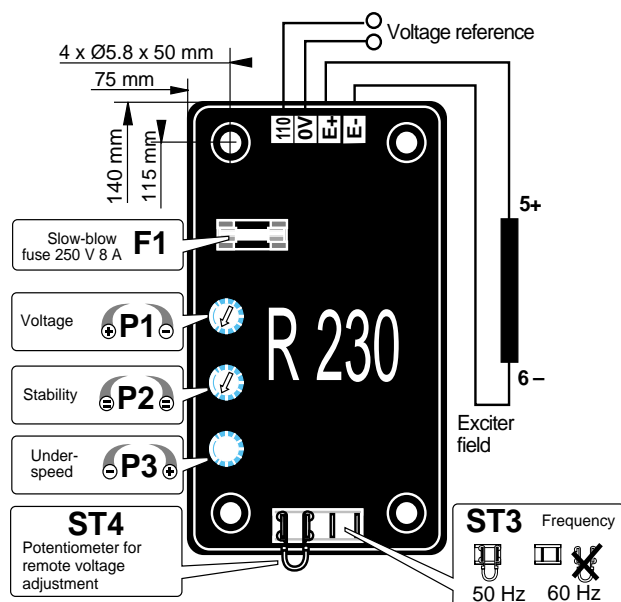
2.3 - SHUNT excitation system

The alternator with Shunt excitation is self-excited with an **R 230** voltage regulator. The regulator monitors the exciter excitation current as a function of the alternator output voltage. Very simple in design, the alternator with shunt excitation has no sustaining short-circuit capacity.



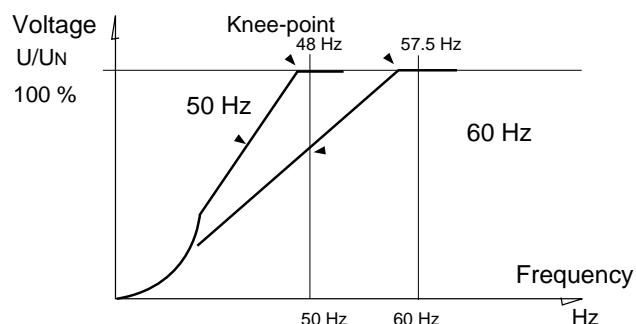
2.3.1 - R 230 AVR

- Voltage regulation: around $\pm 0.5\%$.
- Voltage sensing range 85 to 139 V (50/60 Hz)
- Rapid response time (500 ms) for a transient voltage variation amplitude of $\pm 20\%$
- Voltage setting **P1**
- Stability setting **P2**
- Power supply protected by 8 A fuse, slow-blow action (tolerates 10 A for 10 s)
- Frequency: 50 Hz with **ST3** jumper - 60 Hz without ST3 jumper
- Factory-set underspeed protection **P3**.



2.3.2 - R 230 AVR options

Potentiometer for remote voltage adjustment, 1000 Ω / 0.5 W min: adjustment range $\pm 5\%$.
Remove the **ST4** jumper.



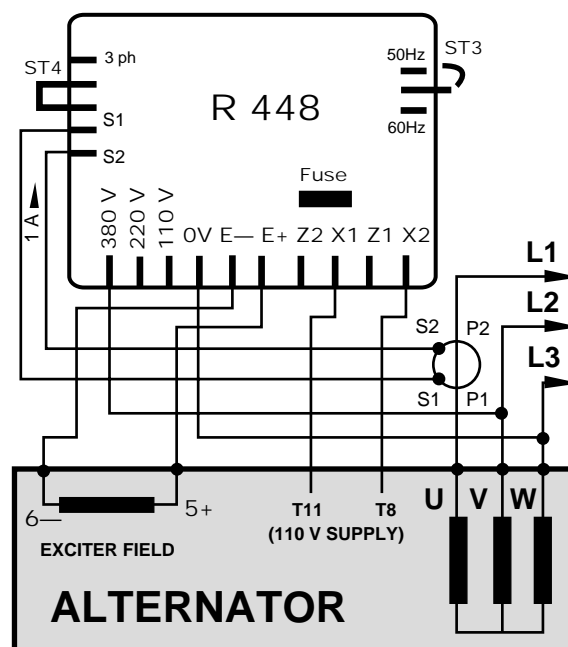
2.3.3 - R 231 AVR for dedicated single-phase

With an M or M1 dedicated single-phase winding, the alternator works with an R 231 voltage regulator. The R 231 is an R 230 with a specific excitation ceiling setting for the dedicated single-phase alternator. See the R 230 for connections, setting up and troubleshooting.

2.3.4 - Additional functions with the R 448

As an option, the LSA 43.2/44.2 SHUNT alternator can work with the R 448 AVR in order to obtain the following functions:

- Parallel operation between alternators with C.T.
- Parallel operation with the mains with C.T. and R 726 module
- 3-phase sensing (R 731 module)
- LAM function integrated in the R 448 AVR



The AVR and its modules need to be mounted outside the terminal box.

In this case, the R 448 AVR replaces the R 230.

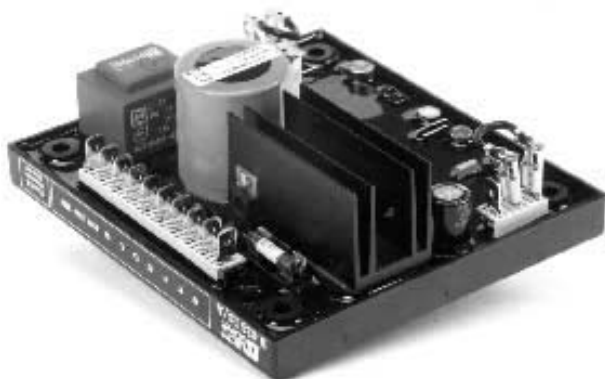
For settings and maintenance, see section 4.5 of this manual (the R 448 functions are identical to those for the R 438, & 2.4).

LSA 43.2/44.2 - 4-POLE ALTERNATORS

TECHNICAL CHARACTERISTICS

2.4 - AREP excitation system

With AREP excitation, the **R 438** electronic AVR is powered by two auxiliary windings which are independent of the voltage sensing circuit. The first winding has a voltage in proportion to that of the alternator (shunt characteristic), the second has a voltage in proportion to the stator current (compound characteristic: booster effect). The power supply voltage is rectified and filtered before being used by the AVR monitoring transistor. This principle ensures that regulation is not affected by distortions generated by the load.



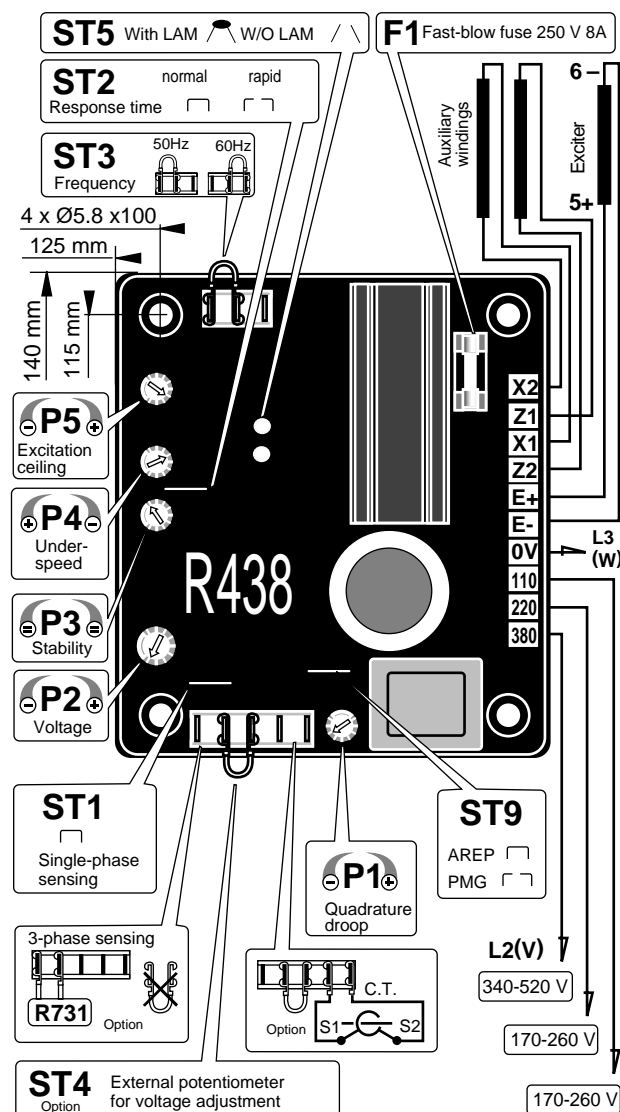
2.4.1 - R 438 AVR

- Short-circuit current = 3 IN for 10 seconds
- Standard power supply; 2 auxiliary wdgs
- Shunt power supply; max. 48 V - 50/60 Hz
- Rated overload current: 8 A - 10 s
- Electronic protection (overload, short-circuit on opening of voltage sensing circuit): excitation overload current for 10 seconds then return to approximately 1A

CAUTION

The alternator must be stopped (or the power switched off) in order to reset the protection.

- Fuses:
 - F1 on the input of auxiliary windings X1, X2
- Voltage sensing: 5 VA isolated via transformer:
 - 0-110 V terminals = 95 to 140 V
 - 0-220 V terminals = 170 to 260 V
 - 0-380 V terminals = 340 to 520 V
- Voltage regulation $\pm 0.5\%$
- Normal or rapid response time via the **ST2** jumper
- Voltage adjustment via potentiometer **P2**
(Other voltages via adapter transformer)
- Current sensing (parallel operation): C.T. 2.5 VA c1, secondary 1A (optional)
- Quadrature droop adjustment via potentiometer **P1**
- Underspeed protection (U/f) and LAM: frequency threshold adjustable via potentiometer **P4**
- Max. excitation current adjustment via **P5**: 4.5 to 8 A
- 50/60 Hz selection via the **ST3** jumper



