Product Information Automotive

Glow Plugs
At a glance:
PIA glow plugs

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Despite the hype surrounding electric and hybrid vehicles – diesel is still the most environmentally friendly and attractive type of drive. This is unlikely to change in the next few decades. Today, diesel vehicles are often the first choice. Current sales figures back up this trend. Bosch technologies are the driving force behind the progress of diesel. With trendsetting systems such as Common Rail and Unit Injector System, Bosch is a pioneer of diesel technology. Bosch is the world leader and no. 1 in diesel system technology. All Bosch system knowledge goes into the development of individual components, such as glow plugs, and uses individual parts to create the perfect diesel system. In particular, glow plugs play an important role in modern diesel engines. They work with such low compression that post-heating is required. This is only to ensure concentric running of the engine with reduced fuel consumption and lower emissions. Bosch delivers perfect system performance consisting of an electronic glow control unit and the glow plugs.

The range of glow plugs from Bosch provides the right solution for almost every diesel vehicle – even for older vehicles. Even in their original equipment, a large number of manufacturers rely on innovative preheating systems from Bosch: professional quality from the original equipment manufacturer and technology leader. Also retail and workshops know that Bosch is the right choice for OE quality in replacement parts.

Bosch: more than 90 years of glow plug experience.
In 1921, Bosch developed the first glow plugs for heavy oil engines. Just one year later, the first series production of Bosch glow plugs began – even before the existence of the first diesel truck and diesel passenger car. Thanks to the single-coil glow plug generation in 1958, Bosch was able to reduce the preheating time to as little as 45 seconds. In 1978 Bosch made a breakthrough with the Rasant® (RSK) glow plug and reduced the preheating time to less than 15 seconds. With the use of turbo diesel in the 1980s, the number of new diesel passenger cars being registered rose sharply. Diesel engine development became more dynamic and brought increasingly progressive performance improvements and, above all, ever new requirements of the diesel injection systems. Duraterm® by Bosch revolutionized the diesel world in 1990. Without this "invention" diesel engine development would have progressed much more slowly. With a preheating time of less than 4 seconds, and a post-glow time of up to 180 seconds, Duraterm® by Bosch set new standards. Accordingly, the Duraterm® plugs became much slimmer and, in some cases, also longer. In 2004 the era of low-voltage glow plugs began. The Duraterm® High Speed is the second generation of the successful Bosch Duraterm®.

Yet again, Bosch developers were able to optimize the technical features, such as improved cold-idling or doubling of the post-glow time to 360 seconds. In response to the new diesel engine generation with low compression ratios, Bosch introduced the patented DuraSpeed® glow plug in 2006. The self-regulating, ceramic DuraSpeed® allows for preheating temperatures of up to 1300°C within 2 seconds and is among the fastest glow plugs on the market.

Bosch developments have not only given new dimensions to the diesel world, but they have continuously revolutionized it.
The diesel engine has such a high compression ratio ($\varepsilon = 20 : 1$ to $24 : 1$) that the air heated during the compression stroke immediately ignites the injected diesel fuel. By comparison, a normal gasoline engine has a ratio of $\varepsilon = 10 : 1$.

**Combustion processes for passenger car diesel engines**

**Whirl chamber process for IDI engines**

The combustion process uses a ball or disk-shaped precombustion chamber (whirl chamber) with a tangentially discharging connection chute channel to the cylinder combustion chamber. During the compression stroke, the air entering via the chute channel is brought into a whirling movement and the fuel is injected into this vortex. The fuel is injected in the direction of the moving air. This results in a good air/fuel mixture. At the start of combustion, the air/fuel mixture is pressed into the cylinder compartment through the chute channel and mixed with the remaining combustion air there. Compared with the prechamber process, the flow losses are lower, as the overflow cross-section is greater and thus more advantageous for the inner efficiency and fuel consumption. The layout and design of the nozzle jet as well as the position of the glow plug must be carefully coordinated with the engine in order to achieve a good mixture preparation at all speeds and load conditions.

A further requirement is, of course, fast heating of the whirl chamber via the glow plug after a cold start. During the warm-up, you avoid the generation of uncombusted hydrocarbons (blue smoke) in the exhaust gas.

**Prechamber process for IDI engines**

The fuel is injected into a hot prechamber in which precombustion initiates good mixture preparation with reduced ignition delay for the main combustion process. A specially designed baffle plate in the center of the chamber dissipates the jet occurring here from a single jet throttle pintle nozzle (up to 300 bar) and mixes it intensively with the air. The combustion that takes place drives the partially combusted air/fuel mixture through holes in the bottom end of the prechamber and into the main combustion chamber with further heating. A controlled post-glow phase (up to 3 minutes after the cold start with the Bosch Duraterm®, depending on the coolant temperature) contributes to exhaust gas improvement and noise reduction in the warm-up phase.

**By comparison:**

Direct injection engines with single-part combustion chamber have a lower heat loss and thus improved starting behavior than prechamber engines or whirl-chamber engines with a split combustion chamber.
With IDI engines, the glow plugs protrude into the precombustion chamber, while in DI engines, they protrude into the combustion chamber of the engine cylinder.

**Direct injection process in DI engines**
The above-mentioned processes, such as fuel atomization, heating, evaporation and mixing with air must occur in a short time sequence during direct injection of the diesel into the combustion chamber. The special shape of the intake duct in the cylinder head creates a vortex during the intake and compression stroke. The design of the piston surface, with incorporated combustion chamber, also contributes to the air movement at the end of the compression stroke, i.e. at the start of injection. Here, a multi-hole injection nozzle is used, whose jet position has been optimized in coordination with the combustion chamber design. There are higher requirements of the injection equipment in terms of position, number of nozzle holes and fineness of the atomization through small nozzle diameters as well as very high injection pressure in order to achieve the required short injection time.

**Low-compression DI engines**
A further diesel engine development is the reduction of the compression ratio to $\varepsilon = 15 : 1$. This means the engines can become smaller, lighter and provide even better performance and environmental compatibility. Even while driving after engine cooling through overrun mode or to support particle filter regeneration (see page 16), an intermediate glow phase is required. These development trends set highly complex requirements for the preheating system.
Starting systems

Starting systems are used on passenger car diesel engines with max. 1 liter cubic capacity per cylinder. These systems increase the temperature in the combustion chamber. For a reliable cold start, glow plug temperatures of at least 850°C are required, which are dependent on the type of engine, its condition and the outside temperature.

Direct injection engines (DI) start spontaneously at low outside temperatures above 0°C. The self-ignition temperature of 250°C for the diesel fuel is reached thanks to the starting speed. Prechamber engines require a jump lead at ambient temperatures below 40°C, while whirl-chamber engines require a jump lead below 20°C.
The cold can do it
Bosch preheating systems guarantee a cold engine start in winter. But the diesel fuel can become the problem:
With summer diesel fuel, the finest of paraffin crystals (wax) clog the fuel filter at below 0°C and the engine does not start.

