

POCKET GUIDE

Glow Plugs



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Never settle for second best, always insist on NGK,
the world's No.1 OE fitment.



If you thought all glow plugs were the same, think again.

Setting new standards in performance, reliability and technical innovation.

- Fast warm up for better cold starting.
- In built over voltage protection.
- High durability and corrosion resistance.
- Reduced smoke emissions on start up.
- High reliability and long life.
- Lower current requirement, reduced battery drain.
- Reduced noise and vibration.
- Ceramic products that set new standards for emission control and engine performance.



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Internal synthetic rubber seal prevents ingress of moisture and air.

Zinc plated terminal nut provided (where required).

Solid core provides mechanical strength and good heat transfer.

Unique metal shell design for high strength and corrosion resistance.

Magnesium oxide powder for excellent coil protection, electrical insulation and heat transfer.

Regulating coil controls heating and post-glow operation.

Heater tube constructed from special alloys for extreme durability.

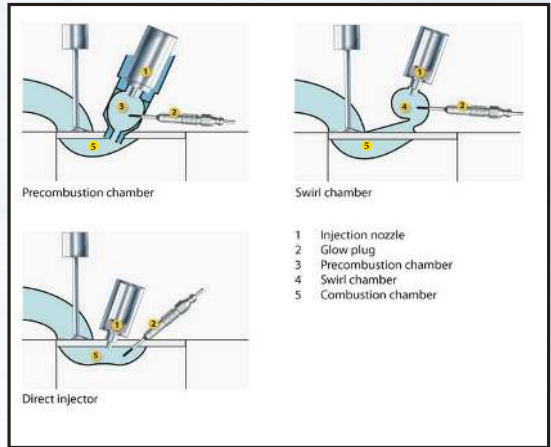
Compact heating coil concentrates heat energy in the required area of the combustion chamber.



NGK Glow Plugs

A glow plug is essentially an electrical heating element installed within the combustion space. By elevating the temperature of the air within the combustion chamber the glow plug promotes easier cold starting, improved driving performance from cold and more importantly than ever, a significant reduction of unwanted emissions. A glow plug usually works for a short period of time at the starting phase however more stringent emission regulations often require significantly longer periods of operation after start up and even intermittent heating during the driving phase.

Typical Location of Glow Plug



NGK Glow Plugs



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There are other types of pre-heating equipment such as an air heater or flame start devices which are located outside the combustion chamber. However these are generally more suited to large displacement engines and therefore glow plugs are used on virtually all passenger cars and light commercial vehicles.

Diesel engines have evolved considerably over recent years and so has the glow plug. This means that there are a wide range of glow plug designs which are matched to specific engine types and it is essential to use the correct part for each application. Most modern diesel vehicles have three stages of heating: pre-heating, heating whilst the engine is being started and post-heating. The demands of this strategy have given rise to significant advances in glow plug technology.



Manifold Heater

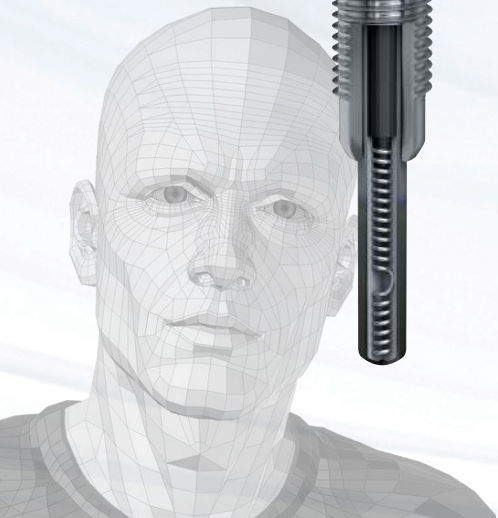


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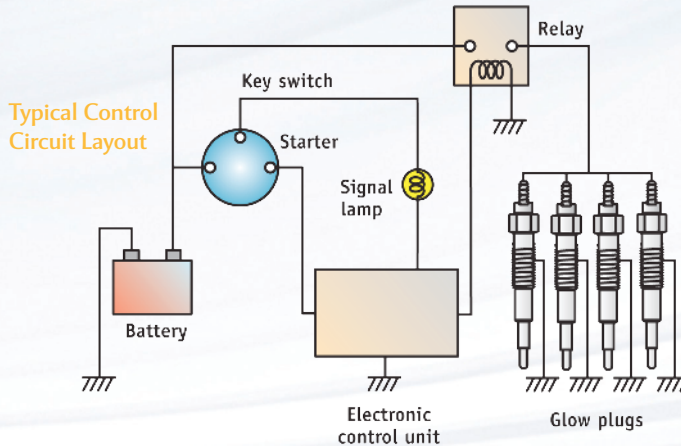


Principle of operation

Most glow plugs consist of a piece of resistance wire that gets hot when a voltage is applied and current starts to flow. The heat energy is transferred to the compressed air within the combustion chamber raising its temperature sufficiently so that when the fuel is injected the resulting mixture is hot enough to initiate combustion. The coil temperatures reach 800-900 degrees Celsius and often considerably higher on later designs. It is worth noting that fuel is not sprayed directly onto the hot glowing surface as this would damage the glow plug.



