

# Hidria

CLEPA  
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HIFE WINNER in GREEN  
TECHNOLOGIES



SMART | START  
innovation | excellence

## Premium Glow Plugs

### Smart technology

**ULTIMATE**  
TECHNICAL GUIDE

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## WHY TRUST HIDRIA?

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THEY TRUST US. AND YOU?



# THE DIESEL ENGINE

A diesel engine uses internal combustion, meaning that it introduces fuel into a combustion chamber which is then ignited. It uses high compression to heat the fuel to its ignition point, whereas a gasoline engine uses a spark plug to ignite a mixture of fuel and air.

Like a gasoline engine, a diesel engine uses a 4-stroke combustion cycle:

1. Air is drawn into the cylinder as the piston moves down (1<sup>st</sup> stroke)
2. Air is compressed as the piston moves back up (it heats up to 700-900°C) (2<sup>nd</sup> stroke)
3. As the piston reaches the top of the cylinder, diesel fuel is injected and ignites, which results in explosion forcing the piston back down (3<sup>rd</sup> stroke)
4. Finally, the piston moves back up again, forcing the exhaust gasses to the exhaust system (4<sup>th</sup> stroke)

Diesel engines were once considered very inconvenient and primarily for agricultural purposes. Nevertheless, significant

improvements were made in ignition technology and glow plugs, making diesel engines much cleaner, quieter and more efficient.

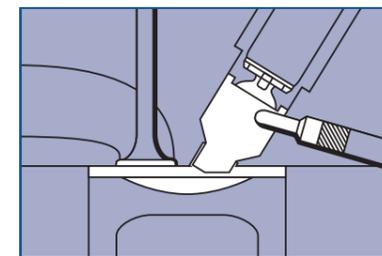


## INJECTION SYSTEMS

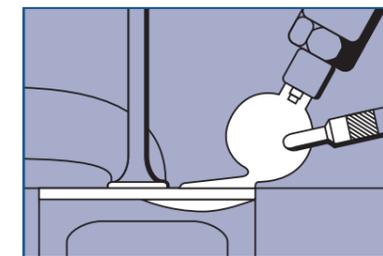
There are three basic injection systems in diesel engines: precombustion chamber, turbulence chamber method and direct injection.

Indirect injection is an old approach, as the direct injection diesel operates at a much higher efficiency with significantly lower emissions and greater performance. The difference between these two systems is not in how fuel is injected, but rather where it is injected. In precombustion chamber

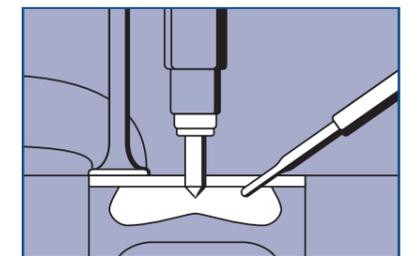
and turbulence chamber diesel engines (indirect injection), the glow plug extends into the secondary combustion chamber, while in direct injection (DI) engines, it extends into the main combustion chamber. DI engines operate at higher injection pressures and more complete atomization occurs (mixing of fuel and air). Therefore, direct injection engines do not require a prechamber to ensure proper diffusion of the fuel into air. The function of the glow plug is to provide an ignition aid at the start. Its heating rod can reach up to 1000°C in only a few seconds.



Precombustion chamber (indirect injection)



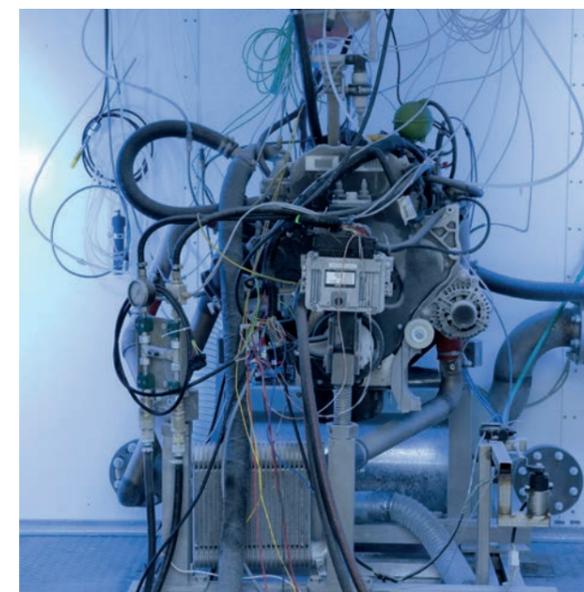
Turbulence-chamber method (indirect injection)



Direct injection

## COLD START

The term "cold start" is referred to when diesel engine and its fluids are exposed to cold temperature e.g. below 5°C. Not only are diesel engines harder to start at low temperature, low battery voltage may also impede starting performance. Therefore, glow plugs are a key component for every cold start. They warm up the engine combustion chamber to a sufficient temperature to create the ideal ignition conditions for the injected fuel. Glow plugs not only provide the necessary energy to ensure efficient combustion but modern low voltage systems compensate against low or poor battery conditions.



