

Glow plugs



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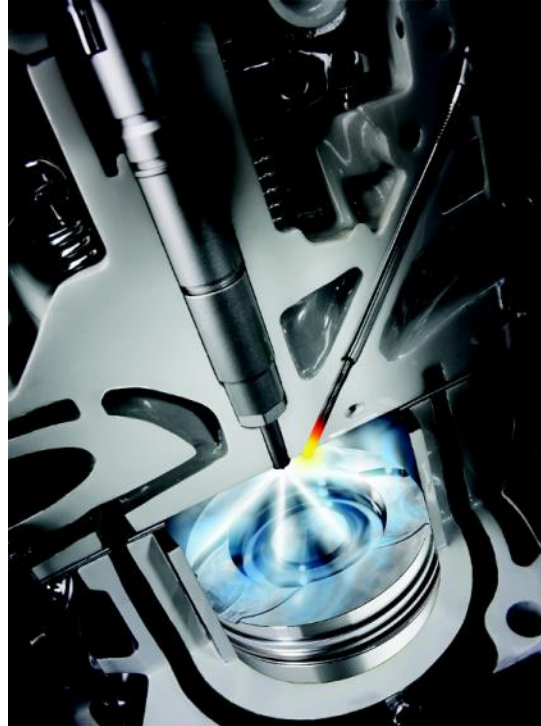
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Glow plugs

