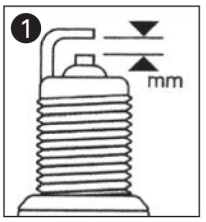
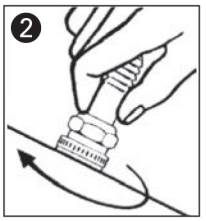
SPARK PLUG INSTALLATION TIPS

- Refer to current NGK catalogue for correct spark plug selection
- Check condition and cleanliness of threads in cylinder head
- Ensure plug is gapped according to vehicle manufacturers specification *(fig 1)*
- Multi ground electrode and precious metal plugs should not be regapped - visual inspection only
- Install new spark plug *by hand* until it seats - *(fig 2)* a length of rubber tubing pushed over the insulator can be a useful aid for plug installation where access is difficult
- Tighten to specified torque setting as shown in the chart below *(fig 3)*
- If a torque wrench is unavailable then refer to vehicle/engine manufacturers installation instructions or the tightening angle advice which is displayed on current NGK packaging (excluding specialist race plugs). Note that this angle advice can differ between part numbers due to individual spark plug design (e.g. seating type, thread diameter and gasket material)
- It is important not to over or under tighten spark plugs during installation. Over-tightening can lead to distortion of the spark plug. Under-tightening can cause overheating due to poor heat dissipation. *In extreme cases incorrect tightening can cause spark plug breakage and/or engine damage*
- NGK does not recommend the application of lubricant to spark plug threads as the resultant reduction of frictional forces at the thread faces will render the torque charts inaccurate and over tightening could occur
- If a gasket type spark plug is re-installed, it should only require a further 1/12 of a turn after it has been seated
- Always carefully use the correct tools for removal/installation to prevent damage to the spark plug or engine
- Inspect spark plug cover and renew if necessary





3	FOR FLAT SEAT TYPE (WITH GASKET)					TAPER SEAT TYPE	
Thread Ø	**18 mm**	**14 mm**	**12 mm**	**10 mm**	**8 mm**	**18 mm**	**12 & 14 mm**
Cast iron head	35-45Nm (3.5-4.5kgm) (25.3-32.5lbs ft)	25-35Nm (2.5-3.5kgm) (18.0-25.3lbs ft)	15-25Nm (1.5-2.5kgm) (10.8-18.0lbs ft)	10-15Nm (1.0-1.5kgm) (7.2-10.8lbs ft)	-	20-30Nm (2.0-3.0kgm) (14.5-21.6lbs ft)	15-25Nm (1.5-2.5kgm) (10.8-18.0lbs ft)
Aluminium head	35-40Nm (3.5-4.0kgm) (25.3-28.9lbs ft)	25-30Nm (2.5-3.0kgm) (18.0-21.6lbs ft)	15-20Nm (1.5-2.0kgm) (10.8-14.5lbs ft)	10-12Nm (1.0-1.2kgm) (7.2-8.7lbs ft)	8-10Nm (0.8-1.0kgm) (5.8-7.2lbs ft)	20-30Nm (2.0-3.0kgm) (14.5-21.6lbs ft)	10-20Nm (1.0-2.0kgm) (7.2-14.5lbs ft)

Important: Some spark plugs differ in gasket design or material, refer to tightening advice on specific spark plug packaging

SPARK PLUG GAP SETTINGS

Important: Spark plug gap settings are given in millimetres.
Practical equivalents are shown below.

mm	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.6	1.8	2.0
ins	.016	.020	.024	.028	.032	.035	.039	.043	.051	.055	.059	.063	.071	.079

IGNITION PARTS

TECHNICAL INFORMATION SHEET

SPARK PLUG OVERTIGHTENING

Inadvertent over tightening of a spark plug can cause the metal shell to deform, fracture or break. Deformation can cause the insulator to crack (sometimes hidden from view) or to become loose within the metal body during vehicle use, due to loss of the special packing powder inside the product. Deformation can also cause internal distortion of the spark plug and alter its ability to transfer heat away from the plug tip efficiently.

The more common result of over tightening is fracture of the metal shell during installation. This results in either immediate breakage (at the top of the thread or just below the hexagon) or sometimes a fracture remains unnoticed and final breakage occurs during engine operation or when the spark plug is next removed.

The following torque chart should assist with selecting the correct torque recommended for different plug types. Note that there is a difference between cast iron and aluminium cylinder heads and also between flat seat (gasket type) and conical (taper) seat type spark plugs.