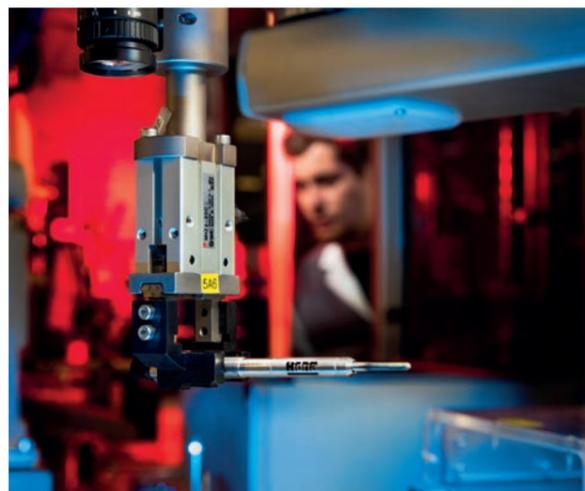
# GLOW PLUGS

The diesel engine is continuously being improved, in terms of its fuel consumption, power outputs and sophistication. Not only are the modern driver's demands higher, also emission regulations are becoming stricter. Nowadays drivers expect that start up time of diesel engine is equal or at least comparable to gasoline engine. They will no longer accept to wait 8 to 10 seconds for a glow plug light to go out before they can start the engine. One of the many reasons this is possible is due to innovative technology and continuous technical development in glow plug design.

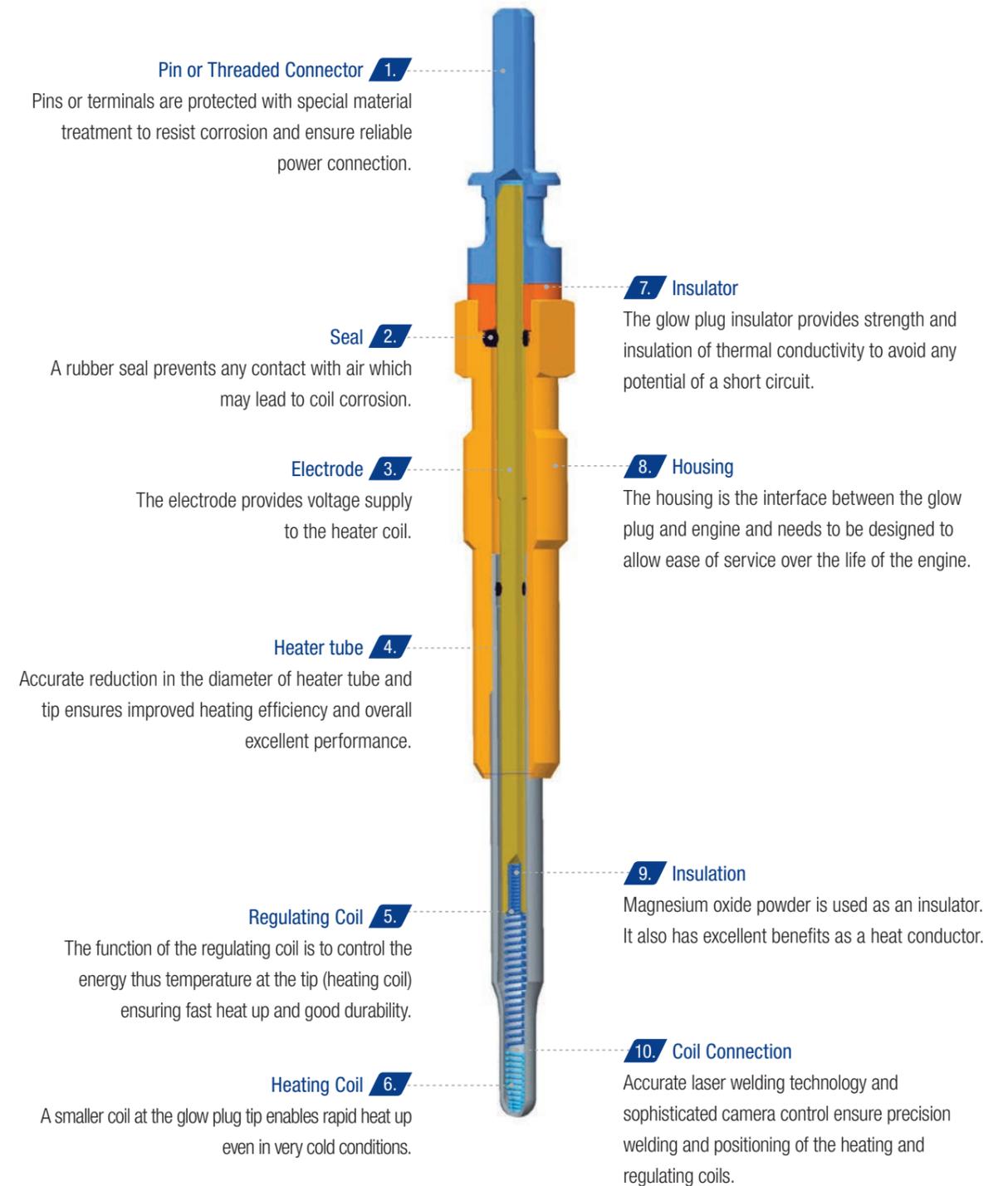
Requirements for modern glow plugs:

1. Ability to withstand extreme conditions (extreme heat, high pressure, vibrations, corrosive chemicals)
2. An extremely short pre-heating time
3. A high service life
4. Small space requirement (with modern diesel engines, the space requirement for a glow plug is minimised)
5. Perfect fit for a combustion chamber
6. Reduced exhaust emissions
7. Reduced load on the vehicle electrical system

The future of the diesel engine requires innovative and resource-efficient solutions. Dedicated Research & Development teams in HIDRIA are working closely with the leading OE global automotive manufacturers to meet the ever demanding trends. With its innovative solutions and state-of-the-art technology, HIDRIA is one of the leading suppliers for diesel cold start systems, especially glow plugs.



## THE BASIC SCHEME OF THE GLOW PLUG





## HOW THE GLOW PLUG WORKS

### Pre-heating phase

- The pre-heating system supplies the additional heat energy which is required for a clean and successful cold start.
- Just before starting the engine a voltage is applied to the terminal of the glow plug and the current flows through the heater and regulator coil. The glow plug is heated to its operating temperature and the heat energy is being transferred to the protective sheath causing it to glow.
- The time taken to reach sufficient temperature where stable combustion is attainable varies with different engine designs.



*Low voltage glow plug needs only two seconds to reach a sufficient temperature.*

### Post-heating phase

- The glow plugs continue glowing after start-up to reduce the amount of white or blue smoke produced and maintain good idle stability until the engine is sufficiently warm. The post-heating phase depends on the engine temperature, driving mode and other environment conditions.

## A breakthrough in diesel technology – exclusive solution developed and patented by Hidria.

Striving for green mobility while being aware of the demanding limits set by emissions guidelines, Hidria has developed a new generation of glow plug technology that improves engine combustion control.

Hidria's innovative cylinder pressure sensing technology integrated in the glow plug ensures extremely high accuracy levels and real time measurements of pressure during the combustion process. This enables engine closed loop control which leads to improved fuel burn levels and reduces engine emissions.

## Additional functionalities and benefits:

- Cylinder balancing
- Combustion control
- Load pressure regulation
- Improved engine vibration and smooth running
- Compensation for different fuel qualities
- Injector drifts corrections
- Easier and more robust engine calibration
- Improvement of cold start and acoustic optimization
- Operating temperature: -40°C – 150°C
- Compliancy with EURO 6 & EURO 7



# INSTALLATION TIPS

Some general tips to follow when installing and removing HIDRIA glow plugs:

1. Use the correct wrench for the glow plug and the terminal.
2. Make sure that dirt, oil, etc. on the outside of the disassembled glow plug does not enter into the cylinder.

3. When mounting the glow plug, clean the engine side of the flange (use a reamer set) and make sure the glow plug is correctly aligned with the thread of the cylinder head.
4. Make sure the plug is correctly positioned and tighten it by hand until it cannot be tightened any further.
5. Use a torque wrench to tighten it accurately to the torque showed in the table.