To ensure that sufficient heat is generated but to prevent damage to the wire by overheating the electrical supply must have some form of voltage or current control. This can be as simple as manual operation of a switch to energise the glow plug or more commonly on contemporary vehicles, strict control by pulse width modulation controlled by dedicated electronic control units. Glow plugs are sometimes wired in series but much more commonly in parallel; some designs have an insulated earth circuit but most are grounded through the metal shell and via the engine to the vehicle ground.



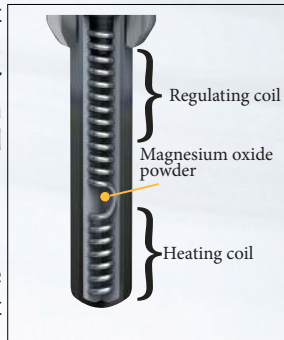
NGK glow plugs can be broadly classified in two groups, metal sheathed and ceramic types.

Metal Sheathed Types

Construction

Metal sheathed glow plugs consist of a coiled heating element encased within a protective metal casing or sheath. Magnesium oxide powder is packed around the heating coil to further protect it from the shock waves produced by the combustion process and to aid the rapid transfer of heat energy from the coil to the surface of the casing.

Most automotive glow plugs have an additional coil wired in series with the first that controls the flow of current to the heater. This allows more precise control of the heater element and longer post-glow operation.





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Standard Type - contains a heating coil that maintains a uniform electrical resistance as temperature increases. This produces linear rise in temperature with constant current consumption.

- Temperature rise time
20-25 sec. up to 800 degrees Celsius
- Typical Part No. Y-103-2

Fast Heating or Rapid Glow - contains a heating coil which increases its electrical resistance as its temperature rises. This allows more current flow from cold raising the temperature more rapidly than the standard type. As the temperature rises the resistance increases reducing current flow.

- Temperature rise time
15-17 sec. up to 800 degrees Celsius
- Typical Part No. Y-103V



Quick Glow System (QGS) Single coil

The single coil type has a low resistance heating coil to allow very high initial current flow. The design of these glow plugs allows very short pre-heating times and improved starting performance but are only used in conjunction with a dedicated QGS control unit to regulate voltage or current flow.

- Temperature rise time approx. 10 sec. up to 900 degrees Celsius
- Typical Part No. Y-112M1

Quick Glow System (QGS) Double coil

The double coil type has a low resistance heating coil and a regulating coil to increase resistance in the circuit as the temperature rises. This provides very fast pre-heating performance and a degree of temperature control, therefore protecting against overheating. This type must also be used with a dedicated QGS controller to regulate voltage or current flow.

- Temperature rise time approx. 6 sec. up to 900 degrees Celsius
- Typical Part No. Y-707RS



Self Regulating Metal (SRM)



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The SRM glow plug contains a heating coil to rapidly raise the temperature and a second coil to increase the electrical resistance as the temperature rises. Due to the special electrical properties of the resistance-regulating coil the SRM glow plug can provide a very fast warm up time and control the final temperature without the need for complex external control systems. This reduces the vehicle manufacturer's costs whilst giving good pre and post-heating performance.

- Temperature rise time approx.
4 sec. up to 900 degrees Celsius
- Typical Part No. Y-924J

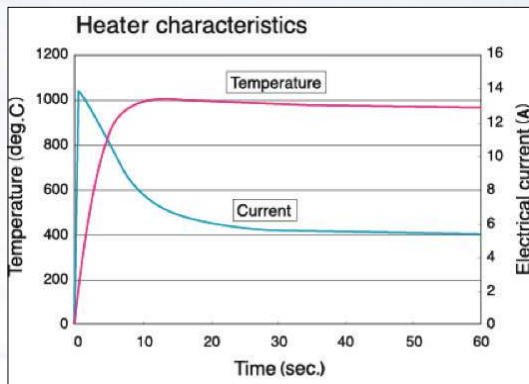




Advanced Quick Glow System (AQGS)

Special alloy heating and regulating coils provide the best performance from a metal glow plug with faster temperature rise than either SRM or QGS types. Strict pulse width modulation (PWM) control by the ECU allows long, high temperature post-glow periods, reducing engine emissions.