LSA 43.2/44.2 - 4-POLE ALTERNATORS

TECHNICAL CHARACTERISTICS

2.4.2 - LAM characteristics

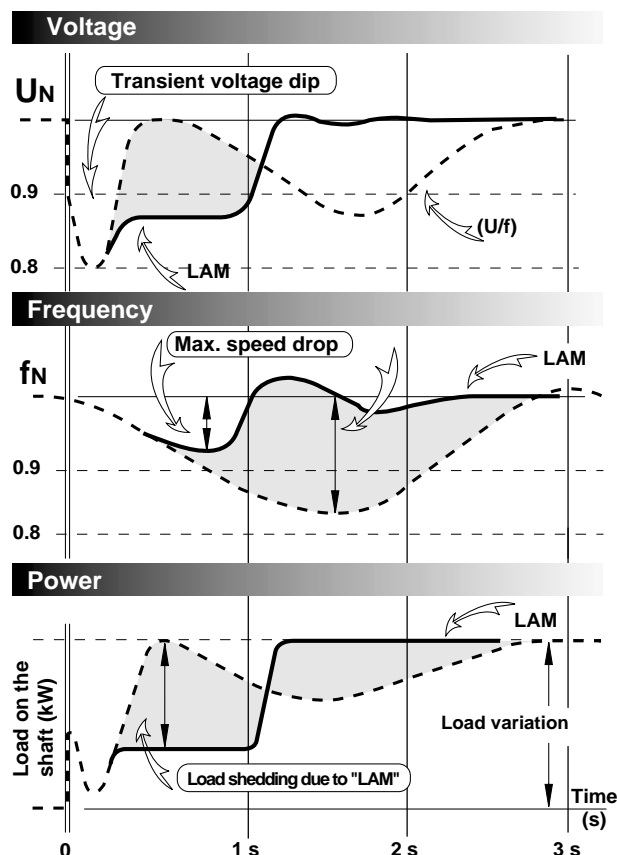
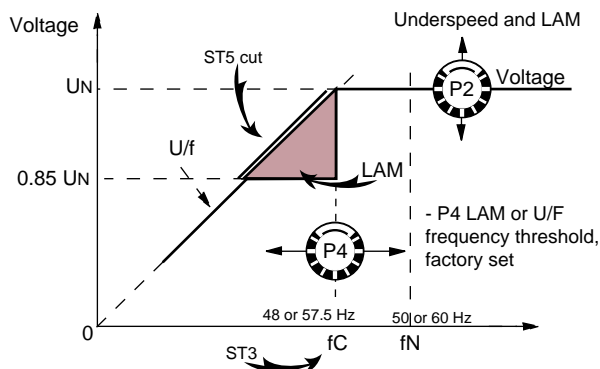
The LAM system is integrated in the R 438 AVR as standard.
Role of the "LAM" (Load Adjustment Module):

On application of a load, the rotation speed of the generator set decreases. When it passes below the preset frequency threshold, the "LAM" causes the voltage to drop by approximately 15% and consequently the amount of active load applied is reduced by approximately 25%, until the speed reaches its rated value again.

Hence the "LAM" can be used either to reduce the speed variation (frequency) and its duration for a given applied load, or to increase the applied load possible for the same speed variation (turbo-charged engines).

To avoid voltage oscillations, the trip threshold for the "LAM" function should be set approximately 2 Hz below the lowest frequency in steady state.

- LAM: action eliminated by cutting the ST5 jumper



Typical effects of the "LAM" with a diesel engine -
— with LAM · · · without LAM (U/F only)

2.4.3 - R 438 AVR options

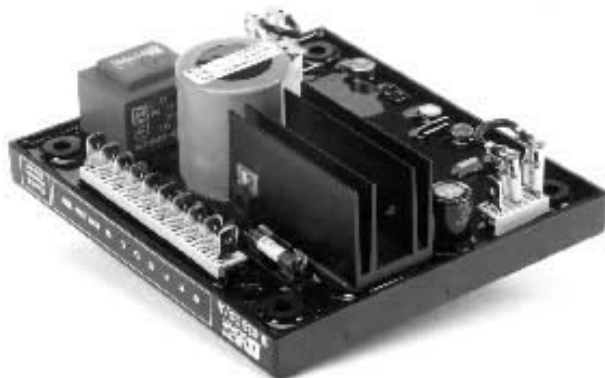
- **Current transformer** for parallel operation.
- **Remote voltage adjustment potentiometer**: 470 Ω , 0.5 W min: adjustment range $\pm 5\%$ (range limited by internal voltage potentiometer **P2**). Remove ST4 to connect the potentiometer. (A 1 k Ω potentiometer can also be used to extend the adjustment range)
- **R 731 external module**: sensing of 3-phase voltage 200 to 500 V, compatible with parallel operation. Disconnect ST1 to connect the module; set the voltage via the module potentiometer. (The R 730 module is not compatible with parallel operation.)
- **R 726 module**: 3 functions (mounted externally)
 - P.F. regulation (2F) and voltage sensing circuit before paralleling (3 F).
 - C.T. of/1A. 5 VA CL 1. (See the diagram included with this manual.)

LSA 43.2/44.2 - 4-POLE ALTERNATORS

TECHNICAL CHARACTERISTICS

2.5 - PMG excitation system

This excitation system consists of a SHUNT alternator and a "PMG" (permanent magnet generator). This is fitted at the rear of the machine and connected to the LS R 438 AVR. The PMG supplies the AVR with constant voltage which is independent of the main alternator winding. As a result the machine has a short-circuit current capacity and good immunity to distortions generated by the load. The AVR monitors and corrects the alternator output voltage by adjusting the excitation current.



2.5.1 - R 438 AVR

- Short-circuit current = 3 IN for 10 seconds
- Standard power supply: PMG
- Rated overload current: 8 A - 10 s
- Electronic protection (overload, short-circuit on opening of voltage sensing circuit): excitation overload current for 10 seconds then return to approximately 1A

CAUTION

The alternator must be stopped (or the power switched off) in order to reset the protection.

- Fuses:
 - F1 on X1, X2
- Voltage sensing: 5 VA isolated via transformer:
 - 0-110 V terminals = 95 to 140 V
 - 0-220 V terminals = 170 to 260 V
 - 0-380 V terminals = 340 to 520 V
- Voltage regulation $\pm 1\%$
- Normal or rapid response time via **ST2** jumper
- Voltage adjustment via potentiometer **P2**
- Other voltages via adapter transformer
- Current sensing (parallel operation): C.T. 2.5 VA cl1, secondary 1 A (optional)
- Quadrature droop adjustment via potentiometer **P1**
- Underspeed protection (U/f) and LAM: frequency threshold adjustable via potentiometer **P4**
- Max. excitation current adjustment via **P5**: 4.5 to 8 A
- 50/60 Hz selection via the **ST3** jumper

2.5.2 - R438 AVR options

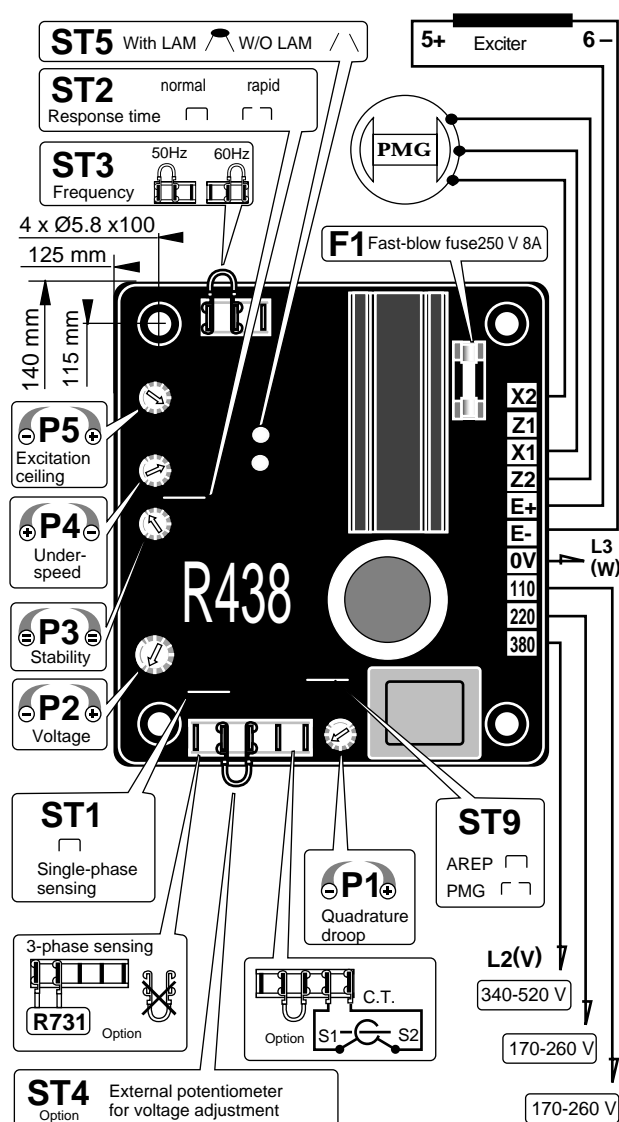
- See section 2.4.2.

2.5.3 - LAM characteristics

- See section 2.4.3.

CAUTION

The ST9 jumper must be disconnected for operation using the PMG system.



LSA 43.2/44.2 - 4-POLE ALTERNATORS INSTALLATION

3 - INSTALLATION

3.1 - Assembly

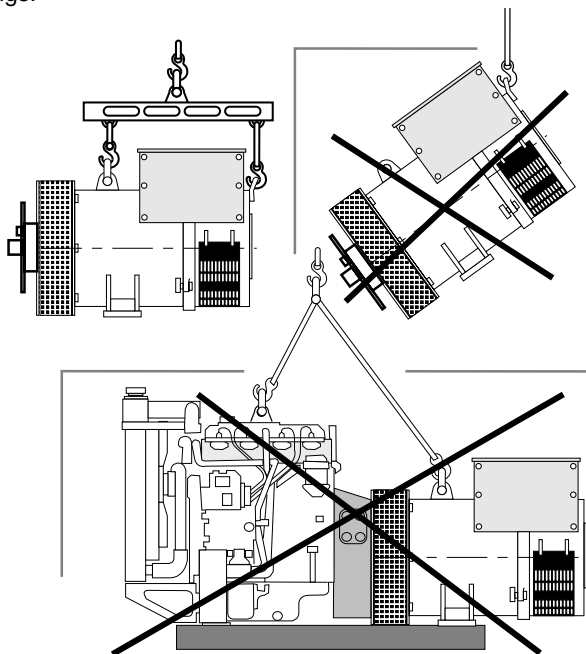


All mechanical handling operations must be undertaken using approved equipment.

Whilst being handled, the machine should remain horizontal.

3.1.1 - Handling

The generously-sized lifting rings are for handling the alternator alone. They must not be used to lift the genset. Choose a lifting system which respects the positioning of the rings.



3.1.2 - Coupling

3.1.2.1 - Single-bearing alternator

Before coupling the two machines, check that both are compatible by:

- undertaking a torsional analysis of the transmission on both units
- checking the dimensions of the flywheel and its housing, the flange, coupling discs and offset

CAUTION

When coupling the alternator to the prime mover, the holes of the coupling discs should be aligned with the flywheel holes by cranking the engine.

Do not use the alternator fan to turn the rotor.

Tighten the coupling disc screws to the recommended torque (see section 4.6.2) and check that there is lateral play on the crankshaft.

3.1.2.2 - Two-bearing alternator

- Semi-flexible coupling

Careful alignment of the machines is recommended, checking that the concentricity and parallelism of both parts of the coupling does not exceed 0.1 mm.

CAUTION

This alternator has been balanced with a half-key.

3.1.3 - Location

Ensure that the ambient temperature in the room where the alternator is placed cannot exceed 40 °C for standard power ratings (for temperatures > 40 °C, apply a derating coefficient). Fresh air, free from damp and dust, must be able to circulate freely around the air intake grilles on the opposite side from the coupling. It is essential to prevent not only the recycling of hot air from the machine or engine, but also exhaust fumes.