## Recommended installation torque specification

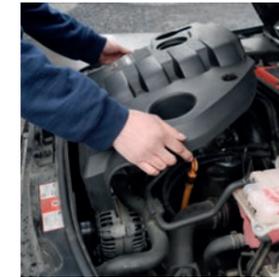
	THREAD SIZE	RECOMMENDED TORQUE
<b>GLOW PLUG</b>	M8	8-14 Nm
	M10	15-18 Nm
	M12	20-25 Nm
<b>CONNECTION NUT</b>	M4	max. 2 Nm
	M5	max. 4 Nm

-  **Do not use a thread lubricant – it might result in over tightening.**
-  **Insufficient tightening of the glow plug could lead to combustion gas leakage and poor electrical performance.**
-  **Tightening more than the recommended torque shown in the table could result in damage to the glow plug and engine.**

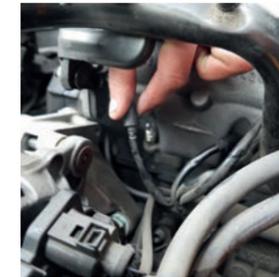


## STEP BY STEP GUIDE FOR INSTALLATION AND REMOVAL

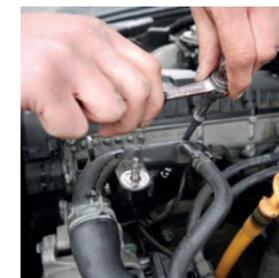
1. Remove the engine cover and other components that impair access to the glow plug



2. Manually disconnect the electrical connector



3. Using a deep socket or combination wrench, remove the glow plug from the cylinder head



4. Screw the glow plug reamer into the glow plug opening all the way in and then out (removal of carbon deposits to prevent premature failure or damage to the glow plug)



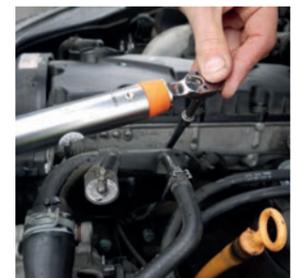
5. Screw the new glow plug in as far as it goes by hand



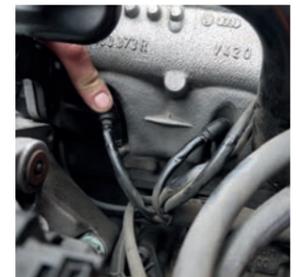
6. Set the torque wrench to the correct tightening torque



7. Place the torque wrench onto the glow plug and tighten it



8. Reconnect the connector to the glow plug terminal



What to do if the glow plug breaks during removal from engine head?

1. Remove broken part of glow plug with broken glow plug removal kit available on the market.
2. Go to step 4 from the **Step by step guide for installation and removal** and follow instructions from there.

## Glow plug test device – an easy and fast way to test glow plugs

Defective glow plugs can cause many different malfunctions: increased smoke formation, louder combustion noise, uneven running of the engine, the power output drops or fuel consumption increases, etc. It is recommended to check glow plugs regularly every 50,000 km to ensure they function perfectly. HIDRIA glow plug tester is one of the easiest and most reliable ways to check the glow plug resistance.

Benefits of using HIDRIA GLOW PLUG TESTER:

- Reliable, fast and economical testing with no need to remove glow plugs or start the engine
- Very easy to use
- Possibility for testing each glow plug individually
- It tests all commercially available glow plugs including ceramic glow plugs
- Self-calibration for better accuracy



**Tip:** It is recommended to change glow plugs regularly every 100,000 km to ensure their best performance.

**Tip:** Experience shows that glow plugs mostly reach their wear limit shortly one after another – it is much more efficient to replace the whole set than to have to change further glow plugs only a short time later.

**⚠ Glow plug failure is most commonly caused by excessive voltage. Make sure you check out the entire electrical system before changing the glow plugs. If the electrical voltage to the glow plug is held too long, either because of a faulty relay or controller, it can lead to overheating. This can result in failure of the heating coil and potential melting of the heater tube.**