- Temperature rise time approx.
2 sec. up to 1000 degrees Celsius
- Typical Part No. Y8001AS



Ceramic Types

Construction

First introduced in 1985 these high performance glow plugs employ fine ceramics (silicon nitride) in the construction of the heater tube in order to achieve higher temperatures and a longer service life when compared to metal glow plugs. Their temperature rise characteristic, high final temperature and extended post glow performance allows significantly improved cold starting and greater reduction of unwanted emissions than metal glow plugs. In addition, ceramic glow plugs have a more compact design which is increasingly important as free space in the modern engine is extremely limited.

Quick Glow System (QGS)

First generation of high performance ceramic glow plug designs incorporating a heating element encased in silicon nitride. The large current flow and extremely fast heating times must be strictly managed by a dedicated QGS controller/relay unit.

- Temperature rise time approx. 3 sec. up to 900 degrees Celsius
- Typical Part No. CZ51

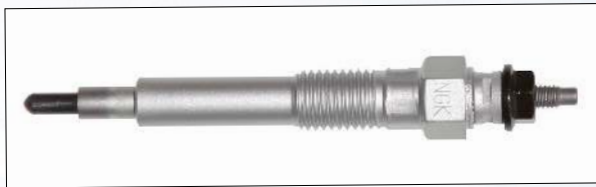




Self Regulating Ceramic (SRC)

The SRC glow plug has a heating coil and a resistance-regulating coil encased in silicon nitride. Final temperatures in excess of 1000 degrees Celsius are achieved very rapidly. The regulating coil reduces current flow as temperature rises providing long, high temperature post-glow operation with relatively simple external control.

- Temperature rise time approx. 4sec. up to 900 degrees Celsius
- Typical Part No. commences CY (note part number commencing CY have mostly been replaced by CZ)



New High Temperature Ceramic (NHTC)

The latest generation of ceramic glow plug incorporates a ceramic heating element which can achieve temperatures in excess of 1000 degrees Celsius in two seconds. This performance combined with very long post-glow temperatures of up to 1350 degrees Celsius can be utilised by engine manufacturers to meet the tough Euro IV and Euro V emission regulations. The ceramic material (silicon nitride) is extremely durable and allows the glow plug to survive in a tough operating environment that would severely limit the life of current metal types.

These glow plugs can be produced in extremely compact designs with slim heater elements and installation threads as small as M8.

- Temperature rise time approx. 2 sec. to exceed 1000 degrees Celsius
- 1350 degrees Celsius stable post glow temperature
- Typical Part No. CZ303



Glow Plug Identification, Part Numbers & Other Markings



NGK glow plugs carry identification markings that include:

- NGK Brand
- Part no. marking - usually commencing CY or CZ for ceramic and Y- for metal types



- Manufacturing identification code
- Voltage marking - this is an indication of the intended voltage application e.g. 4.4V, 6.5V, 11V etc. Due to the complexity of control systems it does not mean that this is the continuously applied voltage

See back pages for symbol charts

Installation Tips

Before removing the glow plugs clean any debris that could fall into the combustion chamber. Carefully remove the glow plug and inspect the threads and seating face in the cylinder head. Screw the new plug in by hand until the sealing face is in contact with the cylinder head and then secure to the correct torque. If the glow plug cannot be installed easily check for carbon deposits within the glow hole, these must be removed using a suitable service tool (reamer) to prevent premature failure or damage to the glow plug heater tube. The use of lubricants or anti-seize compounds is not recommended for NGK glow plugs as the anti-corrosion protection provided upon manufacture is sufficient protection and the reduction in frictional forces upon installation can result in over tightening of the glow plug. The wiring harness or busbar may be secured by thumb nut, conventional hexagonal nut or have a 'push on' connector. Care must be taken to ensure that a good connection is made without over tightening the nut.





Caution

Insufficient tightening of the glow plug will lead to combustion gas leakage and poor electrical performance. Over tightening can damage the glow plug by deforming the metal shell.



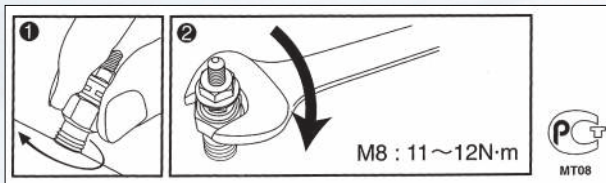
When handling ceramic glow plugs even greater care must be taken to prevent damage to the fine ceramics used in construction. Some glow plugs have very specific installation and torque specifications that must be adhered to.