Starting process stages



1. Pre-heating



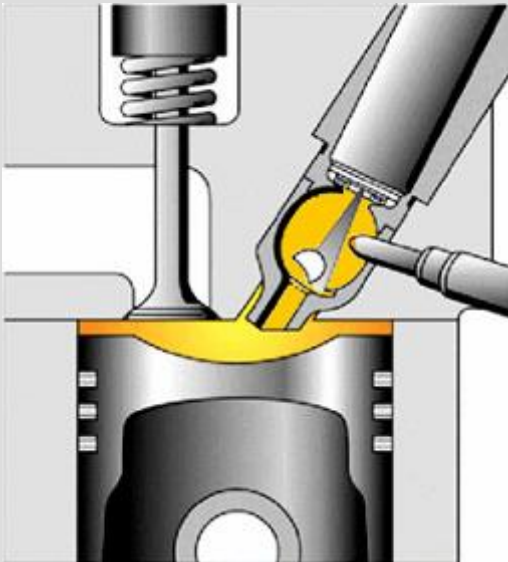
2. Injection



3. Combustion

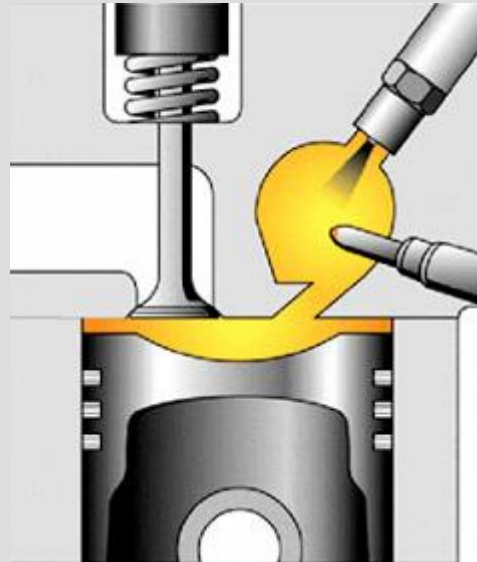
Combustion methods

Pre-chamber

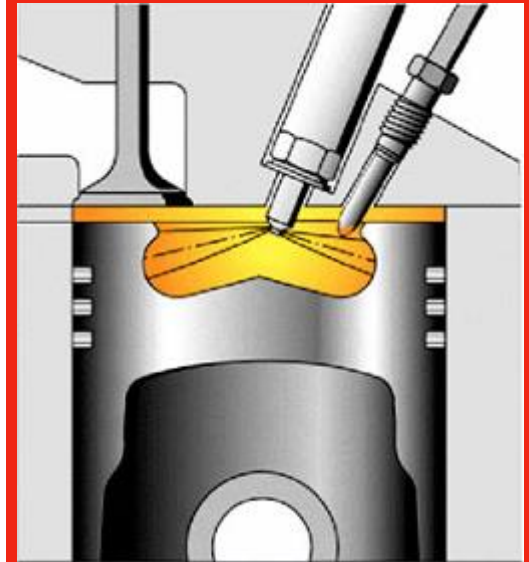


- Obsolete technologies
- Large existing vehicle population

Swirl chamber

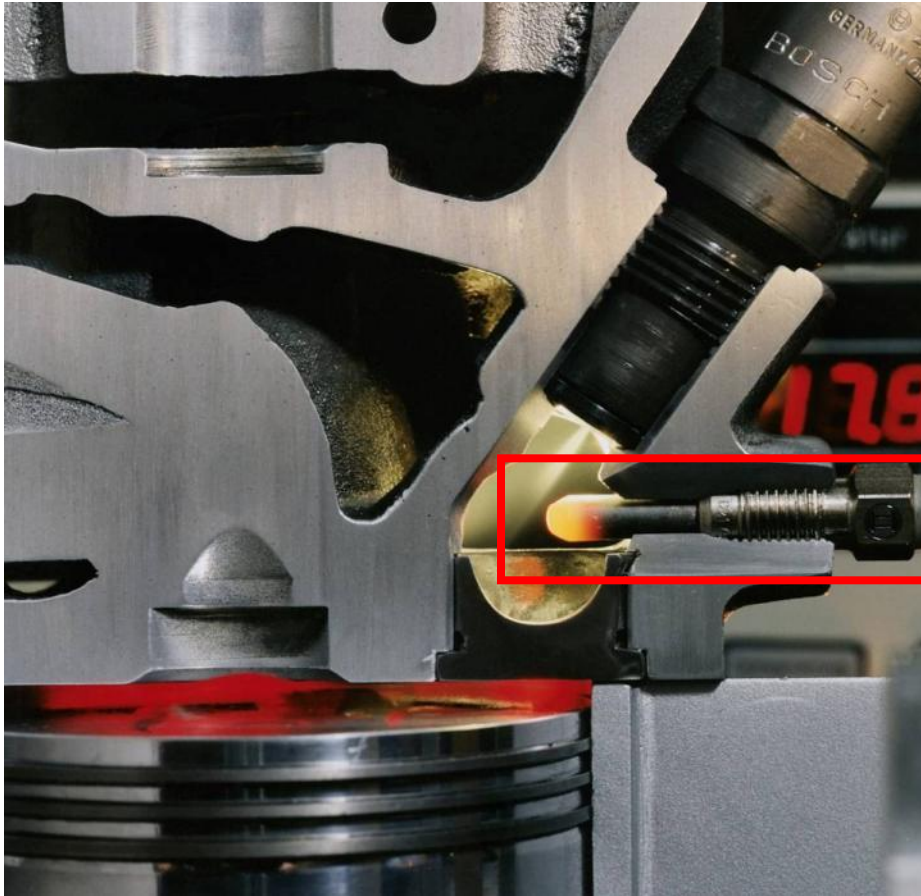


Direct injection



- State of the art
- Diesel boom

Glow plug installation



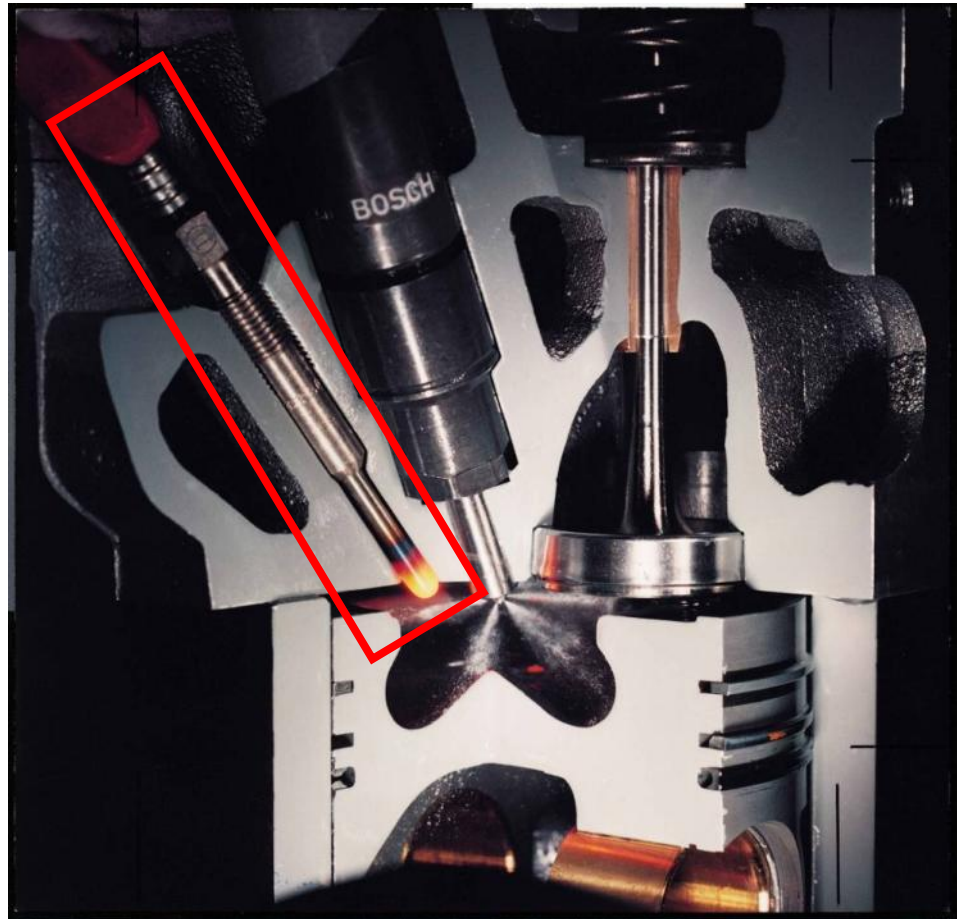
