

Issue No. 02/2017: Starter motor failure due to overload

Starter motors have one simple, but important, job: to start the combustion engine. Depending on the application, starter motors do vary in size, design, and power output. But they all work the same way: A solenoid is energised, causing a lever to push the pinion out into the flywheel's ring gear. At the same time, a contact bridge closes the electrical circuit to the starter motor; the starter motor turns, causing the engine to run. When the flow of electrical current to the starter motor ceases, the solenoid immediately opens the contact bridge, and the pinion disengages and slides out of the ring gear and back into its initial position. This cycle typically lasts only a few seconds.

High temperatures occur when, over an extended period, the starter motor is engaged in quick sequences and without an adequate break. The solenoid, with its windings, now acts like a heater coil—placing a tremendous load on the starter motor.

Such overloading is evident on the indicator paper that is wound around the solenoid during manufacture and becomes discoloured above a specific temperature. Marked discolouration is thus clear evidence of thermal overloading of the starter motor.

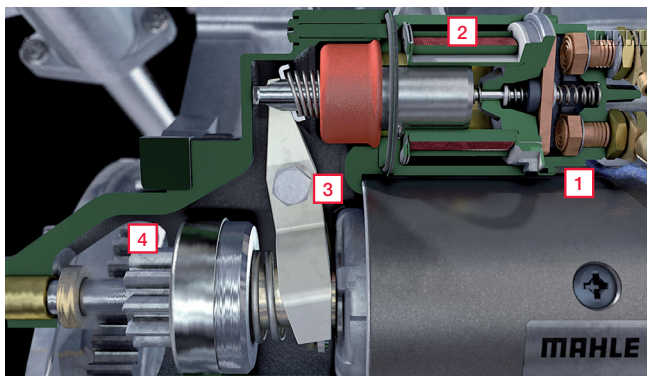


Figure 1: Cross section of starter motor with contact bridge (1), solenoid (2), engaging lever (3), and pinion with free-wheel clutch (4)

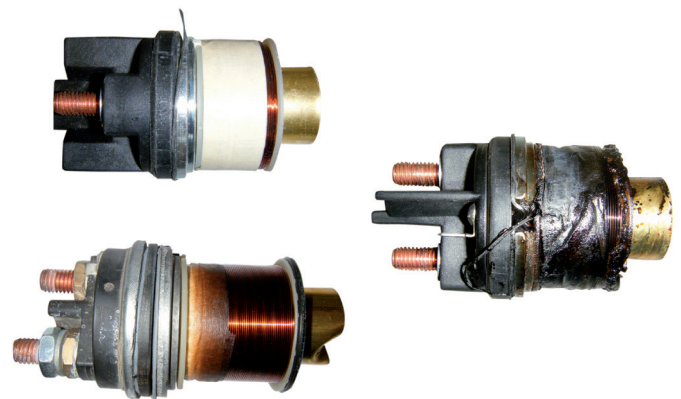


Figure 2: Top: new solenoid—the indicator paper is not discoloured. Bottom: clearly visible discoloration of the indicator paper.

Figure 3: Damaged beyond repair—solenoid with charred indicator paper and melted insulation as a result of extreme overheating

Important: It is generally recommended to engage the starter motor for **no more than 30 seconds** and to then let it cool for **at least 2 minutes**. This can be repeated **up to 3 times** in succession before an extended break is required. Improper use (for instance to bleed the fuel injection system after changing the fuel filter) is extremely inadvisable.