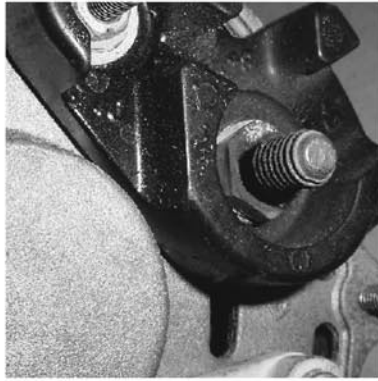
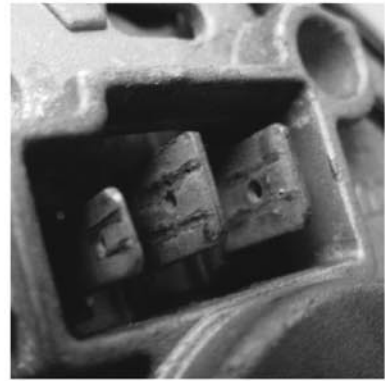
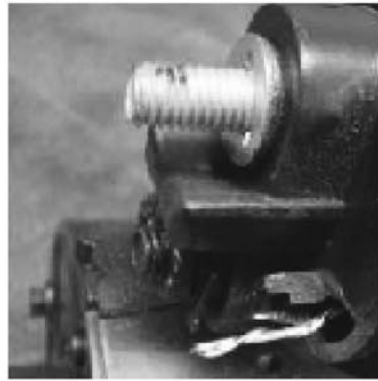


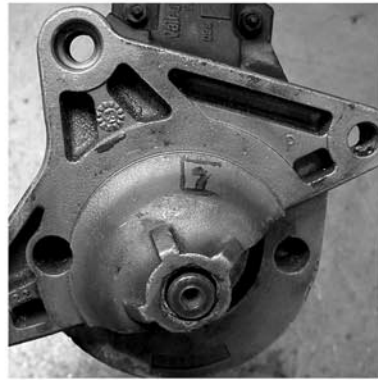
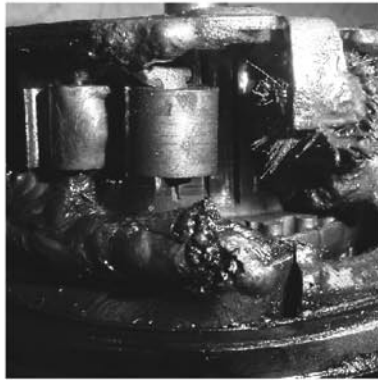
FRIESEN

FAULT DIAGNOSIS GUIDE

CHECK IT!



**FAULT SYMPTOMS
CAUSES AND SOLUTIONS**



**STARTER MOTORS
&
ALTERNATORS**





HOW TO USE THIS GUIDE...



Quinton Hazell's FRIESEN brand of replacement **Starter Motors and Alternators** are the optimum alternative to OE or new parts as we manufacture our units with the same or better quality components and processes.

In practice, any faults that may arise with starter motors and alternators can have a **variety of causes**.

We have presented and described a number of different fault scenarios in the following pages.

We have also included **possible proposals for rectifying many of the problems**.



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CHECK!

FRIESEN. STARTER MOTORS. ALTERNATORS.

QUALITY. RELIABILITY. VARIETY.

FRIESEN: EXPERTS IN EXCELLENT STARTER MOTORS AND ALTERNATORS

FRIESEN. With more than 35 years of experience as specialists in environmentally-friendly manufacture, our production facilities in Oranienburg, as well as the headquarters in Backnang, Germany, have both recently been modernised and extended with the very latest state of the art technology. The famous technical know-how achieved by Friesen over many years is based on ISO certifications to DIN EN ISO 9001:2000 and ISO 14001:2004, and is systematically applied in all our processes, guaranteeing the highest quality in accordance with specifications imposed by the vehicle manufacturers.



FACTORS THAT INFLUENCE PRODUCT PERFORMANCE

The service life of Starter Motors and Alternators depends very heavily on:

- Correct and professional fitting
- The quality of individual system components
- The condition and functional capability of the associated systems

IDENTIFY AND RECTIFY PROBLEMS

The Workshop Instructions will help you to diagnose fault patterns and scenarios and assist you in making the correct assessment of common faults involving starter motors and alternators. They will also provide you with the possibility of identifying the causes of faults including installation errors / vehicle faults, as well as providing suggestions for putting things right.