Indirect injection (IDI):

Installation in pre-chamber
or swirl chamber

Glow plugs

Glow plug installation

Direct injection (DI):
Installation in
combustion chamber



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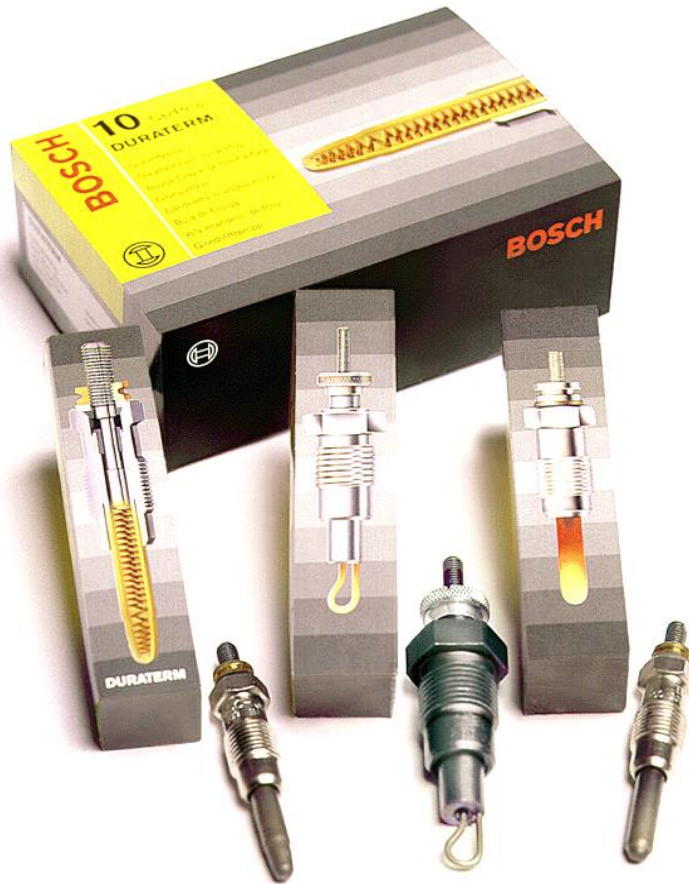
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Glow plug type generations



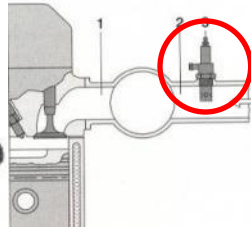
→ Filament-type glow plug (spiral or loop glow plug)