The legislator therefore prescribes a filterability temperature limit (CFPP Cold Filter Plugging Point) for diesel fuels (DIN EN 590) in Europe:
- Transition time to -10°C from 1st October to 15th November
- Winter time to -20°C from 16th November to 28th (29th) February

Tip: Less frequent drivers should ensure that they do not drive with summer diesel fuel in the cold winter months.

Preheating systems
essentially comprise glow plugs and a glow control unit. More modern systems have glow software in the engine management system.

Conventional preheating systems
require Duraterm® glow plugs with a nominal voltage of 11 volts, which are actuated with the electrical system voltage.

Modern low-voltage preheating systems
require glow control units/software specially designed by Bosch and glow plugs with nominal voltages below 11 volts.
- Made of metal: Duraterm® High Speed for $\varepsilon \geq 18:1$
- Made of ceramic: DuraSpeed® for $\varepsilon \leq 17:1$

The mixture of air and fuel is routed past the hot glow plug and heated. The ignition temperature is reached in connection with the heating of the intake air during the compression stroke. The diesel engine is able to start easily at temperatures as low as -28°C.
Glow plugs by Bosch: Since 1922
Bosch glow plugs: over 90 years of experience

1921 Start of development of the first Bosch glow plug for heavy oil engines with a 1-pin, mica-insulated plug. This was an open nickel wire coil with 2 turns. The electrical values were 1.7 V and approx. 37 A.

1922 Start of series production of the Bosch glow plug with mica-insulating material – i.e. even before the diesel truck (1924) or diesel passenger car (1936) came on the market.

1932 Production of the first 2-pin Bosch glow wire plug. Normal preheating time up to 180 seconds.

1958 The first single coil glow plug generation with sheathed element instead of glow wire was able to reduce the preheating time to as little as 45 seconds.

1978 20 years later, the first double-coil glow plug followed, called Rasant® (RSK). This was a breakthrough: preheating time < 15 seconds.

1980 The Super-Rasant® (S-RSK), with a preheating time of < 8 seconds, came onto the market.

1990 Duraterm®, the Bosch-patented glow plug, with its fast preheating time and long post-glow time, revolutionized the diesel world:
  • Preheating time = 4 seconds
  • Post-glow time of up to 180 seconds
Without this invention, diesel engine development would have been much slower.

1998 Bosch drastically streamlined the glow plug range, but without any loss of vehicle coverage. Wherever possible, the standard glow plugs were replaced with Duraterm®. Owners of earlier vehicle generations benefited from the short Duraterm® preheating time = 4 seconds as well as a 40% longer service life (without post-glow function).

1999 While retaining the earlier technical specifications, the Super-Rasant® plugs were adapted to Duraterm® technology.

“| I was always plagued by fears that someone would check my products and prove that I had made something of inferior quality. That is why I have always sought to only release work that has passed all objective tests, in other words, that is crème-de-la-crème.” | Robert Bosch |

Comparison of the heating curves for different glow plug generations.
The further development of the diesel engine began to pick up after the year 2000. The glow plug gained central importance. Diesel engines have become increasingly light, so that they are now even more efficient and environmentally friendly. In this context, diesel engines have become smaller and the walls thinner. The pressure ratios have been adapted to ensure that the walls can withstand the very high inner pressure. As a result, the air is heated up less during the compression stroke. The glow plugs must therefore provide help here.

**2000 Duraterm® with 5 mm sheathed element for DI engines**

Space in the engine is no longer sufficient for the previous Duraterm® plugs with 6 mm thick sheathed element and M12 thread diameter. The new Duraterm® plugs are slimmer and have a sheathed element of 5 mm and an M10 thread. The glow plugs are also longer in most cases.

**2002 Duraterm® Ceramix**

For special Japanese and Korean diesel engines, Bosch develops these relatively small 11 volt Duraterm® Ceramix with ceramic sheathed element. The Duraterm® Ceramix is also used in European automotive brands.

Bosch technology – extremely high temperatures for fast starting are achieved in the shortest time.
Low-pressure diesel engines require low-voltage glow plugs. The era of low-voltage glow plugs began in 2004: first with metal sheathed elements for a post-glow temperature of approx. 1000°C for diesel engines with a compression ratio of $\varepsilon \geq 18:1$.

This was followed by the further development with ceramic sheathed elements in order to achieve an even higher post-glow temperature of approximately 1200°C specifically for diesel engines with a compression ratio of $\varepsilon \leq 17:1$.

**2004 Duraterm® High Speed**

The first low-voltage metal glow plug by Bosch with **5.0 volts** and a metal sheathed element diameter of 5.0 mm tapering down to 3.7 mm.

**2005 Duraterm® High Speed**

The next development was the Duraterm® High Speed, a **4.4 volt plug** with a metal sheathed element diameter of 4.0 mm tapering down to 3.3 mm.

**2006 DuraSpeed®**

The DuraSpeed®, a **7.0 volt glow plug**, is characterized by the flexible sheathed element design with a diameter of 4.0 mm and a ceramic sheathed element diameter of 3.2 mm. The patented glow plug is **Bosch’s answer** to the new generations of engines, which are dependent on high temperatures due to their low compression ratios.
Glowing quality: 
Production, development and portfolio

Quality by Bosch
Quality is a tradition at Bosch. This high quality and reliability are the result of successful cooperation and joint development projects with internationally leading automotive manufacturers. The high quality requirements at international level are documented and monitored through a range of certifications.

Vehicle manufacturers trust Bosch
For leading vehicle manufacturers, glow plugs from Bosch are the right choice. Bosch stands for outstanding quality, innovation and extensive expertise. With the continuous development of innovative glow plug starting systems, Bosch guarantees high-quality, state-of-the-art products.

Perfect collaboration – perfect results
Bosch develops glow plug starting systems for original equipment in close collaboration with the vehicle manufacturers. This means the specific systems are tailored to the respective engines, even for heat-dependent low-compression engines.

Glow plug expertise
Bosch develops intelligent auxiliary starting systems for modern engines, so that they can become even faster, more efficient and cleaner. To do this, Bosch uses synergies from the existing diesel areas, in particular for the reduction of fuel consumption and emissions.