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FAULT DIAGNOSIS GUIDE

STARTERS



FAULT DESCRIPTION

Drive bearing housing broken during the starting process.

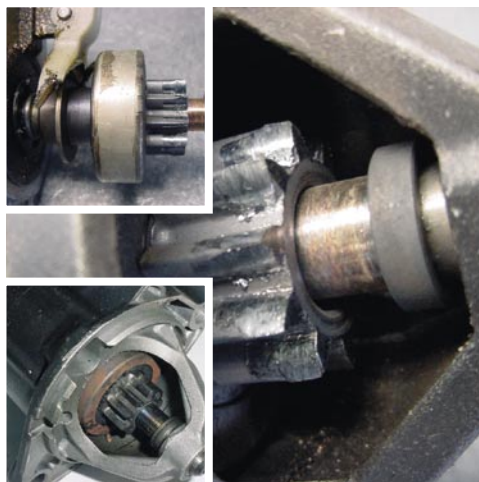
POSSIBLE CAUSE

Defective / worn ring gear

During the starting process, the pinion engages in the ring gear. As soon as what is referred to as a "tooth gap" is reached, the starter pinion will suddenly rotate faster than the engine, and the result is that one of the teeth of the pinion now impinges directly onto one of the teeth of the ring gear. When this happens, the armature shaft is levered upwards, leading to the drive bearing housing being broken. In most cases, this can be easily identified at the bearing sleeve, which will have a clear, upward pressure mark on it.

RECTIFICATION

Replace the ring gear / fly wheel.



FAULT DESCRIPTION

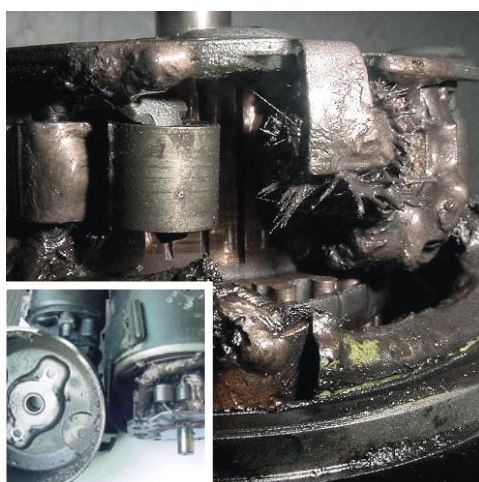
Fret marks on the pinion bearing sleeve, pinion teeth binding, discolouration at the roller freewheel (pinion) and armature shaft due to overheating (internally: Plastic engaging lever running hot or melted. Armature destroyed, collector and armature winding partially spun outwards).

POSSIBLE CAUSE

Permanent or occasional jamming of the starter switch, i.e. the starter pinion remains engaged even after starting the vehicle. The grease in the free-wheel roller is overstressed by the increased movement that occurs, resulting in an excessive temperature, causing it to decompose. The pinion bearing sleeve frets against the armature shaft. The increased starter motor revolution speed exceeds the overspeed of the armature, which can also cause the commutator and armature winding to be destroyed.

RECTIFICATION

Replace ignition lock / contact part.



FAULT DESCRIPTION

Starter shows oil traces on the outside, interior smeared with carbon, collector partially run-in.

POSSIBLE CAUSE

Starter defective due to the permeation of oil and/or Diesel.

RECTIFICATION

Eliminate oil loss or leaks from the vehicle.



**PERFECT KNOW-HOW
FULLY-QUALIFIED MANUFACTURE
AND PROCESSING!**



FAULT DESCRIPTION

Run-on noises.

Abnormal clutch dust deposits on the armature shaft, pinion bearings and sleeves.

POSSIBLE CAUSE

The bearing sleeves of the pinion and drive bearings are “running dry”, which causes loud noises during the starting process as well as “run-on” noises afterwards.

RECTIFICATION

Remove clutch dust and contaminants from transmission housing.

Clean the pinion bearings then apply oil / grease.