3.2 - Inspection prior to first use

3.2.1 - Electrical checks



Under no circumstances should an alternator, new or otherwise, be operated if the insulation is less than 1 megohm for the stator and 100,000 ohms for the other windings.

There are three possible methods for restoring the above minimum values.

- a) Dry out the machine for 24 hours in a drying oven at a temperature of approximately 110 °C (without the AVR).
- b) Blow hot air into the air inlet, having made sure that the machine is rotating with the exciter field disconnected.
- c) Run in short-circuit mode (disconnect the AVR):

- Short-circuit the three output terminals (power) using connections capable of supporting the rated current (try not to exceed 6 A/mm²)

- Insert a clamp ammeter to monitor the current passing through the short-circuit connections

- Connect a 48 Volt battery in series with a rheostat of approximately 10 ohms (50 W) to the exciter field terminals, respecting the polarity

- Open all the alternator openings fully

- Run the alternator at its rated speed, and adjust the exciter field current using the rheostat to obtain the rated output current in the short-circuit connections

Note: Prolonged standstill: In order to avoid these problems, we recommend the use of space heaters, as well as turning over the machine from time to time. Space heaters are only really effective if they are working continuously while the machine is stopped.

LSA 43.2/44.2 - 4-POLE ALTERNATORS INSTALLATION

3.2.2 - Mechanical checks

Before starting the machine for the first time, check that:

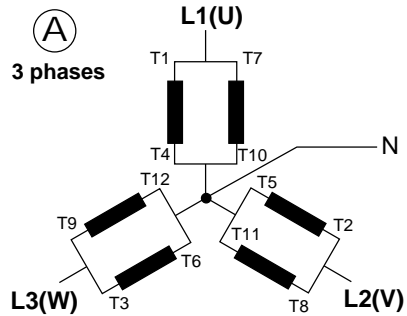
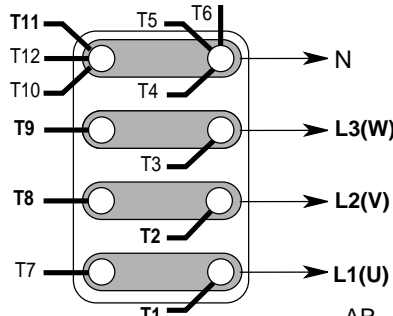
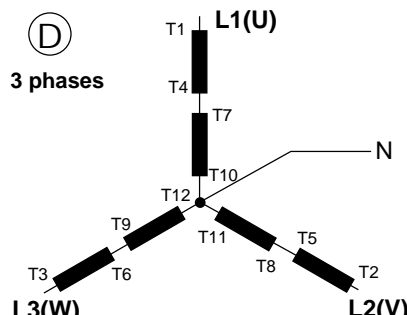
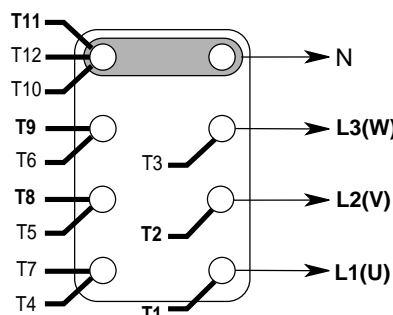
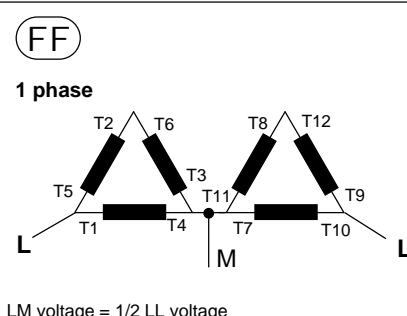
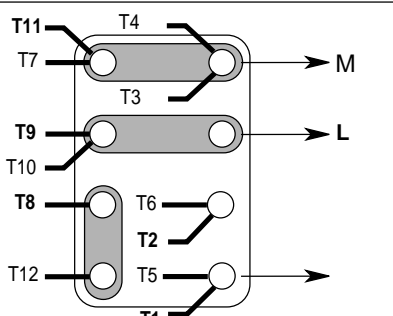
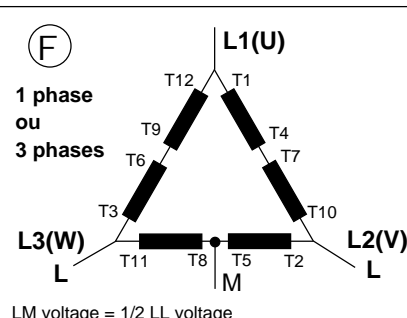
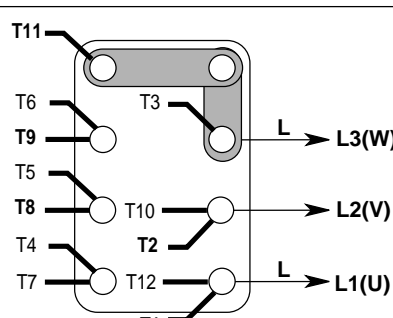
- the fixing bolts on the feet are tight
- the cooling air is drawn in freely
- the protective grilles and housing are correctly in place
- the standard direction of rotation is clockwise as seen from the shaft end (phase rotation in order 1-2-3). For anti-clockwise rotation, swap 2 and 3.
- the winding connection corresponds to the site operating voltage (see section 3.3)

3.3 - Terminal connection diagrams

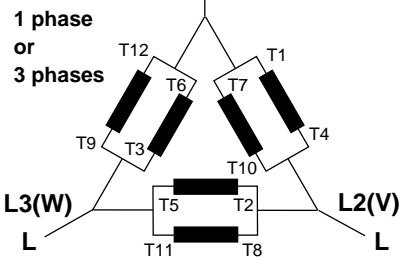
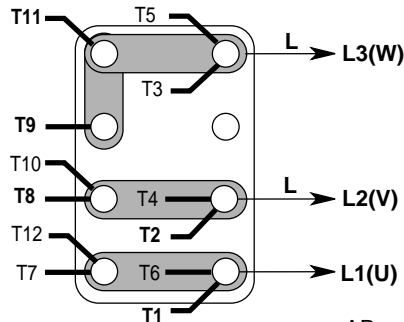
To modify the connection, change the position of the terminal cables. The winding code is specified on the nameplate.

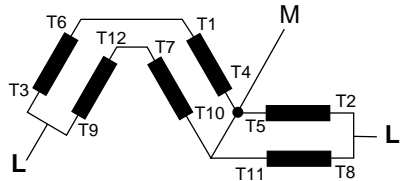
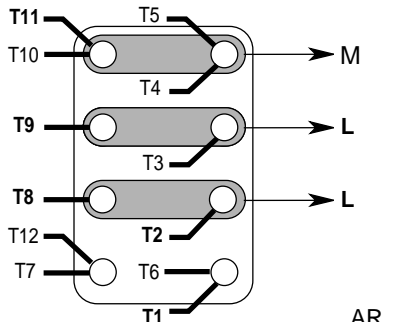


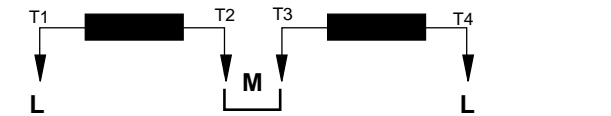
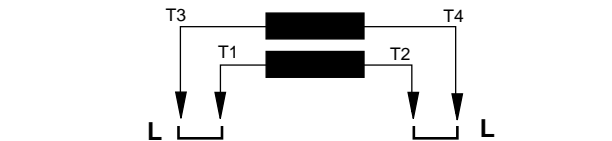
Any intervention on the alternator terminals during reconnection or checks should be performed with the machine stopped.

| Connection codes | | L.L voltage | | Factory connection | |
|---|--|--------------|--------------|--|--|
| <div><div>(A)</div><div>3 phases</div><div></div></div> | Winding | 50 Hz | 60 Hz | <div></div> | |
| | 6 | 190 - 208 | 190 - 240 | | |
| | 7 | 220 - 230 | - | | |
| | 8 | - | 190 - 208 | | |
| | R 230 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 LS voltage sensing: 0 => (T3) / 220 V => (T2) | | | | |
| <div><div>(D)</div><div>3 phases</div><div></div></div> | Winding | 50 Hz | 60 Hz | <div></div> | |
| | 6 | 380 - 415 | 380 - 480 | | |
| | 7 | 440 - 460 | - | | |
| | 8 | - | 380 - 416 | | |
| | R 230 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 LS voltage sensing: 0 => (T3) / 380 V => (T2) | | | | |
| <div><div>(FF)</div><div>1 phase</div><div></div></div> | Winding | 50 Hz | 60 Hz | <div></div> | |
| | 6 | 220 - 240 | 220 - 240 | | |
| | 7 | 250 - 260 | - | | |
| | 8 | 200 | 220 - 240 | | |
| | R 230 voltage sensing: 0 => (T1) / 110 V => (T4) R 438 LS voltage sensing: 0 => (T10) / 220 V => (T1) | | | | |
| <div><div>(F)</div><div>1 phase ou 3 phases</div><div></div></div> | Winding | 50 Hz | 60 Hz | <div></div> | |
| | 6 | 220 - 240 | 220 - 240 | | |
| | 7 | 250 - 260 | - | | |
| | 8 | 200 | 220 - 240 | | |
| | R 230 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 LS voltage sensing: 0 => (T3) / 220 V => (T2) | | | | |

LSA 43.2/44.2 - 4-POLE ALTERNATORS INSTALLATION

| Connection codes | | | L.L voltage | | | Factory connection | | |
|--|--|-----------|-------------|--|--|--------------------|--|--|
| <div><div><div>B</div></div><div>1 phase or 3 phases</div><div></div></div> | Winding | 50 Hz | 60 Hz | <div></div> | | | | |
| | 6 | 110 - 120 | 120 | | | | | |
| | 7 | 120 - 130 | - | | | | | |
| | 8 | - | 110 - 120 | | | | | |
| | R 230 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 LS voltage sensing: 0 => (T3) / 110 V => (T2) | | | AR | | | | |

| | | | | | | |
|--|--|-----------|-----------|---|--|--|
| <div><div><div>G</div></div><div>1 PH</div><div>Connection not recommended</div><div></div></div> | Winding | 50 Hz | 60 Hz | <div></div> | | |
| | 6 | 220 - 240 | 220 - 240 | | | |
| | 7 | 250 - 260 | - | | | |
| | 8 | 200 | 220 - 240 | | | |
| | R 230 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 LS voltage sensing: 0 => (T3) / 220 V => (T2) | | | AR | | |

| SINGLE-PHASE 4-WIRE - type M or M1 DEDICATED WINDING | | | | | | | | | | | | |
|--|-------|---------|----|----|---------|--|--|--|--|--|--|--|
| <div><div><div>SERIAL CONNECTION</div><div></div></div></div> | | | | | | | <div><div><div>PARALLEL CONNECTION (Not possible with LSA 44.2)</div><div></div></div></div> | | | | | |
| Voltage 50/60 Hz | | Output | | | | | | | | | | |
| L - L | L - M | Link | L | L | M | | | | | | | |
| 220 | 110 | | | | | | | | | | | |
| 230 | 115 | T2 - T3 | T1 | T4 | T2 - T3 | | | | | | | |
| 240 | 120 | | | | | | | | | | | |
| R 230 voltage sensing: 0 => (T1) / 110 V => (T2) | | | | | | | | | | | | |

