

# PRODUCT INFORMATION

## STARTERS

- No Core Deposit System (Deposit-Free): A major differentiator is that Hella sells new starters without a surcharge system. This eliminates the need for workshops to return old parts, saving time, reducing administrative hassle, and helping control cash flow.
- High Market Coverage:
- Heavy-Duty Design for Start-Stop Systems: Hella offers starters designed to handle the increased frequency of starting in modern vehicles equipped with start-stop technology, offering a longer service life.
- OE Quality & Perfect Fit: Products are manufactured to meet high quality requirements from the Hella Competence Centre and are guaranteed to fit correctly, ensuring reliable performance.

## PRODUCT FEATURES

The starter (motor) is an electric motor that starts a vehicle's combustion engine by bringing the combustion engine to a sufficient speed for the starting process via a gearwheel, also known as a pinion, to trigger it to start. The starter converts electrical energy into kinetic energy. Diesel vehicles or vehicles with a start/stop system are equipped with a more powerful starter. A reduction gearbox frequently ensures the gear reduction required here to achieve the necessary torque to start the vehicle. A solenoid switch generally helps to 'engage' the starter pinion. In petrol engines, starting the vehicle will place a load of approximately 100A and up to 400A in diesel engines on the battery. The latter coming as a result of the higher compression in diesel engines. The minimum power of a starter not only depends on the type of engine (petrol, diesel), but also on the displacement, the minimum starting speed of the unit and the engine oil formulation specified (oil viscosity). For modern, turbocharged downsizing engines with a lower displacement, a smaller starter with less power is sufficient.

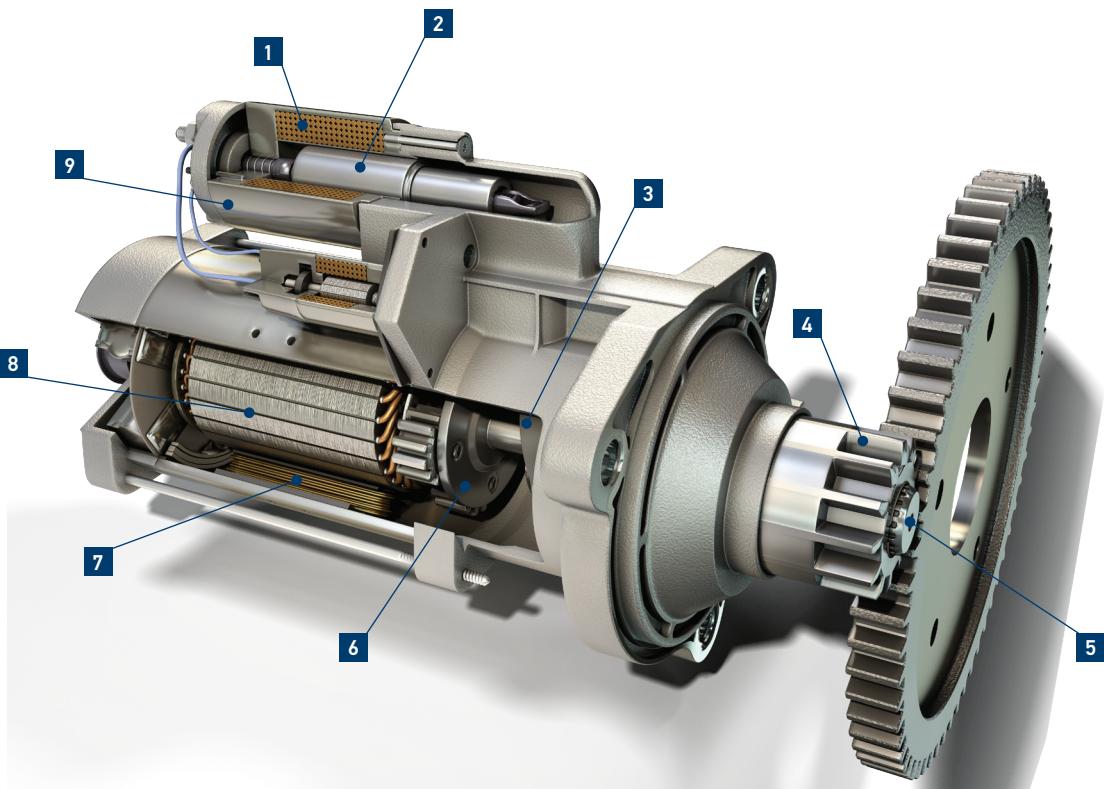
### Design

A starter motor is usually composed of the following assemblies:

- Electric starter motor
- Engaging relay (solenoid switch)
- Drive-end bearing with single-pinion gear

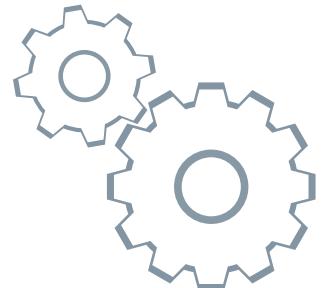
The electric starter motor consists in principle of a tubular pole housing accommodating the pole shoes, excitation winding and permanent magnets. The electrical armature with armature winding is situated in this pole housing. The engaging relay, also known as a solenoid switch, is a combination of a relay and solenoid magnet. It is mounted at the top in the drive-end bearing. The single-pinion gear with pinion, free-running roller, engaging lever, carrier and in-line spring are situated in the drive-end bearing.