Production sites for Bosch glow plugs worldwide:

- Rodez, France
- Bangalore, India
- Higashimatsuyama, Japan
Complete AA program
Bosch partners benefit from:
▶ Bosch OEM quality
▶ Bosch is the no. 1 diesel system manufacturer worldwide
▶ Bosch expertise
▶ Testing and diagnostics technology by Bosch

Bosch today offers a wide range of glow plug products:
- Glow wire plugs for older vehicles
- Standard glow plugs for older preheating systems
- Duraterm®
- Duraterm® Ceramix
- Duraterm® High Speed
- DuraSpeed®

Bosch – extensive expertise:
▶ Close collaboration with vehicle manufacturers
▶ From complete original equipment of components to coordinated systems
▶ Innovations for automotive progress
▶ International development and production network
Glow plug production: Automotive engineering

The design principle of the Duraterm® and Duraterm® High Speed:

- The **insulating washer [2]** ensures reliable insulation between the terminal stud and the housing.
- The **glow tube [4]** must above all be able to withstand the thermal shock, vibration and corrosion caused by aggressive gases and soot from combustion. Bosch therefore uses NiCrFe alloys that meet these requirements perfectly.
- The **control coil [5]** of Co8Fe alloy ensures a constant temperature of 1,000°C.
- The **heating coil [7]** is designed to heat up in the shortest possible time and comply with the defined service life.
- The connection between the **heating coil [7]** and the **control coil [5]** is laser-welded and ensures a permanent connection.
- The **heater seal [8]** and the **housing seal [9]** ensure that the glow plugs are absolutely gas-tight.
- The **screw-in thread** is coated and rolled. This means that it cannot seize in the cylinder head and easy unscrewing is guaranteed. In addition, high mechanical strength is guaranteed.
Short circuit impossible due to Bosch technology
A shorted coil or short circuit with the glow tube is not possible on Bosch glow plugs. The **centering of the coil in the glow tube** guarantees exact spacing from the inner wall of the glow tube. This means contact between the coil and the glow tube is not possible. The coils are embedded in an electrically insulating, but very heat-conductive ceramic **magnesium oxide powder [6]**.

The smaller the glow tube diameter, the more difficult the production of such special heating elements. This is also the main reason for low-cost providers either not offering glow plugs such as Duraterm® High Speed or offering them with a very short service life. Please see also pages 32–33 "Competitors".

Specifications:
The glow plug should enable an immediate start as well as a post-glow with very high temperatures over a long period of time. In addition, a very long service life of the glow plug is desired.

The solution: ceramic glow plugs
The design of a ceramic glow plug is very similar to that of a metal glow plug. The main difference is the ceramic coating of the heat conductor.

Result: Bosch DuraSpeed®
The **ceramic glow plug by Bosch**. The heating element of highly temperature-resistant silicon nitride ceramic material meets these high requirements.

Original equipment technology
Car drivers can rely on the fact that they will receive the same original equipment technology even in the aftermarket. This is Bosch quality, exactly tailored to the engine in question.

Perfect collaboration:
Bosch engineering and production
- Innovation and technology leader
- Quality and reliability in production
- System expertise and networking of engineering and production
- Success-oriented partnerships
Future means "reliable, clean, efficient": With diesel expertise from Bosch

**Diesel belongs to the future**
With the Euro-6 emissions standard (2014), NOₓ emissions have to be more than halved. To do this, Bosch developers increase the exhaust gas recirculation rates, the charge pressures for the combustion air, the injection pressures and thus achieve a low nitrogen-oxide combustion. The exhaust gas treatment means the efficiency of the diesel engine is further improved. Bosch developers have adapted the tried and tested Denoxtronic from the commercial vehicle sector to the requirements of the passenger car.

**Diesel engine of the future**
Through extreme downsizing, diesel engines will only have three cylinders and around 1.1 liters cubic capacity. Downsizing results in more delicate cylinder walls and less space in the combustion chamber. For this reason, thinner glow plugs are an absolute must.

The diesel engines are equipped with additional technologies:
- Start/Stop system for automatic engine start and stop (traffic jam, traffic lights).
- Thermal Management: The engine is quickly brought to its optimal operating temperature and kept there. A highly efficient alternator also uses the braking energy to charge the battery.

**Pulse-width modulation (PWM)**
PWM is the ratio between the on time and the off time within a defined period. This means that exactly as much power is released to the glow plugs as is required for optimal, environmentally friendly combustion. Result: reduced diesel consumption and relief of the electrical system.

**Diesel particle filters**
These are able to almost completely filter the soot particles out of the exhaust gases and then burn them. To ensure that the particle filter does not clog up and the exhaust gas back pressure in the engine does not become excessive, the particles stored in the filter must be combusted from time to time. This process is called regeneration. **The intermediate glow of the DuraSpeed® supports periodic regeneration of the diesel particle filter.**

Exhaust gas system with particle filter:
1 Control unit, 2 Temperature sensor, 3 Differential pressure sensor, 4 Soot sensor, 5 Temperature sensor, 6 Oxidation catalytic converter, 7 Particle filter
Optimization of the glow parameters of the glow plug

Through electro-thermal simulation, the heating profile and also the temperature distribution of the glow plug are determined. In this way, the glow plug and its actuation are optimized.

**Example: Duraterm® High Speed glow plug**

In the original status (top diagram) the maximum internal temperature (see 1) is almost 1400°C. The external temperature at this time is just 1050°C. The thermal image shows the range in which the temperature occurs (2, red color). The temperature is much too high to enable a long service life of the glow plug.

The parameters are changed in the simulator until the glow plug heats up optimally.

The bottom diagram shows the max. internal temperature (3) as being almost 1200°C. This is almost 200°C less than before. The max. external temperature remains approx. 1050°C as before. The thermal image shows that there is no longer a temperature increase in range 4 (yellow color). This optimization increases the service life of the glow plug.
The right glow plug for every engine: 

At a glance

These earlier glow plug generations, which are not capable of post-glow, are maintained in the Bosch delivery range so that older vehicles can continue to start reliably even today.

### Standard glow plugs, not capable of post-glow

<table>
<thead>
<tr>
<th></th>
<th>Volts</th>
<th>Preheating time</th>
<th>Used since</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.9 – 6 V</td>
<td>up to 180 seconds</td>
<td>1950</td>
</tr>
<tr>
<td>B</td>
<td>10 – 18 V</td>
<td>up to 45 seconds</td>
<td>1960</td>
</tr>
<tr>
<td>C</td>
<td>11 V</td>
<td>&lt; 15 seconds type Rasant RSK</td>
<td>1978</td>
</tr>
<tr>
<td>D</td>
<td>11 V</td>
<td>&lt; 8 seconds type Super-Rasant S-RSK</td>
<td>1982</td>
</tr>
<tr>
<td>E</td>
<td>5 mm metal sheathed element</td>
<td></td>
<td></td>
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### Glow plugs capable of post-glow

<table>
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<tr>
<th></th>
<th>Volts</th>
<th>Preheating time</th>
<th>Used since</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11 V</td>
<td>4 seconds</td>
<td>1990</td>
</tr>
<tr>
<td>2</td>
<td>11 V</td>
<td>4 seconds</td>
<td>2000</td>
</tr>
<tr>
<td>3</td>
<td>11 V</td>
<td>4 seconds</td>
<td>2001</td>
</tr>
<tr>
<td>4</td>
<td>11 V</td>
<td>&lt; 7 seconds</td>
<td>2001</td>
</tr>
<tr>
<td>5</td>
<td>11 V</td>
<td>&lt; 6 seconds</td>
<td>2000</td>
</tr>
</tbody>
</table>