→ Standard sheathed-element glow plug



→ Duraterm sheathed-element glow plug

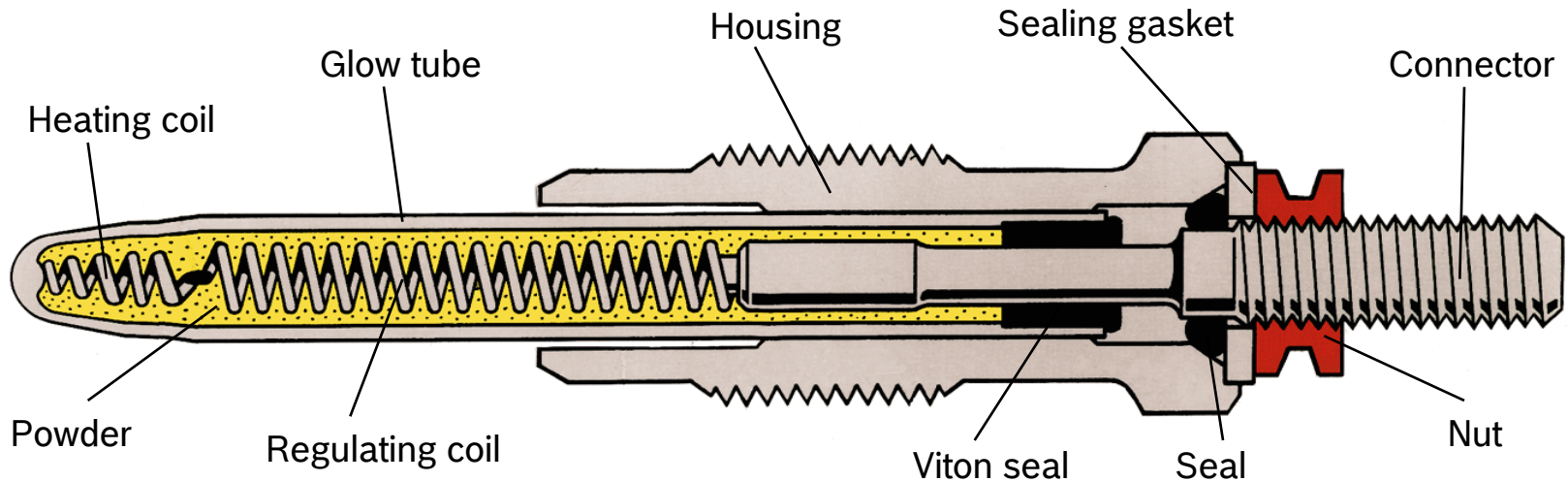


→ Flame glow plug (commercial vehicles only)