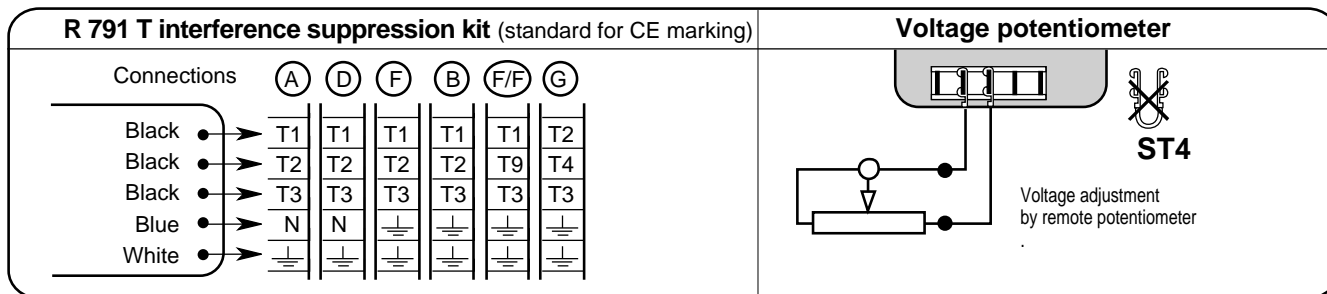
| | | | | | | |
|--|-------|---------|-------|---------|---|--|
| Voltage 50/60 Hz | | Output | | | | |
| L - L | L - M | Link | L | L | M | |
| 110 | - | | | | | |
| 115 | - | T1 - T3 | T1-T3 | T2 - T4 | - | |
| 120 | - | T2 - T4 | | | | |
| R 230 voltage sensing: 0 => (T1) / 110 V => (T2) | | | | | | |

3.3.1 - Exciter field connection

| Series connection (shunt excitation) | Parallel connection (AREP or PMG excitation) |
|--------------------------------------|--|
| | |

LSA 43.2/44.2 - 4-POLE ALTERNATORS INSTALLATION

3.3.2 - Option connection diagram



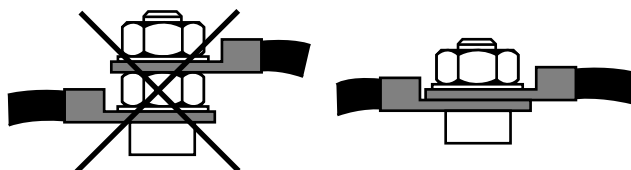
3.3.3 - Connection checks



Electrical installations must comply with the current legislation in force in the country of use.

Check that:

- The residual circuit-breaker complies with legislation on protection of personnel in force in the country of use, and has been correctly installed on the alternator power output as close as possible to the alternator. (In this case, disconnect the blue wire of the R 791 interference suppression module linking the neutral)
- Any protective devices in place have not tripped
- If there is an external AVR, the connections between the alternator and the cubicle are made in accordance with the connection diagram
- There is no short-circuit between phase or phase-neutral between the alternator output terminals and the generator set control cabinet (part of the circuit not protected by circuit-breakers or cubicle relays)
- The machine has been connected with the busbar separating the terminals as shown in the terminal connection diagram



3.3.4 - Electrical checks on the AVR

- Check that all connections have been made properly as shown in the attached wiring diagram.
- Check that the "ST3" frequency selection jumper is on the correct frequency setting
- Check whether the ST4 jumper or the remote adjustment potentiometer have been connected
- Optional operating modes (LS R 438)
 - ST1 jumper: disconnected to connect the R 731 3-phase sensing module
 - ST2 jumper: cut for rapid response time
 - ST5 jumper: cut to suppress the function

3.4 - Commissioning



The machine can only be started up and used if the installation is in accordance with the regulations and instructions defined in this manual.

The machine is tested and set at the factory. When first used with no load, make sure that the drive speed is correct and stable (see the nameplate). On application of the load, the machine should achieve its rated speed and voltage; however, in the event of abnormal operation, the machine setting can be altered (follow the adjustment procedure: see section 3.5). If the machine still operates incorrectly, the cause of the malfunction must be located (see section 4.4).

3.5 - Setting up



The various adjustments during tests must be made by a qualified engineer. Take care that the drive speed specified on the nameplate is reached before commencing adjustment. After operational testing, replace all access panels or covers.

The AVR is used to make any adjustments to the machine.

3.5.1 - R 230 adjustments (shunt system)



LSA 43.2/44.2 - 4-POLE ALTERNATORS INSTALLATION

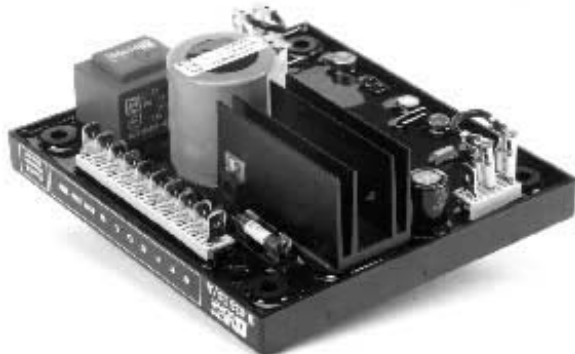
Initial potentiometer settings

- **P1** potentiometer (AVR voltage adjustment): fully anti-clockwise.
- Remote voltage adjustment potentiometer: centre position. Run the alternator at its rated speed. If the voltage does not increase, the magnetic circuit should be remagnetized (see section 4.5)
- Turn the AVR voltage adjustment potentiometer **P1** slowly until the output voltage rated value is obtained
- Adjust the stability setting using **P2**
- Sealed potentiometer **P3** is factory set at 48 Hz for 50 Hz and 57.5 Hz for 60 Hz

3.5.2 - LS R 438 adjustments (AREP or PMG system)

CAUTION

Before any intervention on the AVR, make sure that the **ST9** jumper is closed with AREP excitation and disconnected with PMG excitation.



a) Initial potentiometer settings (see table below)

- Remote voltage adjustment potentiometer: centre (ST4 jumper removed).

| Action | Factory setting | Pot. |
|--|--|------|
| Voltage minimum fully anti-clockwise | 400V - 50 Hz (Input 0 - 380 V) | |
| Stability | Not set (centre position) | |
| Threshold/LAM or U/F Threshold for underspeed protection and Max. frequency "LAM" tripping, fully anti-clockwise | If ST3 = 50 Hz (factory) = 48 Hz If ST3 = 60 Hz (factory) = 58 Hz | |
| Voltage quadrature droop (Parallel operation with C.T.) - 0 quadrature droop fully anti-clockwise. | Not set (fully anti-clockwise) | |
| Excitation ceiling Limiting of excitation current and short-circuit current, minimum fully anti-clockwise | 10 A maximum | |

b) Install a D.C. analogue voltmeter (needle dial) cal. 50 V on terminals E+, E- and an A.C. voltmeter cal 300, 500 or 1000 V on the alternator output terminals.

c) Make sure that the **ST3** jumper is positioned on the desired frequency (50 or 60 Hz).

d) Voltage potentiometer **P2** at minimum, fully anti-clockwise.

e) Turn the V/Hz potentiometer **P4** fully clockwise.

f) Stability potentiometer **P3** to around 1/3 of the anti-clockwise limit.

g) Start the engine and set its speed to a frequency of 48 Hz for 50 Hz, or 58 for 60 Hz.

h) Set the output voltage to the desired value using **P2**.

- rated voltage UN for solo operation (eg. 400 V)
 - or UN + 2 to 4% for parallel operation with C.T. (eg. 410 V -)
- If the voltage oscillates, use P3 to make adjustments (try both directions) observing the voltage between E+ and E- (approx. 10 V D.C.). The best response times are obtained at the limit of the instability. If no stable position can be obtained, try disconnecting or replacing the ST2 jumper (normal/rapid).

i) Check LAM operation: **ST5** closed

j) Turn potentiometer **P4** slowly anti-clockwise until there is a significant voltage drop (approximately 15%)

k) Vary the frequency (speed) around 48 or 58 Hz according to the operating frequency, and check the change in voltage from that observed previously (~ 15%).

l) Readjust the speed of the unit to its rated no-load value.

Adjustments in parallel operation

Before any intervention on the alternator, make sure that the speed droop is identical for all engines.

m) Preset for parallel operation (with C.T. connected to S1, S2 on connector J2)

Potentiometer P1 (quadrature droop) in centre position.

Apply the rated load (P.F. = 0.8 inductive).

The voltage should drop by 2 to 3%. If it increases, swap the 2 incoming wires of the C.T. secondary.

n) The no-load voltages should be identical for all the alternators intended to run in parallel.

- Couple the machines in parallel
- By adjusting the **speed**, try to obtain **0 kW** power exchange
- By altering the voltage setting P2 or Rhe on one of the machines, try to cancel (or minimize) the **current** circulating between the machines

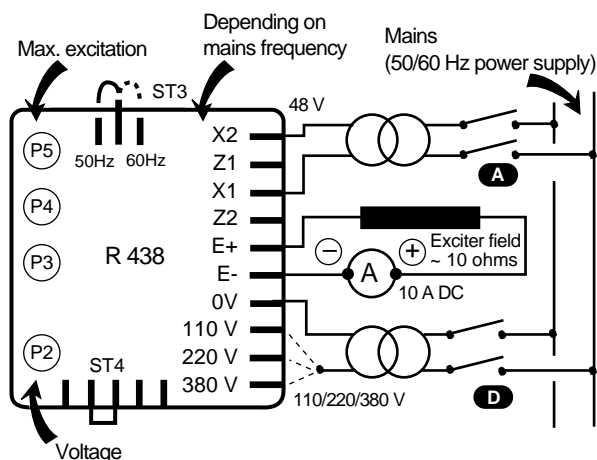
From now on, do not touch the voltage settings.

o) Apply the available load (the setting is only correct if a **reactive** load is available).

- By altering the **speed**, match the **kW** (or divide the rated power of the units proportionally)
- By altering the quadrature droop potentiometer **P1**, match or divide the **currents**

LSA 43.2/44.2 - 4-POLE ALTERNATORS INSTALLATION

3.5.3 - Max. excitation setting (excitation ceiling)



Static adjustment of the current limit, potentiometer P5 (factory setting: 7.5 A, fuse rating: 8 A - 10 seconds).

The factory setting corresponds to that of the excitation current required to obtain a 3-phase short-circuit current of approximately 3 In at 50 Hz for industrial power, unless otherwise specified (*).