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1 1990  2 2000  4 2001  6 2002
Glow plugs capable of post-glow

<table>
<thead>
<tr>
<th>Number</th>
<th>Code</th>
<th>Description</th>
<th>Volts</th>
<th>Preheating time</th>
<th>Used since</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0 250 312 ...</td>
<td>Duraterm® Ceramix 4/2.9 mm ceramic sheathed element</td>
<td>11 V</td>
<td>&lt; 4 seconds</td>
<td>2002</td>
</tr>
<tr>
<td>7</td>
<td>0 250 402 ...</td>
<td>Duraterm® High Speed 5/3.7 mm metal sheathed element</td>
<td>5 V</td>
<td>&lt; 2 seconds</td>
<td>2004</td>
</tr>
<tr>
<td>8</td>
<td>0 250 403 ...</td>
<td>Duraterm® High Speed 4/3.3 mm metal sheathed element</td>
<td>4.4 V</td>
<td>&lt; 2 seconds</td>
<td>2005</td>
</tr>
<tr>
<td>9</td>
<td>0 250 603 ...</td>
<td>DuraSpeed® 4/3.2 mm ceramic sheathed element</td>
<td>7 V</td>
<td>&lt; 1.4 seconds</td>
<td>2006</td>
</tr>
</tbody>
</table>
A Bosch patent is revolutionizing the diesel world: **Duraterm®**

**Bosch Duraterm®**. The patented glow plug with its fast preheating and long post-glow times has revolutionized the diesel world.

- Preheating time of approx. 4 seconds to reach 850°C; previously 15 seconds.
- Post-glow time of up to 180 seconds. Post-glow time previously not available.
- Self-regulation of preheating temperature at 980°C.
- Superior quality thanks to Bosch experience since 1922.

**Longer service life with the NiCrFe glow tube** (Nickel-Chrome-Iron alloy)
For the customer, the longer service life of this glow plug means significantly longer replacement intervals: On an average, a Duraterm® lasts for 80,000 km, which is therefore 40% longer than a standard glow plug.

**Environmentally friendly post-glow**
In the warm-up phase, the glow plug continues to glow for up to 180 seconds, in order to control troublesome knocking during cold starts. In addition, the pollutant content of the exhaust gas falls. The pollutant emissions when the engine is cold fall by up to 60%.

**Uses according to engine characteristics**
The 11 volt Duraterm®, which has been tried and tested millions of times over, is available in 4 different glow tube sheathed element diameters:

- Ø 6 mm, 5 mm, 4.4 mm and 4 mm
  - Ø 6 mm is primarily used in IDI engines; the other diameters are used in DI engines.

**Original equipment technology**
Car drivers can rely on Bosch: They receive original equipment technology even in the aftermarket. This is Bosch quality, exactly tailored to the specific engine.

**Workshop packaging**
The top sellers are available in space-saving packs of 10.
The 3-digit quick search number enables quick and easy identification in electronic media: practical for retail and in workshops.
It is not possible to overheat the Duraterm® glow plug

Thanks to PTC* behavior, it is no longer possible to exceed the permissible temperature. The "steady-state temperature" during the post-glow phase is limited independently. At higher temperatures, the resistance increases, which means performance falls and temperature is stabilized.

*PTC = positive temperature coefficient

Start instead of waiting.

In comparison with previous standard glow plugs:
- Reliable starting behavior at low temperatures
- Environmentally friendly thanks to harmful emissions reduction by up to 60%
- Reduction of noise development (so-called "cold start knocking")
- Increased engine service life due to soot reduction
- Improved combustion and thus fuel saving
- 40% longer service life

Function comparison of Duraterm® and standard glow plug

<table>
<thead>
<tr>
<th>Specific resistance of the control coils (Duraterm®, Standard)</th>
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<tbody>
<tr>
<td>1.2</td>
</tr>
<tr>
<td>1.0</td>
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<tr>
<td>0.8</td>
</tr>
<tr>
<td>0.6</td>
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<tr>
<td>0.4</td>
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<tr>
<td>0.2</td>
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<tr>
<td>0.0</td>
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<tr>
<th>Temperature curve of the glow plugs</th>
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<tbody>
<tr>
<td>1500</td>
</tr>
<tr>
<td>1050</td>
</tr>
<tr>
<td>950</td>
</tr>
<tr>
<td>850</td>
</tr>
<tr>
<td>750</td>
</tr>
<tr>
<td>650</td>
</tr>
</tbody>
</table>

Graphic at top left: The Co8Fe alloy patented for Bosch causes the control coil of the Duraterm® – at temperatures greater than 400°C – to let through a lower current for heat generation than conventional standard glow plugs. The temperature increases and the electrical resistance of the control coil rises.

Graphic at top right: When the glow plug is cold, a higher current flows so that the glow plug heats up quickly. While the Heating coil heats up quickly, the control coil heats up slowly. Due to the PTC effect of the control coil, the current falls and the glow plug stabilizes at its end temperature.

Blister packaging unit
10 x blister packagings per box, thus ruling out any damage to the individual packaging units.

Duraterm® display
Very practical for the shop counter: three top selling types in the display of 16.
Increasingly thin, long and fast: Bosch Duraterm® High Speed

**Duraterm® High Speed: The second Duraterm® generation**

The Duraterm® High Speed low-voltage glow plug is characterized by faster starts in new diesel engines.

The design and functional principle are the same as for the Duraterm metal glow plugs. To improve its technical features compared with Duraterm®, Duraterm® High Speed was designed for a low voltage of 4.4 or 5.0 volts:

- Halving of the start time to around 2 seconds
- Reaches its preheating temperature of approx. 1000°C in about 2 seconds
- Doubling of the post-glow time to 360 seconds
- Protection of the battery and relief of the alternator during cold starts

**Yesterday and today**

For decades, glow plug starting systems were used only for starting. Today, they also reduce exhaust emissions and make engines more environmentally friendly.
The average service life of Bosch Duraterm® High Speed is approximately 100,000 km. Thanks to the NiCrFe alloy, the glow tube is able to withstand the aggressive gases from combustion. Duraterm® High Speed is therefore protected against thermal shocks, vibration and corrosion.

**Long post-glow**
Thanks to its long post-glow time and the intermediate glow, Duraterm® High Speed allows for very good smooth running and comfort in all load ranges.