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1. Solenoid winding | 2. Through-bolts | 3. Engaging lever | 4. Pinion | 5. Drive shaft  
6. Planetary gear | 7. Field winding | 8. Armature | 9. Starter solenoid

## Starters with different numbers of teeth



As part of product revisions it may be possible that starters with a different number of teeth are installed in a vehicle.

The decisive factor in the equation here is not the actual number of teeth but the shifting of the centre of the armature in order to balance out the difference on the ring gear.

The offset armature shaft corresponds to half a module per tooth, whereby the module is always the ratio of the split  $p$  to the number  $\pi$  ( $n$ ) thus meaning that the diameter of the ring section or working diameter results from the product of module and number of teeth. Wheel and counter wheel must always have the same module.

For instance, if the objective is to replace a starter with 11 teeth with one featuring 12, the armature shaft with a module of 2.05 is removed further away from the ring gear by 1.025 mm. The ring circumference's point of contact at the pinion and the ring gear thus remains identical despite a different number of teeth. If a starter with a different number of teeth is thus supplied, it can be installed without any issues – provided the vehicle has been correctly assigned.

## How does start/stop technology affect the starter?

Start/stop technology has already been used for over 10 years. According to measurements on the basis of the new European driving cycle (NEDC) these technologies can save around 8% in terms of consumption and emissions. In actual city traffic these savings can be significantly higher.

Start/stop starters are geared towards associated, frequent starting procedures by having boosted their lifetime for these special applications. The optimised design makes it possible for the starter to cope with the more frequent starts across the vehicle's lifetime.

For this purpose, the following measures are required:

- Highly stressed bearings are reinforced
- Planetary gear additionally improved
- Use of reinforced single-pinion mechanism
- Optimised commutator for longer service life



## Starter testing

Since an internal combustion engine cannot start by itself, a functioning starter is essential for a roadworthy vehicle. Starters are fundamentally maintenance-free and will do their job over the entire life of a vehicle. Should they however fail or malfunction, in many cases this is due to oxidised or faulty electrical connections, defective solenoid switches, to damaged electric motors or worn single-pinion gears, to the driving pinion (wear or "clogging-up") or the freewheel. Learn everything about possible problems and how you can remedy the individual cases here.

### Symptoms

The following symptoms may indicate a fault in the starter if the engine fails to start:

- No response when actuating the ignition switch
- The starter "clacks", but does not engage
- The starter audibly turns, but without driving the engine

### Cause of failure

A starter malfunction can have different causes:

- Electrical connections faulty
- Solenoid switch (engaging relay) stiff or faulty
- Electric motor damaged electrically
- Single-pinion gear, starter pinion or freewheel damaged

### Important

A fault-free supply of power to the starter is imperative for its successful function. The vehicle battery and the positive and ground contact of the starter should be included in the fault diagnostics.

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## What does HELLA offer?

Premium Technical Expertise and Service: Our technical repair shop service, being provided through our experts, is rounding off our technical service. In addition to Tech World, our Partner World offers targeted content for wholesalers, helping them to better serve their customers.

Target-oriented Marketing Services: Entire communication to market and supporting the W/D with a powerful communication package.

Vast Data Management Services: HELLA's sophisticated data management services allow for precise and efficient parts identification, ensuring that wholesalers and workshops can quickly find the right parts.

Tailormade Logistic Solutions: Our logistics are designed to meet the specific needs of our partners, ensuring timely and reliable delivery of products.

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Discover the **HELLA Electronic range** by following the link above. This comprehensive portfolio offers advanced automotive electronics for all stages of vehicle electrification, from intelligent battery sensors for micro-hybrids to high-voltage battery management systems for fully electric vehicles. Our selection includes various sensors (brake, climate, rain/light, and transmission range), actuators, power electronics (DC/DC converters and onboard chargers), control units, vacuum pumps, radar systems, and smart vehicle access solutions. HELLA is committed to providing innovative and reliable electronic components that enhance the performance, safety, and efficiency of modern vehicles.

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Product features, specifications and availability are subject to change without notice.

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