A static method can be used to reduce this value or adapt the Isc to the actual operating power (derated machine), which is safer for the alternator and the installation. Disconnect power supply wires X1, X2 and Z1, Z2, and the voltage reference (0-110 V-220V-380 V) on the alternator.

Connect the mains power supply (200-240 V) as indicated (X1, X2): 48 V). Install a 10A D.C. ammeter in series with the exciter field. Turn P5 fully anti-clockwise and activate the power supply. If there is no output current from the AVR, turn potentiometer P2 (voltage) clockwise until the ammeter indicates a stable current. Switch the power supply off, then on again, turn P5 clockwise until the required max. current is obtained (no more than 8 A).

Checking the internal protection:

Open switch (D): the excitation current should increase to its preset ceiling, remain at that level for ≥ 10 seconds and then drop to < 1 A.

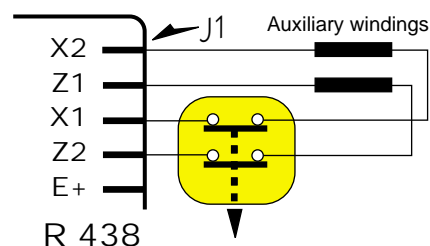
To reset, switch off the power supply by opening switch (A).

Note: After setting the excitation ceiling as described, adjust the voltage again (see section 3.5.2)

(*) In some countries it is a legal requirement to have a short-circuit current of 3 In, so as to offer selective protection.

3.5.4 - Special type of use

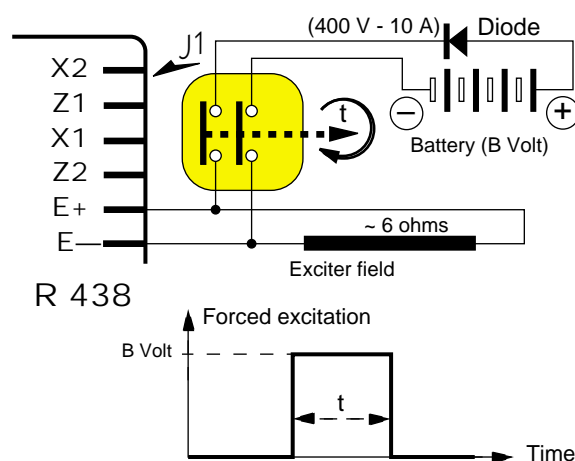
- Field weakening



The exciter is switched off by disconnecting the AVR power supply (1 wire on each auxiliary winding) - contact rating 10 A - 250 V A.C.

Connection is identical for resetting the AVR internal protection.

- Field forcing



| Applications | B volts | Time t |
|-----------------------------------|----------------|---------------|
| Guaranteed voltage build-up | 6 (1 A) | 1 - 2 s |
| Parallel operation, de-energized | 6 (1 A) | 1 - 2 s |
| Parallel operation, at standstill | 12 (2 A) | 5 - 10 s |
| Frequency starting | 24 (4 A) | 5 - 10 s |
| Sustained voltage on overload | 24 (4 A) | 5 - 10 s |

LSA 43.2/44.2 - 4-POLE ALTERNATORS SERVICING / MAINTENANCE

4 - SERVICING / MAINTENANCE

4.1 - Safety measures



Servicing or troubleshooting must be carried out strictly in accordance with instructions so as to avoid the risk of accidents and to maintain the machine in its original state.



All such operations performed on the alternator should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components.

Before any intervention on the machine, ensure that it cannot be started by a manual or automatic system and that you have understood the operating principles of the system.

4.2 - Regular maintenance

4.2.1 - Checks after start-up

After approximately 20 hours of operation, check that all fixing screws on the machine are still tight, plus the general state of the machine and the various electrical connections in the installation.

4.2.2 - Cooling circuit

It is advisable to check that circulation of air is not reduced by partial blocking of the air intake and outlet grilles: mud, fibre, grease, etc.

4.2.3 - Bearings

The bearings are permanently greased: approximate life of the grease (depending on use) = 20,000 hours or 3 years. Monitor the temperature rise in the bearings, which must not exceed 60 °C above the ambient temperature. Should this value be exceeded, the machine must be stopped and checks carried out.

4.2.4 - Electrical servicing

Cleaning product for the windings

CAUTION

Do not use: trichlorethylene, perchlorethylene, trichloroethane or any alkaline products.

Certain strictly defined pure volatile degreasing agents can be used, such as:

- Normal petrol (without additives); inflammable
- Toluene (slightly toxic); inflammable
- Benzene (or benzine, toxic); inflammable

- Cyclohexane (non toxic); inflammable

Cleaning of the stator, rotor, exciter and diode bridge

The insulating components and the impregnation system are not at risk of damage from solvents (see the list of authorized products).

Avoid letting the cleaning product run into the slots. Apply the product with a brush, sponging frequently to avoid accumulation in the housing. Dry the winding with a dry cloth. Let any traces evaporate before reassembling the machine.

4.2.5 - Mechanical servicing

CAUTION

Cleaning the machine using a water spray or a high-pressure washer is strictly prohibited.

Any problems arising from such treatment are not covered by our warranty.

The machine should be cleaned with a degreasing agent, applied using a brush. Check that the degreasing agent will not affect the paint.

Compressed air should be used to remove any dust.

If filters have been added to the machine after manufacture and do not have thermal protection, the service personnel should clean the air filters periodically and systematically, as often as necessary (every day in very dusty atmospheres).

Cleaning can be performed using water for dry dust or in a bath containing soap or detergent in the case of greasy dust. Petrol or chloroethylene can also be used.

After cleaning the alternator, it is essential to check the winding insulation (see sections 3.2 and 4.8).

4.3 - Fault detection

If, when commissioned, the alternator does not work normally, the source of the malfunction must be identified.

To do this, check that:

- the protective devices are fitted correctly
 - the connections comply with the diagrams in the manuals supplied with the machine
 - the speed of the unit is correct (see section 1.3)
- Repeat the operations defined in section 3

LSA 43.2/44.2 - 4-POLE ALTERNATORS SERVICING / MAINTENANCE

4.4 - Mechanical defects

| Fault | | Action |
|----------------------|---|---|
| Bearing | Excessive overheating of one or both bearings (temperature > 80 °C on the bearing retainers with or without abnormal noise) | <ul style="list-style-type: none"> - If the bearing has turned blue or if the grease has turned black, change the bearing. - Bearing not properly seated. - End shields misaligned (flanges not properly fitted). |
| Temperature abnormal | Excessive overheating of alternator frame (more than 40° C above the ambient temperature) | <ul style="list-style-type: none"> - Air flow (intake-outlet) partially clogged or hot air is being recycled from the alternator or engine - Alternator operating at too high a voltage (> 105% of Un on load) - Alternator overloaded |
| Vibration | Excessive vibration | <ul style="list-style-type: none"> - Misalignment (coupling) - Defective mounting or play in coupling - Rotor balancing fault |
| | Excessive vibration and humming noise coming from the machine | <ul style="list-style-type: none"> - Alternator operating in single-phase mode (single-phase load or faulty contactor or installation fault) - Stator short-circuit |
| Abnormal noise | Alternator damaged by a significant impact, followed by humming and vibration | <ul style="list-style-type: none"> - System short-circuit - Mis-paralleling <p>Possible consequences</p> <ul style="list-style-type: none"> - Broken or damaged coupling - Broken or bent shaft end - Shifting and short-circuit of main field - Fan fractured or coming loose on shaft - Irreparable damage to rotating diodes or AVR |

4.5 - Electrical faults

| Fault | Action | Effect | Check/Cause |
|---|---|--|---|
| No voltage at no load on start-up | Connect between E- and E+ a new battery of 4 to 12 volts, respecting the AVR polarities, for 2 to 3 seconds | The alternator builds up and its voltage is still correct when the battery is removed. | - Lack of residual magnetism |
| | | The alternator builds up but its voltage does not reach the rated value when the battery is removed. | - Check the connection of the voltage reference to the AVR - Faulty diodes - Armature short-circuit |
| | | The alternator builds up but its voltage disappears when the battery is removed | - Faulty AVR - Field windings disconnected - Main field winding open circuit. Check the resistance |
| Voltage too low | Check the drive speed | Correct speed | Check the AVR connections (AVR may be faulty) - Field windings short-circuited - Rotating diodes burnt out - Main field winding short-circuited - Check the resistance |
| | | Speed too low | Increase the drive speed (Do not touch the AVR voltage pot. (P2) before running at the correct speed.) |
| Voltage too high | Adjust AVR voltage potentiometer | Adjustment ineffective | Faulty AVR |
| Voltage oscillations | Adjust AVR stability potentiometer | If no effect: try normal/rapid recovery modes (ST2) | - Check the speed: possibility of cyclic irregularity - Loose connections - Faulty AVR - Speed too low when on load (or LAM set too high) |
| Voltage correct at no load and too low when on load (*) | Run at no load and check the voltage between E+ and E- on the AVR | Voltage between E+ and E-SHUNT < 20 V - AREP/PMG < 10 V | - Check the speed (or LAM set too high) |
| | | Voltage between E+ and E-SHUNT > 30 V - AREP/PMG > 15 V | - Faulty rotating diodes - Short-circuit in the main field. Check the resistance - Faulty exciter armature |
| (*) Caution: For single-phase operation, check that the sensing wires coming from the AVR are correctly connected to the operating terminals | | | |
| Voltage disappears during operation (**) | Check the AVR, the surge suppressor, the rotating diodes, and replace any defective components | The voltage does not return to the rated value | - Exciter winding open circuit - Faulty exciter armature - Faulty AVR - Main field open circuit or short-circuited |
| (**) Caution: Internal protection may be activated (overload, open circuit, short-circuit) | | | |

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4.5.1 - Checking the winding

You can check the winding insulation by performing a high voltage test. In this case, you must disconnect all AVR wires.

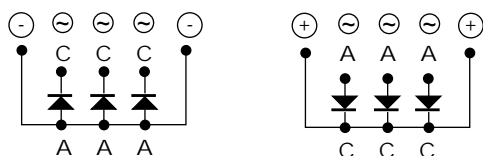
CAUTION

Damage caused to the AVR in such conditions is not covered by our warranty.

4.5.2 - Checking the diode bridge

LSA 43.2 / 44.2 Diode bridge

Anode  Cathode



A diode in good working condition allows the current to flow in only one direction, from anode to cathode.

4.5.3 - Checking the windings and rotating diodes using separate excitation

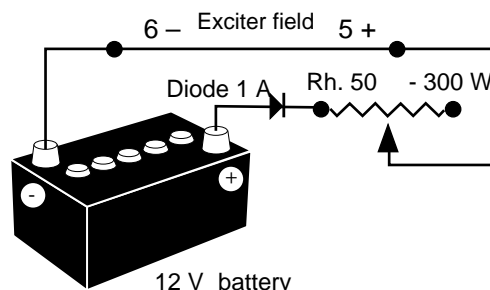


During this procedure, make sure that the alternator is disconnected from any external load and inspect the terminal box to check that the connections are fully tightened.

