

The incorrect use of starter motors can lead to thermal overload of the solenoid and thus to failure of the starter motor.

Internal combustion engines cannot generate torque from a standstill. A starter motor is therefore required to start the engine. Starter motors may vary in size, design, and performance depending on the application, but they are all based on the same operating principle: pressing the start button or turning the ignition key causes current to flow to the starter motor solenoid. This activates the engaging lever to push the starter pinion into the ring gear of the engine flywheel. At the same time, a contact bridge closes the electrical circuit to the starter motor—the starter motor turns, starting the engine. Once the engine is running, the starter motor is no longer needed. The circuit is interrupted and the

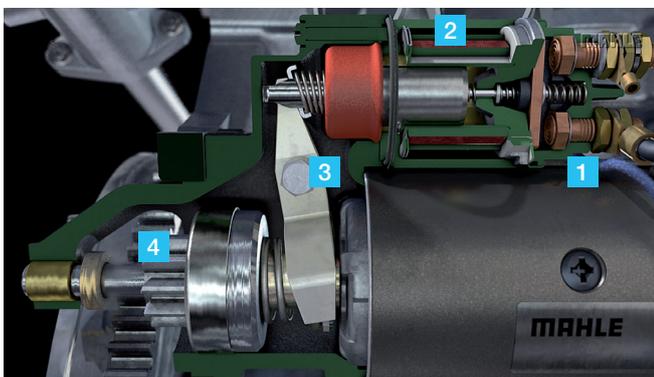


Figure 1: Cross section of starter motor with contact bridge (1), solenoid (2), engaging lever (3), and pinion with freewheel clutch (4)

solenoid withdraws the pinion from the ring gear and returns it to its original position.

Defects due to thermal overload

The starting process places the engine under enormous load. This is generally not a problem, as a start cycle usually lasts only a few seconds. However, if the starter motor is operated repeatedly in quick succession over an extended period without sufficient breaks, the windings of the solenoid act like a heating coil. Repeated instances of high power consumption can cause the solenoid to heat up so much that the winding burns out. Such overloads can be seen on the indicator paper that is wound around the solenoid during manufacture and becomes discolored when a certain temperature is exceeded. Marked discoloration of the indicator paper is thus clear evidence of thermal overloading of the starter motor.



Figure 2: Indicator paper not discolored (top left), clearly discolored (bottom left), and a defective solenoid with charred indicator paper (right)

Important!

The starter motor should never be operated continuously for more than 30 seconds and should then be allowed to cool down for at least 2 minutes. The starting process may be initiated no more than three times in a row, otherwise a longer break will be needed. We strongly advise against improper use of the starter motor (for instance to bleed the fuel injection system after changing the fuel filter).