**Uses according to engine characteristics**
Duraterm® High Speed is longer, thinner and fits perfectly into today’s engines. This was achieved through the tapering of the glow tube diameter:

- With tapering from 5.0 mm to 3.7 mm for the 5.0 volt version
- With tapering from 4.0 mm to 3.3 mm for the 4.4 volt version

**Advantages of Duraterm® High Speed over Duraterm®**
- Ready to start in 2 seconds
- Improved cold idling
- Even lower emissions even at higher engine speeds
- Lower energy consumption
- Protects battery and alternator during cold start
- Improved combustion and thus fuel saving

**Workshop tip**
In the case of very thin glow tube tips, you must observe the exact nominal voltage of the glow plugs! With this type of low-voltage glow plug – whether metal or ceramic – measurement must only be taken with the max. nominal voltage (see page 31).
Specially developed for modern engines: Bosch DuraSpeed®

Specifically for current and future modern "cold engines" with a compression ratio reduction down to $\varepsilon \leq 17:1$, Bosch has developed the DuraSpeed® with regulated post-glow.

**High preheating temperature, long post-glow time**
The self-regulating ceramic DuraSpeed® allows for a post-glow time of up to 15 minutes at up to 1200°C with the engine running. This means the cold-idling noise is barely audible and the harmful emissions are significantly reduced. The intermediate glow phase supports the periodic regeneration of the diesel particle filter (see page 16) and prevents the formation of smoke during load changes in the engine cooled when in overrun mode.

With these features, the Bosch DuraSpeed® opens up new perspectives for vehicle and engine manufacturers: They can rely more heavily on low-compression turbo diesel engines with greater specific engine performance and reduced nitrogen oxide emissions. The design-based disadvantages of these engines – poor cold start and cold running behavior – can be compensated for with the ceramic glow plugs.

**Lightning fast and clean diesel engine cold start**
With DuraSpeed®, diesel engines can start just as quickly as gasoline engines. They are also quieter and more environmentally friendly. In less than 2 seconds, they heat up to 1000°C, develop a post-glow temperature of up to nearly 1300°C and level off at 1200°C. Thus, the temperature is approximately 30% higher than with metal glow plugs.

In extreme cold, down to -28°C, a quick start is guaranteed after a preheating time of just 2 seconds. By way of comparison: In identical conditions, conventional metal glow plugs require around 15 seconds to do this. DuraSpeed® is among the fastest glow plugs on the market.

**Table:**

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Start temperature</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>1300</td>
</tr>
</tbody>
</table>
Ceramic heating element in patented flexible design
A special design feature of the Bosch DuraSpeed® is the heating element, which is made of highly temperature-resistant silicon nitride ceramic material (see pages 14–15) and, together with a flexible moldable metal tube, forms the so-called heater. This patented “flexible design” increases the mechanical durability of the glow plug. Thus, the heater can bend, e.g. as a result of incorrect, slanted insertion in the workshop. This significantly reduces the risk of breakage. The ceramic material also guarantees high hot-gas resistance and durability.

Low-voltage technology reduces warm-up time and protects the battery
In particular the good thermal conductivity of ceramic as well as the nominal voltage of 7.0 volts – which is significantly lower than the electrical system voltage of 12 volts – are crucial for this progress. The electronic glow control unit connected to the EDC (Electronic Diesel Control) adapts the voltage for the glow plugs and thus their preheating temperature accurately to the respective requirements of the engine. Advantage: To reach the temperature required for engine starting as quickly as possible, the glow plugs can be operated at increased voltages during warm-up. Experts speak of so-called “pushing”. This guarantees a fast start even in extreme cold, as with gasoline engines. In addition, the plugs reach their optimal preheating temperature even during drops in the electrical system voltage during the cold start.

Original equipment customers
Renault was the first customer in the world to introduce DuraSpeed® with low-voltage technology in its original equipment. BMW, Citroën, Infiniti, Land Rover, Nissan, Opel, Peugeot, Vauxhall and Volvo soon followed suit. Other brands have registered their interest.

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>DuraSpeed®</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMW</td>
<td>03.2007</td>
</tr>
<tr>
<td>Citroën</td>
<td>07.2009</td>
</tr>
<tr>
<td>Infiniti</td>
<td>04.2010</td>
</tr>
<tr>
<td>LandRover Group</td>
<td>09.2009</td>
</tr>
<tr>
<td>Nissan</td>
<td>10.2006</td>
</tr>
<tr>
<td>Opel</td>
<td>08.2006</td>
</tr>
<tr>
<td>Peugeot</td>
<td>07.2009</td>
</tr>
<tr>
<td>Renault</td>
<td>09.2004</td>
</tr>
<tr>
<td>Vauxhall</td>
<td>08.2006</td>
</tr>
<tr>
<td>Volvo</td>
<td>04.2006</td>
</tr>
</tbody>
</table>

Emissions reduction through optimal adjustment of the preheating temperature to the respective operating status of the engine
Lower emissions even at higher engine speeds
Lowest emissions even with poorer fuel quality
Best adaptation of the preheating time to engine requirements
“Flexible design” protects against assembly damage
Lower power consumption protects the battery and alternator
Diesel expertise, technology and service: Customer satisfaction as top priority

Common features of all post-glow capable glow plugs from Bosch

- Very high original equipment quality
- Intrinsic safety through self-regulation of temperature
- Very long service life
- Excellent price-performance ratio
- Reliable and very fast cold start

Advantages for the customer

- Emissions reduction → Protects the environment
- Optimal fuel combustion → Increased driving performance
- Reduced fuel consumption → Reduced costs
- Bosch reliability → Satisfied customers
- Self-regulation of temperature = Reliable post-glow → Ensures optimal engine running
- Longer replacement intervals due to increased service life → Reduced costs

Bosch glow plugs with the power of persuasion:
The extensive glow plug range from Bosch offers the right solution for almost every diesel vehicle. With over 90 years of experience and expertise, Bosch develops cutting-edge technology for diesel. From the Duraterm® to the DuraSpeed® glow plug – Bosch sets benchmarks and meets the highest quality requirements.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Type</th>
<th>Voltage 1)</th>
<th>Ready to start 2)</th>
<th>Start time at -28°C</th>
<th>Post-glow time up to</th>
<th>Post-glow temperature</th>
<th>Average service life km</th>
<th>Warm-up time to 1000°C</th>
<th>Maximum preheating temperature</th>
<th>For engines with compression ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duraterm®</td>
<td>Metal</td>
<td>11.0 V</td>
<td>&lt; 4 sec.</td>
<td>15 sec.</td>
<td>3 min.</td>
<td>1000°C</td>
<td>80000</td>
<td>&lt; 6 sec.</td>
<td>1150°C</td>
<td>≥ 20:1</td>
</tr>
<tr>
<td>Duraterm® High Speed</td>
<td>Metal</td>
<td>4.4 V/ 5.0 V</td>
<td>&lt; 2 sec.</td>
<td>&lt; 10 sec.</td>
<td>6 min.</td>
<td>1000°C</td>
<td>100000</td>
<td>&lt; 3 sec.</td>
<td>1100°C</td>
<td>≥ 18:1</td>
</tr>
<tr>
<td>DuraSpeed®</td>
<td>Ceramic</td>
<td>7.0 V</td>
<td>&lt; 1 sec.</td>
<td>2 sec.</td>
<td>15 min.</td>
<td>1200°C</td>
<td>300000</td>
<td>&lt; 2 sec.</td>
<td>1300°C</td>
<td>≥ 17:1</td>
</tr>
</tbody>
</table>