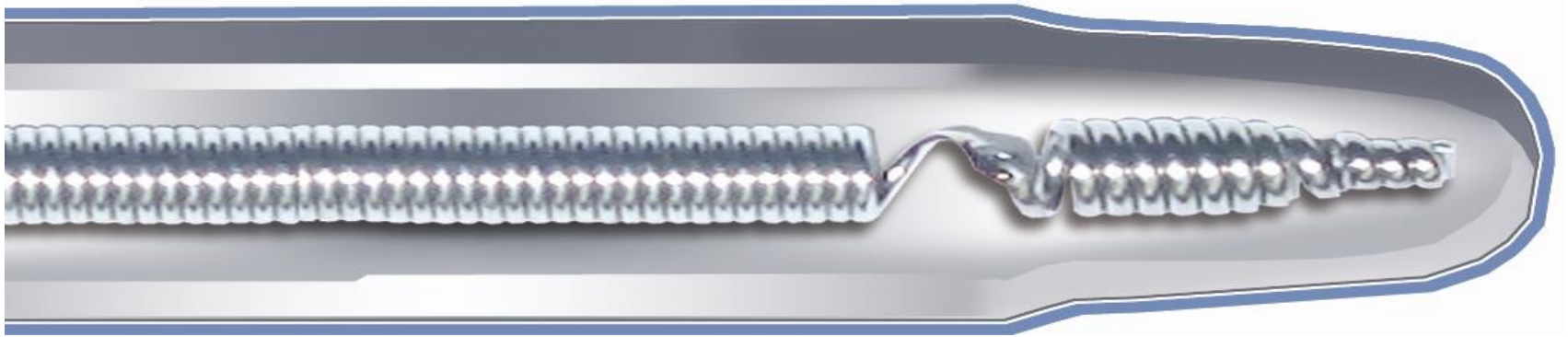
→ Ceramic glow plug GLP5

Duraterm sheathed-element glow plug



Glow plugs

Heat-up simulation



 20°C

 250°C

 900°C

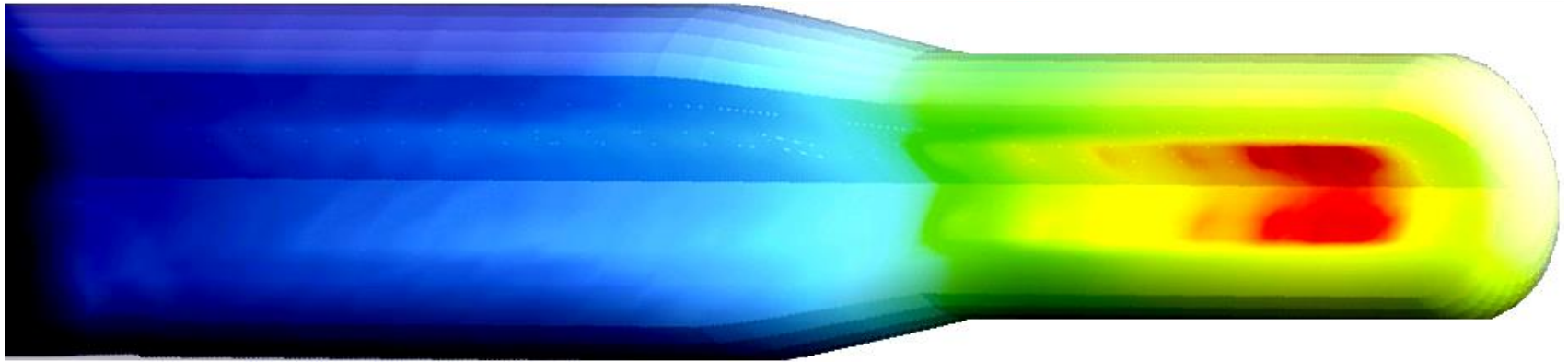
 1300°C

 100°C

 450°C

 1100°C

Heat-up simulation



■ 20°C

■ 250°C

■ 900°C

■ 1300°C

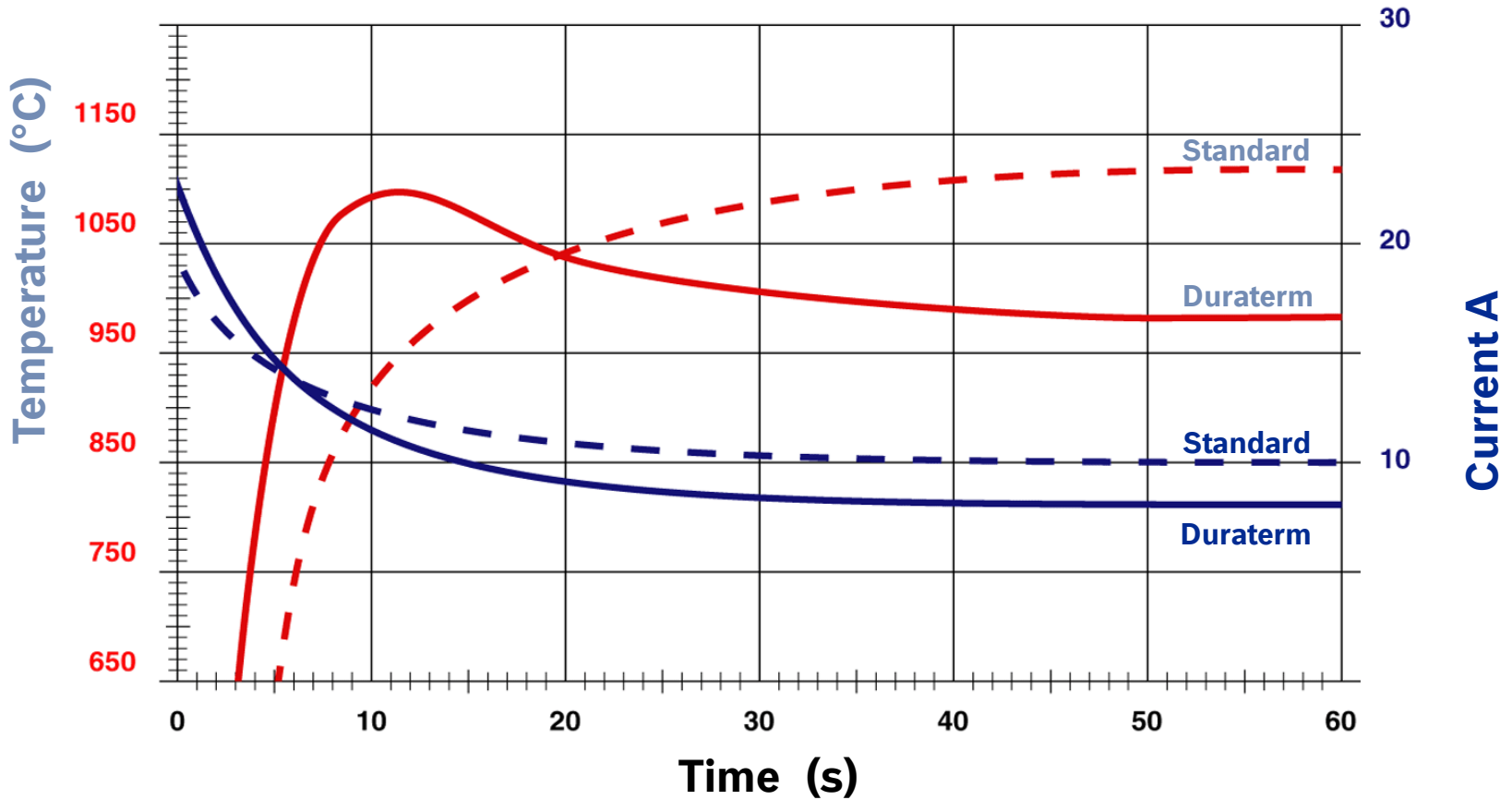
■ 100°C

■ 450°C

■ 1100°C

Glow plugs

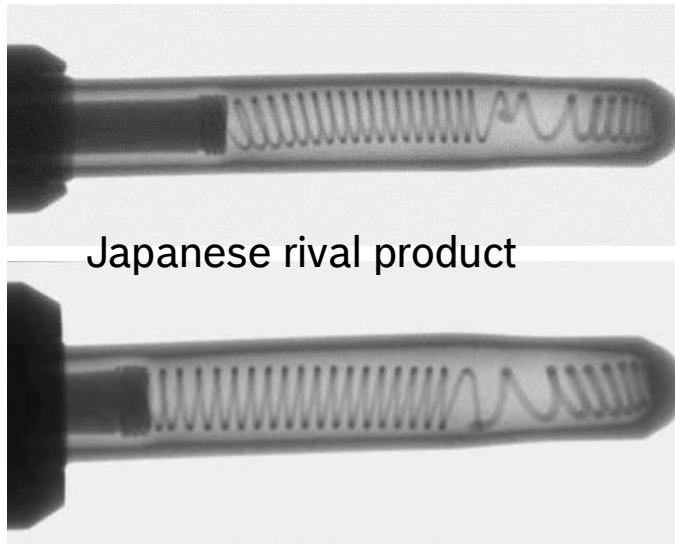
Comparison of Duraterm and standard sheathed-element glow plugs



Quality comparison: X-ray images



- Centered, uniform coils
- Properly welded coils
- Reliability and durability



- Coils deformed, unevenly wound:
Local overheating zones
- Inferior coil welding:
Premature burn-out
- Short service life, risk of
engine damage on melting

New generations of control units and glow plugs



Glow plugs

GLP5 DuraSpeed glow plug



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Ceramic glow plugs in modern engines

- Instant cold engine starting: 1,000 °C in < 2 s
- Up to 1,300 °C for low-compression engines up to $\varepsilon < 16$
- Post-glow and minute-long intermediate heating, e.g.
 - To reduce HC emissions during DPF regeneration
 - To achieve longer engine overrun phases
- Voltage range 4.4 V to 11 V, pulse width modulation
- **Attention:**
Do not test with 12 V due to risk of destruction!
Ensure correct torque (in some cases only 8 Nm!)