FAULT DESCRIPTION

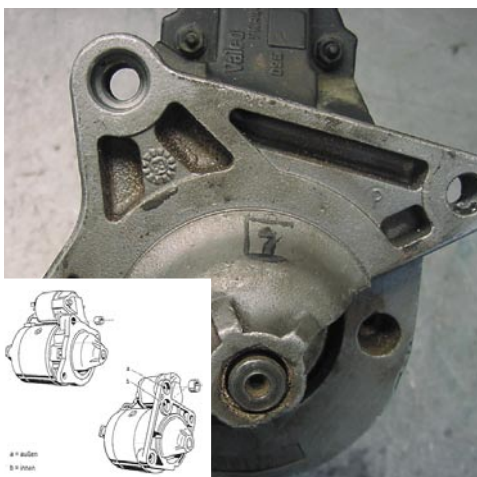
Terminal 30 (battery lead) connection bolt snapped off.

POSSIBLE CAUSE

The connection bolt was excessively tightened when the battery cable was secured, causing the connection bolt to snap off.

RECTIFICATION

Check the battery cable has been properly attached and tighten up to the vehicle manufacturers recommended torque settings.



FAULT DESCRIPTION

Loud noises during starting procedure, pinion teeth damaged, bearing sleeve knocked out.

POSSIBLE CAUSE

Centering bush / dowel not inserted into mounting hole, or placed into incorrect hole.

RECTIFICATION

The starter is centred by way of the fitting hole and the dowel. When the starter is fitted, care must be taken to ensure that the dowel is located in the drive end bracket and in the clutch housing respectively. The dowel must be placed in the same hole as the defective starter which has been removed (e.g. Renault C-Motor outside and Renault F-Motor inside). Make sure that the dowel has not become jammed in the mounting flange of the removed starter.

FAULT DIAGNOSIS GUIDE

ALTERNATOR



FAULT DESCRIPTION

Alternator shows signs of oil on the outside, smeared with carbon on the inside, collector rings run-in.

POSSIBLE CAUSE

Oil loss from the vehicle.

The oil on the slip rings causes the carbon to float up, which leads to intermittent brush contact. The magnetic field in the rotor breaks up and induces an induction voltage of up to 300 V. The result of this is that electrical components such as the regulator or diode board may be destroyed.

RECTIFICATION

Eliminate the oil loss from the vehicle.



FAULT DESCRIPTION

Belt pulley running hot (heat discoloration).

POSSIBLE CAUSE

The belt pulley is becoming hot due to "loose" V-belts. Otherwise the alternator is in order.

RECTIFICATION

Adjust the tension of the V-belt depending on the vehicle type (refer to the manufacturers' instructions).



FAULT DESCRIPTION

Alternator mounting points are broken off.

POSSIBLE CAUSE

Installation fault.

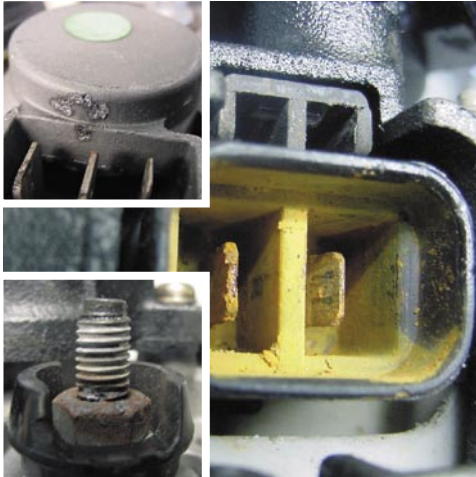
RECTIFICATION

Take note of the torque value specified by the manufacturers and tighten the securing screw accordingly. Protect the alternator against damage by ensuring it is tightly secured to the engine.



FRIESEN

FRIESEN REPLACEMENT PARTS: THE PERFECT COMBINATION OF QUALITY AND ECONOMY!