Thread Diameter	Tightening Torque
8mm	8-15Nm (0.8-1.5Kgm)
9mm	7.65-9.35Nm (0.7-0.9Kgm)
10mm	15-20Nm (1.5-2.0Kgm)
12mm	20-25Nm (2.0-2.5Kgm)
14mm	20-25Nm (2.0-2.5Kgm)
18mm	20-30Nm (2.0-3.0Kgm)

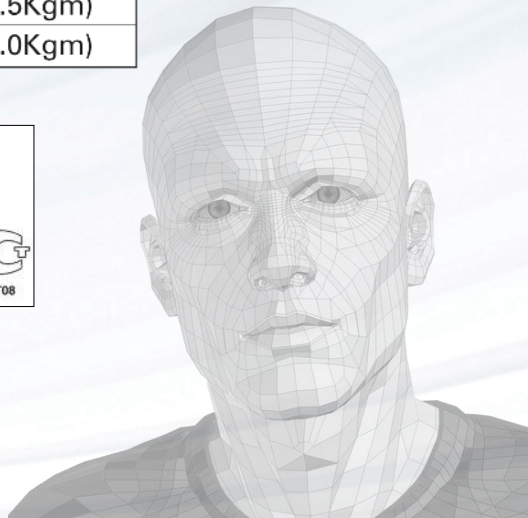


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Typical Package Information



Always refer to the information shown on the NGK packaging or to the vehicle manufacturers instructions.





Trouble Identification

The appearance of a glow plug can provide vital clues as to the reason for failure.

A glow plug that appears normal but that does not get hot will usually have a broken heating or regulating coil, typically caused by:

- use of the wrong glow plug (12 volts instead of 24 volts)
- the control unit is defective, applying incorrect voltage or energising glow plug for too long
- a faulty charging system (voltage too high)

A broken or melted heater tube is usually the result of:

- excessive voltage application - possible causes include faulty control system, incorrect voltage glow plug, charging fault.
- abnormal combustion conditions - possible causes include fuel injector fault, injection timing / volume fault, excessive lubricating oil entering combustion chamber.



A swollen heater tube is usually the result of

- use of the wrong glow plug (12 volts instead of 24 volts)
- the control unit is defective, applying incorrect voltage or energising glow plug for too long
- a faulty charging system (voltage too high)



Damage to the metal shell or terminal nut is usually the result of:

- the excessive application of tightening torque
- misuse / poor handling of tools and equipment





Design Symbols



Current style

Y

204TS1

Y or YS = Sheathed Type
(earthed through body)

YD = Sheathed with double
insulator (for wiring in series)

Modification Or Revision

Some types with suffix 1, 2 etc.
are sometimes interchangeable
with those without the suffix - but
not always. The occurrence of this
will be rare for the UK market.

Thread Diameter

- 1 = Ø 10mm
- 2 = Ø 12mm
- 3 = Ø 10mm
- 4 = Ø 14mm
- 5 = Ø 10mm Double Coil
- 7 = Ø 10mm Double Coil
- 8 = Ø 18mm
- 9 = Ø 12mm Double Coil

Special Tube Material

For Higher Temperatures

Battery Voltage

- 0 to 4 = 12 Volt
- 5 to 9 = 24 Volt

Heating Characteristic

- K or No Letter = Standard type
- V = Fast Heat or Rapid Glow type
- T = Fast Heat or Rapid Glow (faster than V type)
- M = QGS type (Quick Glow System only)
- R = QGS type (faster than M type)
- U = QGS double coil type
- J = SRM (Self Regulating Metal) type

Therefore Y-707RS or Y-507R would be double-coil QGS type

Serial Number

Design Symbols



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New style

Y 1 008 A S 1

other characters as opposite page

Thread Diameter

- 1 = Ø 10mm
- 2 = Ø 12mm
- 4 = Ø 14mm
- 8 = Ø 8mm
- 9 = Ø 9mm

Serial Number

- 001 to 899 = 12 Volt
- 901 to 999 = 24 Volt

Heating Characteristic

- A = AQGS type (Advanced Quick Glow System)
- J = SRM (Self Regulating Metal) type

Ceramic

CZ 304

Serial Number

Y E 04

Ø 8 & 9mm SRM
Self Regulating Metal
Type

- Y = Self Regulating Type
- Z = QGS Type
- X = QGS (Double Insulator) Type

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