1) V: Bosch glow plugs are identified with the test voltage
2) Preheating time for preheating temperature 850°C for a cold start at normal winter temperatures
The "Exhaust gas index" graphic shows this clearly:
The hotter the glow plug surface temperature the better it is for the environment. Only ceramic glow plugs (DuraSpeed®) with preheating temperatures up to 1300°C can also guarantee this. Duraterm® by Bosch, in comparison with standard glow plugs, which are not capable of post-glow, reduces smoke formation by as much as 60%. The hot DuraSpeed®, on the other hand, lowers the exhaust gas turbidity values by a further 60% in comparison with Duraterm®.
At the start of the new millennium, Bosch Common Rail technology further reinforced the diesel boom. While 22 percent of all passenger cars sold in Europe in 1997 were self-igniters, this figure had already risen to over 55 percent by the start of 2012. In America and Asia too things are now moving forwards rapidly.

**The service life of the glow plugs** varies from type to type. According to Bosch experience, the average service life for Duraterm® is 80,000 km and, for ceramic plugs, the average service life is equal to the engine life. This applies under normal conditions. Different factors are crucial for the life of the glow plugs, for example:

- Use in IDI engines or DI engines or DI low-voltage engines
- Use in specific engines, which tend towards very heavy sooting
- Mileage
- Customer service maintenance
- Nozzle jet setting

**Glow plug replacement: When?**

The customer will not immediately notice that one or more glow plugs need to be replaced. If the engine does not start immediately, the customer will try to start it again. By the time the cold season starts it is too late (see table). Workshops should therefore inform their customers of the problem of cold via advertisements or by letter. Nonetheless, Bosch does not advise the workshop to replace glow plugs in general, but to proceed according to the following rule: If a Bosch glow plug is defective at less than 50,000 km, only this individual plug should be replaced. For mileages above 60,000 km, all Bosch glow plugs must be replaced, as the other plugs that are still working could very soon become faulty. The customer would then have to visit the workshop again.

**Reliable and precise functional test**

The glow plug resistance should only be measured with an Ohmmeter/multimeter. This protects the glow plug against overheating due to direct battery voltage.

**Check regularly every 80,000 – 100,000 km**

Glow plugs are wearing parts and therefore have to be checked regularly to ensure they function perfectly. Experience has shown that glow plugs usually reach their wear limit in quick succession. For the customer, replacing the complete set costs less than repeatedly replacing individual defective glow plugs. This is because the connection lines and conductor bars have to be removed before each replacement.
Engine loud, unsettled, lack of power? Check the glow plugs!

Defective glow plugs can cause many different malfunctions. If the following symptoms occur, it may be worthwhile checking the glow plugs.

- Increased smoke formation, especially after a cold start
- Combustion noise is louder than normal when the engine is cold
- The engine runs unevenly despite a warm engine
- The power output drops or fuel consumption increases

Temperature dependence of starting performance

<table>
<thead>
<tr>
<th>IDI engines</th>
<th>DI engines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting problems if...</td>
<td>at less than °C</td>
</tr>
<tr>
<td>-5°C</td>
<td>-10°C</td>
</tr>
<tr>
<td>-10°C</td>
<td>-15°C</td>
</tr>
<tr>
<td>Below +5°C, starting problems can occur even with just one defective glow plug</td>
<td>At temperatures above -5°C, DI starts even without glow plug</td>
</tr>
</tbody>
</table>

The starting behavior of IDI engines and DI engines is very temperature-dependent, in particular during the cold season. IDI engines experience starting problems below 5°C even with just one faulty glow plug. DI engines experience starting problems if there are e.g. two faulty glow plugs and temperatures of -10°C. Customers should therefore be actively advised of this in good time in the workshop.
Fault diagnosis at a glance: Glow plug faces

**Tip of heating element damaged**
- **Cause:** Premature start of injection.
- **Impact:** Tip of heating element too hot, becomes brittle and breaks.
- **Remedy:** Check injection system, set injection point exactly.

**Heating element melted/broken off**
- **Cause:** Premature start of injection. Nozzles with coke deposits or nozzle wear. Engine damage (after valve damage, piston seizure, etc.). Dribbling nozzles. Seized piston rings.
- **Impact:** Heating element too hot and melts or breaks.
- **Remedy:** Check injection system (e.g. nozzle-and-holder assembly), set injection point exactly.

**Heating element ruptured**
- **Cause:** Cheap glow plugs/imitations (tube may swell, burst or even explode due to incorrect filling or poor drying of insulating powder before filling).
- **Impact:** Short circuit due to overheating. Tube may burst or explode.
- **Remedy:** Use Bosch glow plugs.

**Ceramic heating element broken**
- **Cause:** Incorrect injection point. Incorrect spray pattern. Overvoltage (refer to heating element melted). Incorrect fitting due to plug being tilted during installation.
- **Impact:** Heating element tip overheats and breaks.
- **Remedy:** Check the engine for oil loss due to leaks. Check that the control unit functions correctly. Install plug correctly.

**Ceramic heating element melted**
- **Cause:** Installation of wrong glow plug (e.g. 12 V glow plug instead of 24 V glow plug). Defective control unit generating too much voltage or not shutting off current flow soon enough.
- **Impact:** Ceramic heating element melts due to overvoltage.
- **Remedy:** Check alternator. Check correct operation of control unit. Use vehicle-specific glow plugs.

**No glow-plug continuity**
- **Cause:** Annular orifice between plug shell and heating element constricted or blocked by coke deposits. Too much heat dissipated by heating element, control coil remains cold and allows too much current to reach heating coil.
- **Impact:** Break in heater coil.
- **Remedy:** Check injection system. Set injection point exactly.

**Terminal stud damaged**
- **Cause:** Excessive terminal-nut tightening torque. Use of incorrect tool.
- **Impact:** Terminal stud shears off, damage to hexagon, short circuit.
- **Remedy:** Use appropriate torque wrench. Comply exactly with specified tightening torque.

**Heating element with dents and folds**
- **Cause:** Operation with excessively high voltage, e.g. starting assistance. Excessively long energization (power supply/preheating relay). Impermissible post-glow with engine running. Glow plug with no post-glow capability fitted. Increased alternator voltage.
- **Impact:** Break in heater coil.
- **Remedy:** Starting assistance with 12 V vehicle electrical system only. Check glow-plug system. Replace preheating-time relay.
The “glow plug faces” reveal a lot to the professional. The Bosch workshop poster shows an overview of typical glow plug damage. Causes and recommendations for remedying the damage are also listed.

**Accurate testing with Ohmmeter/multimeter**

During the functional test, direct battery voltage can overheat the low-voltage glow plugs. Melted metal/ceramic parts can injure the mechanic or cause engine damage. Therefore, always check the resistance values with a multimeter.