FAULT DESCRIPTION

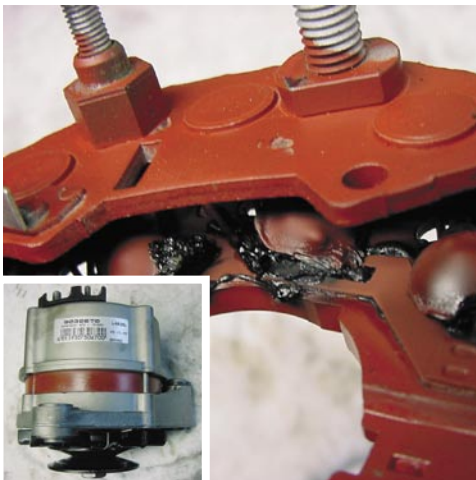
Traces of burning on terminal lugs, connection bolts have heat discolouration, possibly parts burnt off.

POSSIBLE CAUSE

The terminal plug, cable lug, or connections are defective or loose.

RECTIFICATION

Replace terminal plug, cable lug, and connections. Always ensure they are firmly mounted. All connections must be free of corrosion.



FAULT DESCRIPTION

Rectifier field diodes destroyed due to abnormal loading on field terminal (D+).

POSSIBLE CAUSE

Defective control device (regulator or ECU), fault in the cabling (defective insulation, causing a connection between D+ / W) or fault in other additional vehicle components linked to the D+.

RECTIFICATION

Replace defective plug, cable or insulation, and test additional linked components. Replace control device if necessary.

In general: When working on the electrical system of the vehicle, always disconnect the battery Earth cable.

CHECK IT!

STARTERS & ALTERNATORS



Rotor with fan



Vacuum pump



Regulator

Stator



Roller bearing



Rectifier



Solenoid



Planetary gearbox



Bush



Carbon brush holder

Drive or pinion



Bearing



Sealing ring



Armature

INSTALLATION INSTRUCTIONS

The following installation instructions are intended to show the correct way to install starter motors and alternators, in order to avoid premature failure of the units. The installation work must be carried out by authorised persons only, who have the technical knowledge required.

Please refer to the appropriate workshop manual with regard to special instructions for dismantling and installing procedures for your vehicle.

STARTER MOTORS

When working on the electrical system of the vehicle, always disconnect the battery Earth cable.

For a vehicle to start properly not only is a starter required, but the complete starting system must be in good working order.

This includes:

Ignition lock – Battery – Earth straps – All electrical cables – Ring gear – Injection system – Carburettor – Engine electricals.

With there being such a large number of potential sources of faults, the most important thing is how to diagnose them properly.

Technical instructions for replacing starter motors:

1. When fitting the starter, ensure that all screws, bolts and nuts are correctly tightened.
2. The positive cable and control cable (terminal 50) must be free of corrosion.
3. Check the cable lug of the control cable for correct fitment to the solenoid switch terminal.
4. Check the Earth connection from the battery (negative) to the bodywork and engine or transmission system respectively for secure fitment and freedom from corrosion.
5. To check the solenoid cable (terminal 50), connect a voltmeter to the battery (positive) and to the terminal 50 on the solenoid switch. During the starting procedure, the voltage drop must not exceed 0.2 Volt. If necessary, replace the contact board on the ignition lock.
6. To check the battery positive cable, attach a voltmeter to the battery (positive) and to the starter terminal 30 (main cable). Engage fourth gear and engage the brake. During the starting procedure the starter will now be blocked and therefore under full loading. The voltage drop must again not exceed 0.2 Volt.
7. To check the Earth cable, attach a voltmeter to the battery (negative) and to the housing of the starter, and repeat the starting procedure as under Point 6. The voltage drop in this case too must not exceed 0.2 Volt.
8. Check the ignition switch. This must reset itself effectively and without any delay.
9. Check the battery for perfect function.
10. Check the ring gear.
11. Check the engine for oil leaks / loss.
12. Check for Clutch dust, this leads to starter defects (pinion jams).

Terminal designation:

- No. 30** Battery to starter
- No. 50** Ignition lock to solenoid switch
- No. 15a/16** Solenoid switch to series resistor on the ignition coil (start emphasize).

When replacing the following items, ensure that the appropriate actions are carried out:

- Ford starter:** Clean all connection terminals and Earth connections and check them for corrosion.
- Mercedes starter:** Check whether the ring gear is mounted securely on the flywheel. Check the ignition contact plate.
- GM starter:** When dismantling the defective starter, check whether it has been continuously engaged (running in engagement), this will be shown by the armature shaft being coloured blue or pinion broken off. If so, replace the ignition switch without fail, otherwise the damage may be repeated. Check the ring gear by making at least one full rotation.
- VAG starter:** Check the bearing sleeves in the transmission system without fail, or replace them. On automatic models, fit the heat shield (where applicable) back without fail, since otherwise there is a risk of overheating.