- 1) Stop the unit, disconnect and isolate the AVR wires.
- 2) There are two ways of creating an assembly with separate excitation.

Assembly A: Connect a 12 V battery in series with a rheostat of approximately 50 ohms - 300 W and a diode on both exciter field wires (5+) and (6-).

ASSEMBLY A



Assembly B: Connect a "Variac" variable power supply and a diode bridge on both exciter field wires (5+) and (6-).

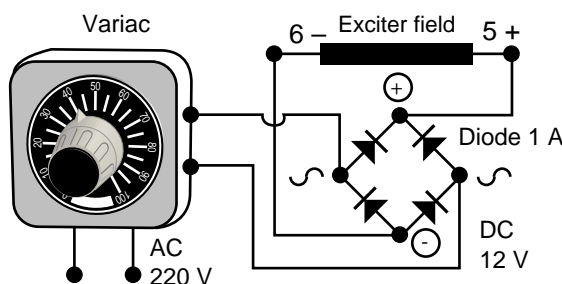
Both these systems should have characteristics which are compatible with the field excitation power of the machine (see the nameplate).

3) Run the unit at its rated speed.

4) Gradually increase the exciter field supply current by adjusting the rheostat or the Variac and measure the output voltages on L1 - L2 - L3, checking the excitation voltage at no load and at full load (see machine nameplate or ask for the factory test report).

When the output voltage is at its rated value and balanced within 1% for the rated excitation level, the machine is in good working order. The fault therefore comes from the AVR or its associated wiring (ie. sensing, auxiliary windings).

ASSEMBLY B



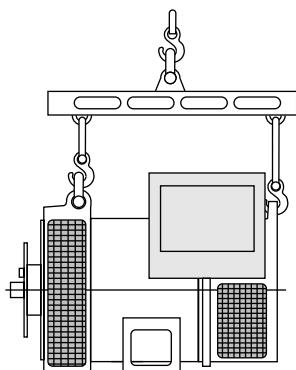
LSA 43.2/44.2 - 4-POLE ALTERNATORS

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4.6 - Dismantling, reassembly (see sections 5.5.1/5.5.2)



During the warranty period, this operation should only be carried out in an LEROY-SOMER approved workshop or in our factory, otherwise the warranty may be invalidated. Whilst being handled, the machine should remain horizontal (rotor not locked when moved).



4.6.1 - Tools required

To fully dismantle the machine, we recommend using the tools listed below:

- 1 ratchet spanner + extension
- 1 torque wrench
- 1 set of flat spanners: 7 mm, 8 mm, 10 mm, 12 mm
- 1 socket set: 8 mm, 10 mm, 13 mm, 16 mm, 18 mm, 21 mm, 22 mm, 24 mm
- 1 size 5 Allen key (eg. Facom: ET5)
- 1 size 6 Allen key (eg. Facom: ET6)
- 1 size 10 Allen key (eg. Facom: ET6)
- 1 size 12 Allen key (eg. Facom: ET6)
- 1 T20 and T30 TORX bit
- 1 puller (eg. Facom: U35)
- 1 puller (eg. Facom: U32/350).

4.6.2 - Screw tightening torque

| IDENTIFICATION | screw Ø | Torque N.m |
|----------------------------|---------|------------|
| Field terminal block screw | M4 | 4 N.m |
| Field screw | M6 | 10 N.m |
| Diode bridge/RP | M6 | 5 N.m |
| Diode nut | M5 | 4 N.m |
| 43.2 tie rod | M12 | 57 Nm |
| 44.2 tie rod | M14 | 90 Nm |
| Earth screw | M8 | 26 Nm |
| 43.2 disc/shaft screw | M12 | 110 Nm |
| 44.2 disc/shaft screw | M14 | 180 Nm |
| 44.2 turbine screw | M6 | 5 Nm |
| Grille screws | M6 | 5 Nm |
| Cover screws | M6 | 5 Nm |
| Terminal block nut | M10 | 20 Nm |

4.6.3 - Access to connections and the regulation system

The terminals are accessed directly by removing the terminal box lid [48].

To access the AVR adjustment potentiometers, the side plate [367] should be removed.

4.6.4 - Accessing, checking and replacing diodes

4.6.4.1 - Dismantling

- Remove the air intake grille [51]
- Remove the surge suppressor [347]
- Disconnect the 6 diodes using an ohmmeter or a battery lamp (see section 4.5.2)

4.6.4.2 - Reassembly

- Replace the bridges, respecting the polarity (see section 4.5.1)
- Replace the surge suppressor [347]
- Refit the air intake grille [51]
- Replace the terminal box lid [48]

4.6.5 - Replacing the NDE bearing on single-bearing machines

4.6.5.1 - Dismantling

- Remove the terminal box lid [48]
- Remove the air intake grille [51]
- Unscrew the fixing clamps on the power output cables, remove the connector from the exciter and the R 791 module.
- Remove the 4 nuts on the tie rods
- Remove the NDE shield [36] using a puller: eg. U.32 - 350 (FACOM)
- Remove the ball bearing [70] using a screw puller



4.6.5.2 - Reassembly

- Heat the inner slipring of a new bearing by induction or in a drying oven at 80 °C (do not use an oil-bath) and fit it to the machine.

- Place the preloading wavy washer [79] in the shield and fit a new O ring seal [349].

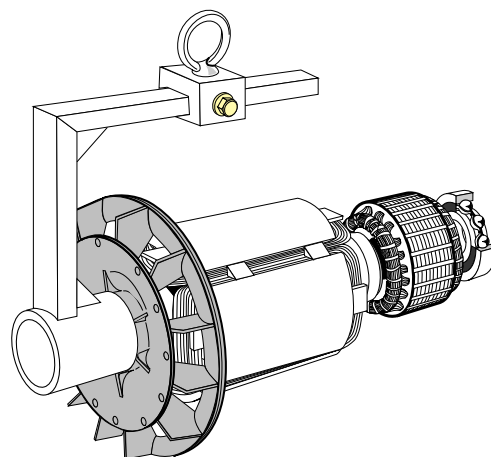
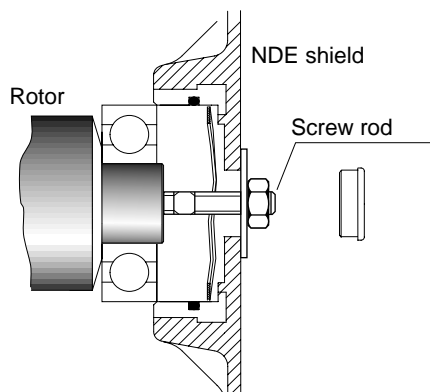
Refit the NDE shield and pass the bundle of wires between the top bars of the shield.

- Refit the fixing clamps on the cables, the R 791 module and the exciter connector.

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- Refit the air intake grille [51].
- Replace the terminal box lid [48].



4.6.6 - Replacing the bearings on two-bearing machines

4.6.6.1 - Dismantling

- Uncouple the alternator from the prime mover.
- Remove the 8 assembly screws.
- Remove the DE shield [30].
- Remove the NDE shield (see section 4.6.5.1)
- Remove both ball bearings [60] and [70] using a puller with a central screw.

4.6.6.2 - Reassembly

- Heat the new bearings by induction or in a drying oven at 80 °C (do not use an oil-bath) and fit them to the machine.
- Check that both the preloading wavy washer [79] and the new O ring seal [349] have been fitted on the NDE shield [36]. Refit the NDE shield and pass the bundle of wires between the top bars of the shield.
- Refit the DE shield [30] and tighten the 4 fixing screws.
- Check that the machine assembly is correctly mounted and that all screws are tightened.

4.6.7 - Accessing the main field and stator

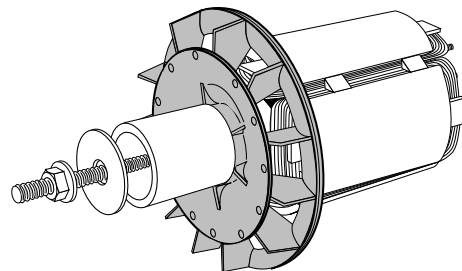
4.6.7.1 - Dismantling

- Follow the procedure for dismantling the bearings (see sections 4.6.5.1 and 4.6.6.1)
- Remove the coupling disc (single-bearing machine) or the DE end shield (two-bearing machine) and insert a tube of the corresponding diameter on the shaft end or a support made according to the following diagram.
 - Rest the rotor on one of its poles, then slide it out. Use the tube as a lever arm to assist dismantling.
 - After extraction of the rotor, be careful not to damage the fan. If the fan is dismantled, it is essential that it is replaced for the 43.2.

NOTE: If intervention is required on the main field (rewinding, replacement of components), the rotor assembly must be rebalanced.

4.6.7.2 - Reassembling the main field

- Follow the dismantling procedure in reverse order. Take care not to knock the windings when refitting the rotor in the stator.
- If the fan is being replaced on the 43.2, assemble the parts as shown in the following diagram. Fit a tube and a threaded screw. On the 44.2 the fan is fixed by screws on the hub.



Follow the procedure for reassembling the bearings (see sections 4.6.5.2 and 4.6.6.2).



After operational testing, replace all access panels or covers.

4.7 - Installation and maintenance of the PMG

For the LSA 43.2 and LSA 44.2, the PMG reference is PMG 1.

4.7.1 - Mechanical characteristics

The components are:

- An adaptation shaft (to position the rotor on the shaft extension)
- A tie rod and nut for assembling the rotor on the shaft
- A rotor with 16 magnets
- An assembly consisting of: housing + wound stator + plastic connection sheath + plastic ferrules
- The housing closure cover (4 CBLXS M5 screws)

LSA 43.2/44.2 - 4-POLE ALTERNATORS

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- 4 HM6 screws (for fixing the housing to the NDE shield)

If mounting in kit form, follow the following instructions (see section 5.4):

1 - Remove the PMG cover [297] and the alternator NDE shield seal.

2 - Mount the PMG housing assembly [290] on the shield using the 4 HM6 screws.

3 - Put a coating of anti-vibration adhesive on the tie rod [295] and fix it on the alternator shaft extension.

4 - Mount the magnetized rotor on the adaptation shaft, then using 2 threaded rods screwed into the rotor, slide the assembly onto the tie rod.

5 - Install the cable gland washer [296].

6 - Tighten the assembly with the M10 nut.

7 - Close the PMG with the cover [297].

8 - Pierce the cover (Ø 21 hole) and insert the plastic sheath and its ferrule.

9 - Connect the PMG to the AVR (see sections 2.5 and 4.7.2).

4.7.2 - Electrical connection

Mounting the PMG-1 on a SHUNT machine

(when using an R438):

- Disconnect the connection wires from the R 230/A and remove the AVR.

- Take out both the R 230/A voltage reference wires, marked 2 and 3, by removing them from the terminals (T8 and T11) in which they are inserted.

- Use these same wires for voltage sensing on the R 438 by inserting them in terminals T2 (wire 2) and T3 (wire 3).