PROBLEM	CAUSE	RECOMMENDED SOLUTION
 <b>Swollen glow plug tip</b>	<ul style="list-style-type: none"> <li>• Excessive voltage (e.g. 12V glow plug in a 24V system)</li> <li>• Failure of alternator and regulator</li> <li>• Poor drying of insulating powder (moisture)</li> </ul>	<ul style="list-style-type: none"> <li>• Check on-board and glow plug voltage</li> <li>• Check charging system</li> <li>• Check quality of storage conditions</li> </ul>
 <b>Broken glow plug tip</b>	<ul style="list-style-type: none"> <li>• Excessive glowing / voltage (e.g. 12V glow plug in a 24V system)</li> <li>• Failure of alternator and regulator</li> </ul>	<ul style="list-style-type: none"> <li>• Check contacts on glow plug controller</li> <li>• Check on-board and glow plug voltage</li> <li>• Check charging system voltage</li> </ul>
 <b>Damaged/missing glow plug tip</b>	<ul style="list-style-type: none"> <li>• Failure of ignition unit</li> <li>• Direction or regularity of fuel jet incorrect</li> <li>• Sealing fault causing spraying position error</li> </ul>	<ul style="list-style-type: none"> <li>• Check the ignition unit is correctly installed</li> <li>• Check you are using the correct ignition unit for the vehicle model</li> <li>• Check the glow plug installation point for carbon deposits</li> </ul>
 <b>Deformed glow plug tip (overheating)</b>	<ul style="list-style-type: none"> <li>• Failure of ignition unit</li> <li>• Direction or regularity of fuel jet incorrect</li> <li>• Sealing fault causing spraying position error</li> <li>• Excessive glowing / voltage (e.g. 12V glow plug in a 24V system)</li> <li>• Failure of alternator and regulator</li> <li>• Function or timing fault in injection unit</li> </ul>	<ul style="list-style-type: none"> <li>• Check the ignition unit is correctly installed</li> <li>• Check you are using the correct ignition unit for the vehicle model</li> <li>• Check the glow plug installation point for carbon deposits</li> <li>• Check contacts on glow plug controller</li> <li>• Check on-board and glow plug voltage</li> <li>• Check charging system voltage</li> <li>• Check fuel injection timing</li> </ul>



**Swollen glow plug tip**

- Excessive voltage (e.g. 12V glow plug in a 24V system)
- Failure of alternator and regulator
- Poor drying of insulating powder (moisture)

- Check on-board and glow plug voltage
- Check charging system
- Check quality of storage conditions



**Broken glow plug tip**

- Excessive glowing / voltage (e.g. 12V glow plug in a 24V system)
- Failure of alternator and regulator

- Check contacts on glow plug controller
- Check on-board and glow plug voltage
- Check charging system voltage



**Damaged/missing glow plug tip**

- Failure of ignition unit
- Direction or regularity of fuel jet incorrect
- Sealing fault causing spraying position error

- Check the ignition unit is correctly installed
- Check you are using the correct ignition unit for the vehicle model
- Check the glow plug installation point for carbon deposits



**Deformed glow plug tip (overheating)**

- Failure of ignition unit
- Direction or regularity of fuel jet incorrect
- Sealing fault causing spraying position error
- Excessive glowing / voltage (e.g. 12V glow plug in a 24V system)
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- Check contacts on glow plug controller
- Check on-board and glow plug voltage
- Check charging system voltage
- Check fuel injection timing

## POSSIBLE PROBLEMS AND SOLUTIONS

## WHY TRUST HIDRIA?

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YEARS WARRANTY



Missing heater tube

- Failure of ignition unit
- Direction or regularity of fuel jet incorrect
- Sealing fault causing spraying position error
- Function or timing fault in injection unit
- Thread damage to opening of cylinder head where glow plug is installed
- Glow plug insufficiently tightened causing plug to sit incorrectly
- Check you are using the correct ignition unit for the vehicle model
- Check the ignition unit is correctly installed
- Check the glow plug installation point for carbon deposits
- Check timing of injection pump
- Check the opening of cylinder head for thread damage / carbon fouling



Carbon deposits between glow plug tip and the body of glow plug

- Failure of ignition unit
- Direction of regularity of fuel jet incorrect
- Wrong spraying position caused by faulty sealing
- Injection pump operation / timing failure
- Check you are using the correct ignition unit for the vehicle model
- Check the ignition unit is correctly installed
- Check the glow plug installation point for carbon deposits
- Check the opening of cylinder head for thread damage / carbon fouling
- Check timing of injection pump



Broken/damaged power terminal

- Over-tightened torque
- Wrong tool used
- Thread damage to opening of cylinder head
- Check the opening of cylinder head for thread damage / carbon fouling
- Check glow plug torque



Carbon deposits on the glow plug housing

- Faulty sealing
- Glow plug insufficiently tightened
- Check the glow plug installation point for carbon deposits
- Check the tightening torque



PREMIUM QUALITY



INNOVATIVENESS

EXCELLENT CUSTOMER SUPPORT



**Hidria**

»We strive to improve the quality of life by contributing to **clean sustainable mobility.**«

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## YEARS WARRANTY



## New e-Catalogue Part Finder



Find the right glow plugs for your vehicle quickly in the e-catalogue, scan code or go on <http://glowplugs.hidria.com/>

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05/2017