- The resolution of the multimeter should be less than 100 mOhm
- For a good measurement connection, wipe oil, dirt or corrosion off the contacts
- Determine the inherent resistance (offset) of the multimeter: Place the ends of the measurement electrodes together and read off the measured value
- Measuring points when installed (engine off): Apply the electrodes of the measurement device to the connector of the glow plug and engine housing (ground)
- Resistance value of the glow plug = Measured value minus inherent resistance of multimeter (offset)

**Resistance values:**

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Malfunction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>∞ Ω</td>
<td></td>
<td>Glow plug defective</td>
</tr>
<tr>
<td>&lt; 0.2 Ω</td>
<td></td>
<td>Glow plug defective</td>
</tr>
<tr>
<td>&gt; 0.2 Ω and &lt; 5 Ω</td>
<td>Glow plug OK</td>
<td></td>
</tr>
</tbody>
</table>
How good are the competitors: Bosch has investigated them, and the facts speak for themselves

At first glance, glow plugs differ only slightly these days. Buying a glow plug is therefore a question of trust. You can trust in the tried and tested quality of Bosch.

Glow plugs from numerous competitors have significantly poorer quality than the tried and tested quality of Bosch.

X-ray images from the test lab
The X-ray images shown here provide proof of deficient quality. The result is unsatisfied car drivers, when their car starts badly or the glow plugs have to be replaced after "just" a few thousand kilometers. In the worst case, engine damage can even be caused.

These errors result in immediate short circuit and destruction of the glow plug. If a piece falls into the combustion chamber, engine damage will occur.
Glow plug warranty
Bosch glow plugs can be used in all engines in accordance with the applicable recommendations issued by Bosch. Bosch guarantees the promised properties and flawlessness in accordance with the respective state of the art. The warranty period for material and manufacturing faults is 24 months.
Product piracy: Bosch packaging protection against counterfeiters

Protection and reliability: Original parts from Bosch
In particular for diesel engines, workshops should use original Bosch parts.

Quality creates added value
Beware of counterfeiters! Original replacement part from the OEM or parts from other manufacturers? Not even the workshop professional can identify this immediately. Imitations or counterfeit parts can cause serious consequences. Robert Bosch GmbH has therefore started up the "Quality creates added value" initiative together with reputable automotive suppliers. The aim of this initiative is to teach partners about the risks and origin of dubious products. Bosch therefore offers high reliability, extensive protection as well as a high level of trust in the quality of the products to the replacement parts aftermarket, workshops and car drivers.

Original means top quality
Imitation and counterfeit components can never attain the quality of Bosch replacement parts.
Original Bosch glow plugs in a tamperproof package

Glow plugs from Bosch are unmistakable. Typical features:

- High quality, tear-proof brown box
- The automatic folding base means it is not possible to open the packaging from below without destroying it (pack of 10)
- Perforated opening flaps
- Seal on the label guarantees the integrity of the packaging
- **Bosch Security Label:** A hard-to-copy hologram or VeoMark® label on every item of packaging.
- In addition, there is an 18-digit MAPP code on newer packaging. Check Bosch origin at www.protect.bosch.com
- **MAPP code:** Can be read with commercially available scanners and cell phones. Immediate verification by e-mail or SMS text message.

Beware, if supposed Bosch original products are offered in these ways:

- The sale price of the glow plug is below the market price
- Offer of unpackaged glow plugs
- Original packaging has already been opened
- The source of supply is unknown
A new procedure to protect authenticity

The further development of the Bosch Security Label protects even more efficiently against product counterfeiting. The additionally integrated MAPP code on the glow plug packaging guarantees even more effective protection of original Bosch products.

Query via the Internet
To guarantee the authenticity and integrity of Bosch products, selected Bosch packaging bears a tamper-proof seal of authentication. By checking the seal and entering a security code, partners and customers can easily check that a product is genuine.

Verification via scanner
You can read the KeySecure label with DataMatrix-2D code using a conventional 2D barcode scanner.

Verification by cell phone
Alternatively, you can check the code with your cell phone.

Protection against product piracy is increasingly important
The number of pirate copies has multiplied in recent years. According to estimates by the European Commission, counterfeit brand articles make up between five and nine percent of world trade. Product pirates form global organizations and cause damage in the region of billions. Product counterfeiters illegally copy technical knowledge that a company has developed through many years of work. Fatal consequences can occur, if the safety of modern technology, such as in the automotive area, is no longer guaranteed due to counterfeiting of original parts.

Verifiable via:
www.protect.bosch.com
Examples of how original parts and counterfeits can differ:

**Bosch standard glow plug**

**Original Bosch**
1. Nut caulked twice
2. Thick white washer

**Counterfeits**
1. Nut caulked three times
2. Thin white washer

**Duraterm®**

**Original Bosch**
1. Nut Ø approx. 9.5 mm, caulked twice
2. Thick black washer
3. Sheathed element tip: approx. 9.5 mm long
4. Glow plug labelling: unique, clean and easily legible
   0 250 201 032 955... 764 FRANCE:
   Original Bosch embossing on one line

**Counterfeits**
1. Nut Ø approx. 9.0 mm, caulked three times
2. Thin white washer
3. Sheathed element tip: approx. 7.5 mm long
4. Glow plug labelling faint in part,
   0 250 201 032 embossing not exactly on one line, but slightly offset

**Workshop-compliant packaging:**
Bosch glow plugs are available in the space-saving pack of 10 as well as in handy individual packaging.
Expertise for professionals:
Bosch ESI[tronic] software and testing equipment

Everything to do with diesel systems from a single source
Complex networked systems in vehicles require workshops to provide increasingly well qualified diagnosis and comprehensive expertise in repairs. Bosch Diagnostics therefore offers workshops extensive system expertise and a complete range of testing equipment from a single source. Modern, high performance diagnostic equipment, technical training and a hotline are there to support workshops in all repairs.

ESI[tronic] 2.0 Software for diagnosis and service
ESI stands for “Electronic Service Information” and is the name given to the software for performing servicing work. This includes:
- Troubleshooting on the system
- Maintenance
- Repair instructions

Testing equipment: multi-manufacturer professional diagnosis
For troubleshooting and diagnosis, Bosch offers a wide range of inspection and testing equipment. The modular structure of all components guarantees high investment certainty.

Tailored for the workshop
The ESI[tronic] 2.0 software is completely tailored to the needs of workshops. Easy operation, quick access, and a standardized system across all brands make ESI[tronic] 2.0 software a user-friendly information tool. Comprehensive market coverage and constant updates are provided, as you would expect. The software packages have a modular structure – this means that a diesel system specialist can subscribe to the specific “information types” that are relevant.
Practical Bosch tips:
When replacing the glow plug, always observe the correct torque

### Important:
When **disassembling** the old glow plugs, never exceed the **breaking torque**.

**Tip** ➔ It is easier to **unscrew** the older glow plugs when the engine is warm. For very tight-seated glow plugs, carefully and gradually loosen and retighten them. Note the **breaking torque**. If necessary, start the engine again and run until hot.