- Fit the AVR support plate fitted with the R 438 (2 HM6 screws tightened to 10 Nm).

- Connect the 3 PMG wires (14/15/16), the 2 exciter field wires (5/6) and the 2 previously mentioned voltage sensing wires (2/3) according to the connection diagram no. 2725-02-98.

- Modify the connection by replacing the single jumper on the connector located on the terminal box rear panel with 2 jumpers (see internal connection diagram).

Mounting the PMG-1 on an AREP machine

- Connect the 3 PMG wires (14/15/16), to terminals X1, X2, Z2 on the AVR. The 4 auxiliary winding wires X1.X2.Z1.Z2 should be isolated using the domino fitting supplied with the kit. Both exciter field wires (5/6) and the voltage sensing wires (2/3) remain in place.

Electrical characteristics of the PMG

Stator phase/phase resistance 20 °C: 0.7 Ω

No-load voltage : 73 V

4.8 - Electrical characteristics

Table of average values:

Alternator - 2 and 4 poles - 50 Hz/60 Hz - Winding n° 6 and M or M1 connected in dedicated single-phase. (400 V for the excitation values).

The voltage and current values are given for no-load operation and operation at rated load with separate field excitation. All values are given at ± 10% (for exact values, consult the test report) and are subject to change without prior warning. For 60 Hz machines, the resistance values are the same and the excitation current "i exc" is approximately 5 to 10% weaker.

4.8.1 - 3-phase LSA 43.2: 4-pole, SHUNT excitation

Resistances at 20 °C (Ω)

| LSA 43.2 | S1 | S2 | S3 | M4 | L6 | L7 |
|------------|-------|-------|-------|-------|-------|-------|
| Stator L/N | 0.155 | 0.155 | 0.128 | 0.105 | 0.083 | 0.063 |
| Rotor | 1.35 | 1.35 | 1.41 | 1.57 | 1.76 | 1.96 |
| Field | 19.5 | 19.5 | 19.5 | 19.5 | 19.5 | 19.5 |
| Armature | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |

Field excitation current i exc (A) - 400 V - 50 Hz

"i exc": excitation current of the exciter field

| LSA 43.2 | S1 | S2 | S3 | M4 | L6 | L7 |
|----------|-----|-----|-----|-----|-----|-----|
| No load | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 | 0.5 |
| On load | 1.6 | 1.6 | 1.7 | 1.6 | 1.5 | 1.6 |

4.8.2 - 3-phase LSA 43.2: 4-pole, AREP excitation

Resistances at 20 °C (Ω)

| LSA 43.2 | S1 | S2 | S3 | M4 | L6 | L7 |
|--------------------|-------|-------|-------|-------|-------|-------|
| Stator L/N | 0.155 | 0.155 | 0.128 | 0.105 | 0.083 | 0.063 |
| Rotor | 1.35 | 1.35 | 1.41 | 1.57 | 1.76 | 1.96 |
| X1, X2 auxil. wdgs | 0.32 | 0.32 | 0.29 | 0.26 | 0.26 | 0.21 |
| Z1, Z2 auxil. wdgs | 0.52 | 0.52 | 0.5 | 0.51 | 0.44 | 0.4 |
| Field | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Armature | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |

Field excitation current i exc (A) - 240 V - 60 Hz

"i exc": excitation current of the exciter field

| LSA 43.2 | S1 | S2 | S3 | M4 | L6 | L7 |
|----------|-----|-----|-----|-----|-----|-----|
| No load | 1 | 1 | 1 | 1 | 0.9 | 1 |
| On load | 3.2 | 3.2 | 3.4 | 3.2 | 3 | 3.2 |

LSA 43.2/44.2 - 4-POLE ALTERNATORS

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4.8.3 - Dedicated single-phase LSA 43.2: 4-pole, SHUNT excitation (60 Hz only)

Resistances at 20 °C (Ω)

| LSA 43.2 | S1 | S2 | S3 | M4 | L6 | L7 |
|------------|-------|-------|-------|-------|-------|-------|
| Stator L/N | 0.058 | 0.058 | 0.046 | 0.037 | 0.027 | 0.019 |
| Rotor | 1.35 | 1.35 | 1.41 | 1.57 | 1.76 | 1.96 |
| Field | 13.9 | 13.9 | 13.9 | 13.9 | 13.9 | 13.9 |
| Armature | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |

Field excitation current i_{exc} (A) -240 V -60 Hz

" i_{exc} ": excitation current of the exciter field

| LSA 43.2 | S1 | S2 | S3 | M4 | L6 | L7 |
|----------|------|------|------|------|------|------|
| No load | 0.59 | 0.59 | 0.66 | 0.61 | 0.62 | 0.74 |
| On load | 1.44 | 1.68 | 1.65 | 1.48 | 1.48 | 1.46 |

4.8.4 - 3-phase LSA 44.2: 4-pole, SHUNT excitation

Resistances at 20 °C (Ω)

| LSA 44.2 | VS3 | VS4 | S7 | M9 | L11 | L12 |
|------------|-------|-------|-------|-------|-------|-------|
| Stator L/N | 0.046 | 0.046 | 0.036 | 0.024 | 0.019 | 0.019 |
| Rotor | 2,51 | 2,51 | 2,91 | 3.32 | 3.66 | 3.66 |
| Field | 19.5 | 19.5 | 19.5 | 19.5 | 19.5 | 19.5 |
| Armature | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

Field excitation current i_{exc} (A) - 400 V - 50 Hz

" i_{exc} ": excitation current of the exciter field

| LSA 44.2 | VS3 | VS4 | S7 | M9 | L11 | L12 |
|----------|-----|-----|-----|-----|-----|-----|
| No load | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 |
| On load | 1.6 | 1.6 | 1.7 | 1.6 | 1.5 | 1.6 |

4.8.5 - 3-phase LSA 44.2: 4-pole, AREP excitation

Resistances at 20 °C (Ω)

| LSA 44.2 | VS3 | VS4 | S7 | M9 | L11 | L12 |
|-----------------------|-------|-------|-------|-------|-------|-------|
| Stator L/N | 0.046 | 0.046 | 0.036 | 0.024 | 0.019 | 0.019 |
| Rotor | 2,51 | 2,51 | 2,91 | 3.32 | 3.66 | 3.66 |
| X1, X2 auxil. wdgs | 0.3 | 0.3 | 0.21 | 0.17 | 0.16 | 0.16 |
| Z1, Z2 auxil. wdgs | 0.5 | 0.5 | 0.32 | 0.28 | 0.21 | 0.21 |
| Field | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Armature | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

Field excitation current i_{exc} (A) -240 V -60 Hz

" i_{exc} ": excitation current of the exciter field

| LSA 44.2 | VS3 | VS4 | S7 | M9 | L11 | L12 |
|----------|-----|-----|-----|------|-----|-----|
| No load | 1 | 1 | 1 | 1015 | 1.2 | 1.2 |
| On load | 4 | 4.4 | 4.1 | 3.7 | 3.7 | 4 |

4.8.6 - Dedicated single-phase LSA 44.2: 4-pole, SHUNT excitation (60 Hz only)

Resistances at 20 °C (Ω)

| LSA 44.2 | VS3 | VS4 | S7 | M9 |
|------------|--------|--------|--------|--------|
| Stator L/N | 0.0194 | 0.0194 | 0.0140 | 0.0088 |
| Rotor | 2.51 | 2.51 | 2.91 | 3.32 |
| Field | 19.5 | 19.5 | 19.5 | 19.5 |
| Armature | 0.5 | 0.5 | 0.5 | 0.5 |

Field excitation current i_{exc} (A) -240 V -60 Hz

" i_{exc} ": excitation current of the exciter field

| LSA 44.2 | VS3 | VS4 | S7 | M9 |
|----------|------|------|------|------|
| No load | 0.44 | 0.44 | 0.43 | 0.55 |
| On load | 1.18 | 1.25 | 1.2 | 1.28 |

| | | |
|---|------------------------------|-------------------------------|
| LEROY-SOMER | INSTALLATION AND MAINTENANCE | Ref. 3434 GB - 4.33/a - 03.01 |
| LSA 43.2/44.2 - 4-POLE ALTERNATORS SPARE PARTS | | |

5 - SPARE PARTS

5.1 - First maintenance parts

Emergency repair kits are available as an option.
They contain the following items:

| Ref. | Designation | Qty | LSA 43.2/44.2 - SHUNT | Code |
|------|-----------------------|-----|-----------------------|----------------|
| 198 | AVR | 1 | R 230 | AEM 110 RE 001 |
| 343 | Diode bridge assembly | 1 | LSA 432 9 03/04 | ESC 040 MD 003 |
| 347 | Surge suppressor | 1 | LSA 432 1 13 | CII 111 PM 002 |
| | AVR fuse | 1 | 250 V - 8 A/slow-blow | |
| | | | | |

| Ref. | Designation | Qty | LSA 43.2/44.2 - AREP 4 P | Code |
|------|-----------------------|-----|--------------------------|----------------|
| 198 | AVR | 1 | R 438 | AEM 110 RE 003 |
| 343 | Diode bridge assembly | 1 | LSA 432 9 03/04 | ESC 040 MD 003 |
| 347 | Surge suppressor | 1 | LSA 432 1 13 | CII 111 PM 002 |
| | AVR fuse | 2 | 250 V - 8 A/fast-blow | |
| | | | | |

5.2 - Bearing designations

| Ref. | Designation | Qty | LSA 43.2 | Code | LSA 44.2 | Code |
|------|--------------------------------|-----|-------------|-------------|-------------|-------------|
| 60 | Bearing on shaft extension end | 1 | 6312 2RS/C3 | RLT060TS030 | 6315 2RS/C3 | RLT075TS030 |
| 70 | Bearing on exciter end | 1 | 6307 2RS/C3 | RLT080RB002 | 6309 2RS/C3 | RLT100RB005 |

5.3 - Technical support service

Our technical support service will be pleased to provide any additional information you may require.

When ordering spare parts, you should indicate the complete machine type, its serial number and the information given on the nameplate.

Address your enquiry to your usual contact, or to:

MOTEURS LEROY-SOMER

Usine de Sillac/Alternateurs
16015 ANGOULEME CEDEX - FRANCE
Tel.: (33) 05.45.64.45.64
Technical Support Service:
(33) 05.45.64.43.66 - (33) 05.45.64.43.67 -
(33) 05.45.64.43.68 - (33) 05.45.64.43.69
Fax: (33) 05.45.64.43.24
email: sat.sil@leroy-somer.com

CAUTION

Part numbers should be identified from the exploded views and their description from the parts list.

Our extensive network of service centres can dispatch the necessary parts without delay.

