Glow time relays

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Function

Glow plugs as ignition aids

Diesel engines are compression-ignition engines. This means that an additional heat source is not needed to ignite the mixture in the cylinder. In the cylinder, the air/diesel mixture is highly compressed. This results in a temperature that is so high that the mixture ignites itself, producing an explosion. However, if the engine is not hot, this process can be beset by problems.

At cold temperatures, the air/diesel mixture will not ignite so easily. To safeguard combustion when the engine is cold, glow plugs (one per cylinder) are used as ignition aids. The glow plug increases the temperature in the cylinder's combustion chamber prior to the engine starting. At its peak, the temperature of the glow plug can reach up to 1,000°C. This ensures that the air/diesel mixture will explode even at low temperatures.

The time required for "pre-heating" will vary depending on the glow plug used. Fast glow plugs only need a pre-heating time of just a few seconds. Other glow plugs must pre-heat for up to 15 seconds at low ambient temperatures. The glow time relay is responsible for switching the current for the glow plugs on and off as well as taking care of timing.

Phases of glow time relays

Phases to be taken into account for timing

1. The pre-heating time

The pre-heating time is determined by the type of engine, the glow plugs used and the ambient temperature measured with the assistance of a sensor. Depending on the type of relay, the temperature sensors can be located in the relay itself or externally (in the refrigerant circuit, for example). In winter, at temperatures below zero, the pre-heating time is much longer than it is in summer at temperatures of +30°C, for example. During the pre-heating time, the pre-heating indicator lamp on the dashboard lights up. In some vehicles, the pre-heating time starts when the driver opens the driver's door.

2. The stand-by time

This starts immediately after the pre-heating time. The indicator lamp goes out but the glow plugs remain switched on for a few more seconds. During this time the engine should be started by the driver.

3. The post-heating time

The post-heating time was introduced in more recent vehicles. This was necessary due to increasingly strict exhaust gas standards and the optimisation of combustion processes required as a result. The glow plugs remain switched on during the post-heating time even if the engine is running. The length of the post-heating time is determined by the type of engine and the engine temperature. Only special "post-heating" glow plugs are used for this function.

Functionality of glow time relays

Glow time control unit switches known as power relays are built into the glow time relay (glow time control unit) to switch the current for the glow plugs on and off. If they are already hot, glow plus need a current of approx. 10 A.

However, during the ON phase (when the glow coil is cold), the current is much higher. In the case of a 4-cylinder engine, the power relays must be able to switch currents of up to 80 A. This figure is even higher in the case of 6-cylinder and 8-cylinder engines. Therefore, the glow plugs to be controlled are often distributed across two circuits. Accordingly, there are then two power relays in the glow time relay.

Glow time relays are installed in various locations in the vehicle. Plug-in relays are primarily located in the central relay box. Relays which have screw-on cable shoes for the supply line to the glow plugs instead of plug-in contacts are located in the engine compartment. These relays are screwed directly onto the splash panel or to the car body (in the latter case via the intermediary of special attachment brackets).

Variants of glow time relays

Variants even if the underlying technical function is not always the same, there are many different variants of glow time relay. There are different housing dimensions, connector plugs and types of attachment. There are more than 100 different types of relay for vehicles manufactured in Europe alone. There are also pre-heating systems in which the engine control unit takes over the timing function. The glow time relay then simply has to switch the high currents required for the glow plugs.

Fully electronic glow time relay

It is an entirely different story with these modern types of glow time relay. They support diagnostics and are connected to On-Board Diagnostics (OBD). Fully electronic glow time relays are control units which are connected to the engine control unit via a data bus. The commands for switching on and off come from the engine control unit. It also measures whether there is actually a high enough current flowing after a glow plug has been switched on. This is then fed back to the engine control unit in the form of an acknowledgement signal. If too high a current is detected (in the event of a short-circuit in the cable or glow plug, for example), the corresponding current branch is shut down in order to avoid the electronics being damaged beyond repair.

Another particular feature of fully electronic glow time relays is the use of power transistors (electronic switches) rather than relays for switching on and off. Power transistors not only support switching glow plugs on and off, they also allow current levels to be varied. This is achieved by means of a variable

duty cycle. In other words, the current is switched on and off at very short intervals during the current control phase. If the ON time is longer than the OFF time, the glow plug receives more power and becomes hotter. Conversely, the glow plug is heated less if the ON times are shorter than the OFF times.

Safety

Safety As the relays in the engine compartment are exposed to the prevailing influences there, they must be designed accordingly. Cold in winter, very high temperatures at times in the summer, moisture, fluids such as salt water, cleaning agents, etc. must not be allowed to harm a glow time relay. Plug connectors must always be corrosion-free and clean. Otherwise, contact resistances could cause malfunctions or even cable fires.

Environmental protection

Protection of the environment The exhaust gas values of a vehicle (in particular soot build-up in the case of a diesel vehicle) are heavily influenced by the starting process of an engine. In this context, quick and problem-free starting is very helpful for keeping emission values within desired limits. However, it is even more important that vehicles with post-heating phases are controlled correctly by the glow time relay. This can help to reduce emissions during the warm-up phase too. As such, a fully functioning glow time relay makes an important contribution to the protection of the environment.

Depreciation

Depreciation For the glow system to function correctly, only glow time relays with matching reference numbers should be replaced like for like. Even if the housing and the plug connector, including the number of contacts, are the same, the internal function might be different. Where pre-heating times are concerned, for example, times for fast glow plugs are much shorter than for normal glow plugs. Installing the wrong relay can damage the glow plugs.

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Quelle:
http://www.my-cardictionary.comhttps://www.my-cardictionary.com/cardictionary/electric/products/glow-time-relays.html