Starters jam due to clogging (caused by clutch dust and oil residues).

ALTERNATOR

When working on the electrical system of the vehicle, always disconnect the battery Earth cable.

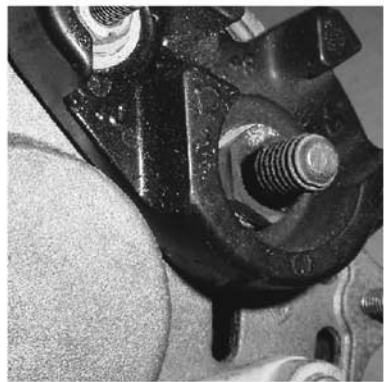
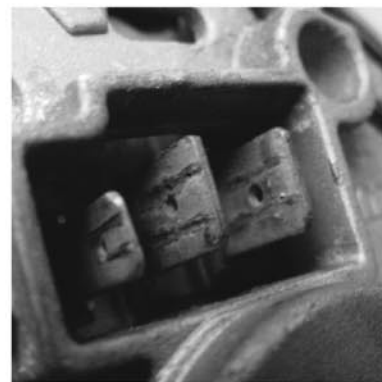
Technical instructions for replacing alternators:

1. When installing the alternator, ensure the mounting bolts are correctly tightened.
2. The alternator must, without fail, be connected by an Earth cable to the engine or the transmission respectively.
3. Check the Earth connection from the battery negative terminal to the body and engine or transmission respectively for secure fitment and freedom from corrosion.
4. Check the positive cable from the alternator to the starter or battery (depending on the vehicle type) for any breaks.
5. To check the charge cable, attach a voltmeter to the battery positive terminal and the alternator B+. Start the engine. The voltage drop under full load must not exceed max. 0.2 Volt. If appropriate, solder the crimp connections and clean the screw connections.
6. To check the earth return cable, attach a voltmeter to the battery negative terminal and the housing of the alternator. In this case too, the voltage drop under full load must not exceed 0.2 Volt. Likewise, solder the crimp connections on the Earth cable from the battery to the body and the engine, and clean the screw connections.
7. Check the terminal plug and screw connections. In some cases, the cable may only be connected by the insulation and not by the conductor.
8. Adjust the V-belt and tension according to the vehicle type (take note of the manufacturers' specifications).
9. Check the battery electrolyte level and specific gravity (1.285).
10. Check for oil leaking / loss from the engine (appearance of oil on the alternator).
11. When the engine is running, do not disconnect any alternator feed cable, voltage peaks can occur and lead to diode damage.
12. Electric welding and rapid charging without the battery being disconnected can lead to diode damage.

When replacing the following items, ensure that the appropriate actions are carried out:

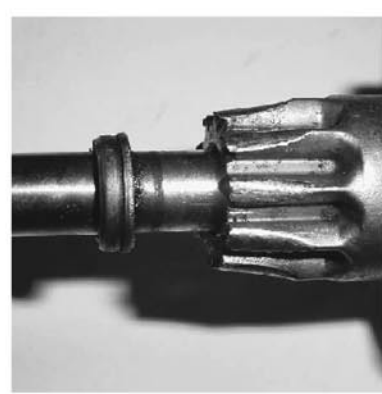
- Ford alternator:** Clean the connections and check the terminal plugs.
- Asian Manufacturer alternator:** Ensure direction of rotation is correct, and check whether the inbuilt regulator or separate regulator is present on the vehicle.
- GM alternator:** Check the relay of the heatable rear window. If the relay is defective, this will rapidly cause diode damage to the generator.
- Renault alternator:** Ensure direction of rotation is correct.
- VAG alternator:** If the old part is showing traces of oil, eliminate the oil leak / loss without fail, otherwise a repeat of the fault will occur. Check the terminal plugs for corrosion and firm fitting.
Consequential damage: Defective diodes. Check terminal plug for continuity, in order to detect any cable breaks. Check Earth strap.

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