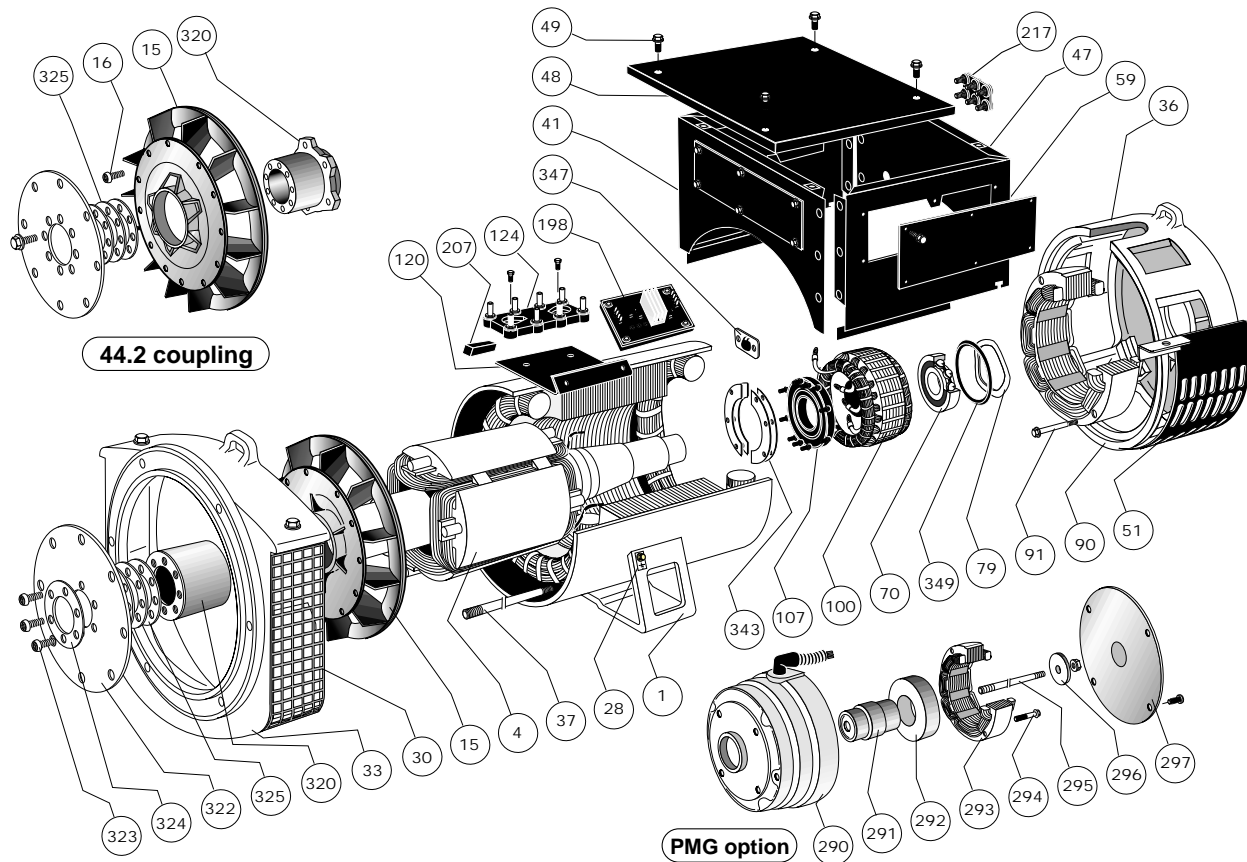
To ensure correct operation and the safety of our machines, we recommend the use of original manufacturer spare parts.

In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

LSA 43.2/44.2 - 4-POLE ALTERNATORS SPARE PARTS

5.4 - Exploded views, parts list

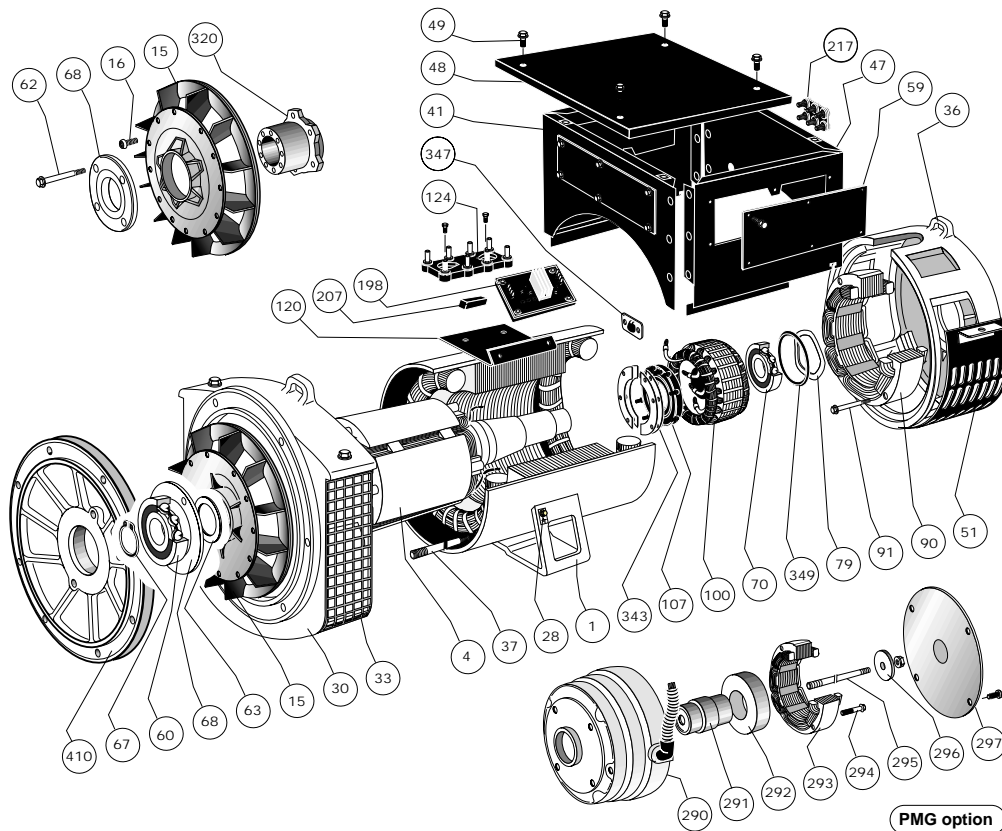
5.4.1 - Single-bearing LSA 43.2/44.2



| N° | Nbr | Description | N° | Nbr | Description |
|-----|-----|----------------------------|-----|-----|-----------------------------------|
| 1 | 1 | Stator assembly | 120 | 1 | Terminal block support (AREP) |
| 4 | 1 | Rotor assembly | 124 | 1 | Terminal block |
| 15 | 1 | Fan | 198 | 1 | Voltage regulator (AVR) |
| 16 | 6 | Fixing screws (44.2 only) | 207 | 1 | AVR damper seal |
| 28 | 1 | Earth terminal | 217 | 1 | Terminal block |
| 30 | 1 | DE shield | 290 | 1 | PMG housing |
| 33 | 1 | Air outlet grille | 291 | 1 | Adaptation shaft |
| 36 | 1 | Shield on exciter end | 292 | 1 | Magnetic rotor |
| 37 | 4 | Tie rod | 293 | 1 | Stator |
| 41 | 1 | Cover front panel | 294 | 2 | Fixing screws |
| 47 | 1 | Cover rear panel | 295 | 1 | Tie rod |
| 48 | 1 | Cover top panel | 296 | 1 | Cable gland washer + nut |
| 49 | 34 | Fixing screws | 297 | 1 | End plate |
| 51 | 1 | Air intake grille | 320 | 1 | Hub (43.2 L7 & 44.2 only) |
| 59 | 3 | Inspection door | 322 | 1 | Coupling disc |
| 70 | 1 | NDE bearing | 323 | - | Fixing screws |
| 79 | 1 | Preloading wavy washer | 324 | 1 | Clamping washer |
| 90 | 1 | Exciter field | 325 | - | Spacer shim (43.2 L7 & 44.2 only) |
| 91 | 4 | Exciter field fixing screw | 343 | 1 | Diode bridge assembly |
| 100 | 1 | Exciter armature | 347 | 1 | Surge suppressor |
| 107 | 1 | Diode crescent support | 349 | 1 | "O" ring |

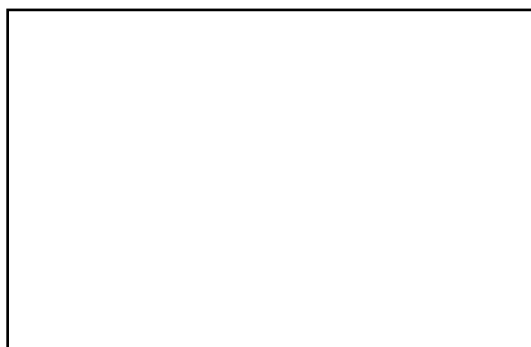
LSA 43.2/44.2 - 4-POLE ALTERNATORS SPARE PARTS

5.4.2 - Two-bearing LSA 43.2/44.2



| N° | Nbr | Description | N° | Nbr | Description |
|----|-----|-------------------------------|-----|-----|-------------------------------|
| 1 | 1 | Stator assembly | 91 | 4 | Exciter field fixing screw |
| 4 | 1 | Rotor assembly | 100 | 1 | Exciter armature |
| 15 | 1 | Fan | 107 | 1 | Diode crescent support |
| 16 | 6 | Fixing screws (44.2 only) | 120 | 1 | Terminal block support (AREP) |
| 28 | 1 | Earth terminal | 124 | 1 | Terminal block |
| 30 | 1 | DE shield | 198 | 1 | Voltage regulator (AVR) |
| 33 | 1 | Air outlet grille | 207 | 1 | AVR damper seal |
| 36 | 1 | Shield on exciter end | 217 | 1 | Terminal block |
| 37 | 4 | Tie rod | 290 | 1 | PMG housing |
| 41 | 1 | Cover front panel | 291 | 1 | Adaptation shaft |
| 47 | 1 | Cover rear panel | 292 | 1 | Magnetic rotor |
| 48 | 1 | Cover top panel | 293 | 1 | Stator |
| 49 | 34 | Fixing screws | 294 | 2 | Fixing screws |
| 51 | 1 | Air intake grille | 295 | 1 | Tie rod |
| 59 | 3 | Inspection door | 296 | 1 | Cable gland washer + nut |
| 60 | 1 | DE bearing | 297 | 1 | End plate |
| 62 | 2/4 | Bearing retainer fixing screw | 320 | 1 | Hub (44.2 only) |
| 63 | 1 | Cable gland washer | 343 | 1 | Diode bridge assembly |
| 67 | 1 | Circlips | 347 | 1 | Surge suppressor |
| 68 | 1 | Inner bearing retainer | 349 | 1 | "O" ring |
| 70 | 1 | NDE bearing | 410 | 1 | End shield |
| 79 | 1 | Preloading wavy washer | | | |
| 90 | 1 | Exciter field | | | |

| | | |
|--|------------------------------|-------------------------------|
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| LSA 43.2/44.2 - 4-POLE ALTERNATORS NOTES | | |



MOTEURS LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE

RCS ANGOULÊME N° B 671 820 223
Limited company with capital of 131,910,700 FF

<http://www.leroy-somer.com>