- When fitting new glow plugs, note the tightening torque (see vehicle manufacturer specifications)

**Tip** ➔ Before fitting, the seat of the glow plug and the glow plug hole should be cleaned thoroughly.

<table>
<thead>
<tr>
<th>Tightening torques for terminal nuts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thread</strong></td>
</tr>
<tr>
<td>4 mm (M4)</td>
</tr>
<tr>
<td>5 mm (M5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tightening torques for metal glow plugs or ceramic glow plugs like DuraSpeed®</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thread</strong></td>
</tr>
<tr>
<td>M 8</td>
</tr>
<tr>
<td>M 9</td>
</tr>
<tr>
<td>M 10</td>
</tr>
<tr>
<td>M 11</td>
</tr>
</tbody>
</table>
Advancement through knowledge: 
Service training, technical hotline 
and knowledge database
Service training: Worldwide – and directly on site
The training offered includes courses on all diesel systems from Bosch and other manufacturers. Learning by doing means: All trainers have a lot of workshop experience and value direct practical reference. Training is carried out in modern workshop rooms and on current vehicles. Bosch training centers can be found around the globe. Individual training courses are also offered directly on site, e.g. courses for wholesalers. In addition, there is an online training course on the subject of diesel injection on the Automotive Campus (www.automotive-campus.com).

The Bosch Service Training Center in Plochingen offers top standards
The training area, which was extended in 2011, covers 3,500 m². Around the world, approximately 116,000 workshop employees take part in training courses in Bosch training centers each year. In total, the Bosch service training centers offer around 100 different courses covering a very wide spectrum, which was extended in 2011 with the new field of Truck Training.

Online help: Problem solutions just a mouse-click away
Around the clock, workshops have access to the Extranet-based Bosch Online Help knowledge database. With all listed problem cases from recent years, this is a tool for efficient self-help in the event of service or maintenance problems. Topics that have not been saved can be requested via a "Trouble Ticket". Bosch specialists will then discuss this issue and provide an answer as soon as possible.

With the How2Fix app for smartphones and tablets (iOS operating system, Android: planned for 2014) mobile access to this knowledge database has also been possible since 2013. The app is available free of charge to Bosch hotline customers and is available in the app store.

By phone: professional knowledge
If you aren’t getting anywhere at all, a call can help: The technical hotline is available to workshops and the aftermarket. Experienced specialists can help with questions about service and repair for all brands. This saves time and guarantees competent, cost-effective help for customers.
What is a standard glow plug?
A standard glow plug has single or double coil technology, which, unlike Duraterm®, must not continue to glow because it would otherwise burn through. At Bosch, this standard technology from before 1990 has largely been replaced with Duraterm®.

Can a standard glow plug replace a Duraterm®?
No, it would burn through immediately as it is not capable of post-glow, unlike Duraterm®.

Can Duraterm® replace a standard plug?
Yes, usually. Please use the Bosch comparisons and the Bosch application lists.

What are the advantages/disadvantages of Duraterm®?
Disadvantages: None. Advantages:
- 40% longer service life
- Faster start within 4 seconds, better cold running and thus environmentally-friendly.

Can a glow plug recommended by Bosch or the vehicle manufacturer be replaced with a glow plug with a longer glow tube sheathed element?
- Not recommended for IDI engines, as the glow tube would lie directly in the fuel jet of the nozzle and would therefore burn through much more quickly.
- For DI engines, the engine would be at risk: Either the glow plug or the piston would become damaged.

Can DuraSpeed® (ceramic glow plug) replace a metal glow plug like Duraterm®?
No, as these are specific to the engine and preheating system.

Can current glow plugs be tested with a test lamp like before?
Previously, the general function of the glow plug was tested with a test lamp between the positive terminal of the battery and the glow plug connection. If the lamp lit up, this meant: function OK. Today this is no longer possible, as the glow plugs are in part operated at lower voltages. A test voltage of 12 volts would destroy the glow plug. See notes on page 23.

Can an end user replace glow plugs?
Yes, if he knows what he is doing, has the required skills and the necessary tools. Without a torque wrench, for example, there is a risk of over-tightening the glow plug. Testing a low-voltage glow plug with an 11 volt test lamp or an earlier glow plug quick tester would destroy the glow plug. Such glow plugs are sometimes installed centrally in the engine below the valve camshafts, i.e. time-consuming disassembly work is required. Professional work belongs in the professional workshop.

Are glow plugs only used in the engine?
No. Some automotive manufacturers, such as Audi, Seat, Skoda, Volvo and VW also use glow plugs to heat cooling water, so that the engine heats up more quickly.

What replacement intervals are recommended for glow plugs?
In general, the replacement interval for glow plugs is indicated in the vehicle manual. Bosch recommends checking the glow plugs for flawless function every 80000 to 100000 km. The glow plugs should be replaced as a complete set (not individually). See the information on pages 28 and 29.
What must be noted when replacing glow plugs?
- Use the correct replacement glow plugs.
- Fit/remove using the correct torque. See page 39.
- After removal, we recommend checking the "glow plug faces" exactly, so that the possible cause of the glow plug failure can be diagnosed and remedied. See page 30.

Does the Duraterm® have to be greased during assembly?
No. The nickel-plated, rolled thread does not corrode and does not seize in the engine.

What should be done if the old glow plug cannot be removed easily?
Do not use force. Please see the tips on page 39.

Is there a way to ascertain if a glow plug has been tightened excessively?
Yes, in the Bosch lab. First contact Bosch customer service with regard to processing.

Are ceramic glow plugs more heat-sensitive than metal glow plugs?
- No, ceramic glow plugs can withstand very high temperatures and can glow up to 1300°C. They are therefore well suited to today’s environmentally-friendly engines. Metal plugs would burn out with such use.
- However, ceramic glow plugs cannot withstand any overvoltage or impact. For example, they must not fall on the ground, as this could result in a fracture in the ceramic sheathed element, which would be difficult to see with the naked eye. In the combustion chamber, the sheathed element could rupture and individual ceramic pieces would have a disastrous impact on the engine.

If there is no "on-board diagnosis display" in the vehicle, when can the customer tell that replacement of the glow plugs is due?
In summer temperatures, the self-igniter starts alone without an auxiliary starting system, even if one or more glow plugs are faulty. Initially, the customer will not notice anything. As the temperature drops, the engine will no longer start so quickly and the customer will have to try for longer. Starting with 3 cylinders may be possible. But in negative temperatures, only the workshop can help. Therefore, it is advisable to have the glow plugs checked before the start of the cold season, to ensure that the engine also starts reliably in winter. For more information, see page 28.
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