Spark Plug Type	Thread Diameter	Cast Iron Cylinder Head	Aluminium Cylinder Head
Flat Seat Type (with sealing gasket)	ø18mm	35~45Nm (25.3~32.5 lbs ft)	35~40Nm (25.3~28.9 lbs ft)
	ø14mm	25~35Nm (18.0~25.3 lbs ft)	25~30Nm (18.0~21.6 lbs ft)
	ø12mm	15~25Nm (10.8~18.0 lbs ft)	15~20Nm (10.8~14.5 lbs ft)
	ø10mm	10~15Nm (7.2~10.8 lbs ft)	10~12Nm (7.2~8.7 lbs ft)
	ø8mm	- -	8~10Nm (5.8~7.2 lbs ft)
Conical (taper) Seat Type (no sealing gasket)	ø18mm	20~30Nm (14.5~21.6 lbs ft)	20~30Nm (14.5~21.6 lbs ft)
	ø12 &14mm	15~25Nm (10.0~18.0 lbs ft)	10~20Nm (7.2~14.5 lbs ft)

We do not recommend the application of lubricant to NGK spark plug threads as the resultant reduction of frictional forces at the thread faces will render the torque charts inaccurate and over tightening could occur.

Particular attention should be paid when fitting spark plugs into ‘twin spark’ heads (two spark plugs per cylinder). Sometimes the two plugs have different thread diameters.

If a torque wrench is unavailable, then refer to the vehicle manufacturers installation instructions or the tightening angle advice displayed on specific NGK spark plug packaging (excluding specialist race plugs).

Important: Note that this angle advice can differ between part numbers due to individual spark plug design (e.g. seating type, thread diameter and gasket material).
Re-used gasket type spark plugs require only 1/12 turn.

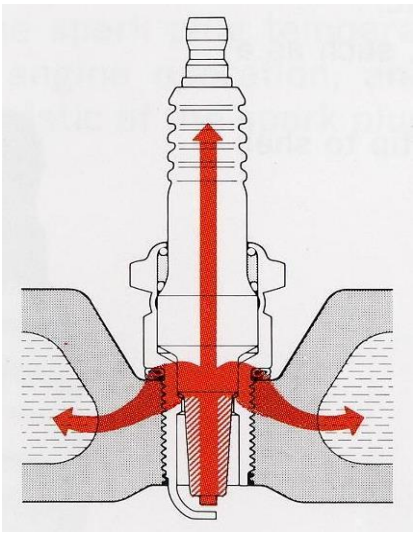
TECHNICAL INFORMATION SHEET

IGNITION PARTS

SPARK PLUG UNDER TIGHTENING (UNDER TORQUE).

Correct tightening of spark plugs is essential. Too tight and the metal shell can be damaged. If the tightening torque is too low, there is a danger of cylinder compression leakage, combustion gas leakage, electrode breakage, insulator breakage and even engine damage.

As well as a spark plug supplying the spark to ignite the fuel charge, it also plays an important role in absorbing and transferring heat generated in the combustion chamber - during the combustion process - into the cylinder head and then on to the cooling system (via coolant waterways or cooling fins).



Flow of heat energy

Heat energy transfer is mainly via the threads and sealing area taper (conical seat plugs) or gasket. As a plug is tightened, the threads of the spark plug, and cylinder head are mated and the respective surfaces come into contact. The more a plug is tightened, the more effective the thread contact and sealing areas become (as the gasket flattens). When tightened to within the recommended torque range, rate of heat transfer from the plug through the threads and sealing area is sufficient.

If too low a torque is applied to a plug insufficient heat transfer can occur and the more likely that overheating can result.

Damage to the firing end of a spark plug can result from this reduced heat dissipation – which can cause hot spots, engine knock/pre-ignition/detonation to occur. Similar damage can occur to a plug that becomes loose and vibrates in the cylinder head.

- *It is important, therefore, that particular attention is paid to installation and tightening information when fitting spark plugs into an engine. This is generally available within most vehicle manufacturers own service information data, workshop repair manuals, in all our catalogues and on most packaging boxes in which NGK spark plugs are supplied.*

Niterra UK LTD

TECHNICAL INFORMATION SHEET

IGNITION PARTS

CENTER ELECTRODE INSULATOR CRACKING

This phenomenon is caused by liquid fuel contacting the hot surface of the insulator on the combustion side of the plug. It causes **'thermal shock'** (very rapid cooling) of the insulator which in-turn causes a crack and/or complete failure of the insulator of the spark plug.

The liquid fuel is caused by over fuelling of the engine due to poor fuelling set-up or poor fuel/air mixture caused by a leaking injector or worn carburetor. In either event, a qualified service agent should check the engine fuel system.

It is confirmed that this failure is not a component related issue and, as described above, relates to the set-up of the engine.

Niterra UK LTD

TECHNICAL INFORMATION SHEET

IGNITION PARTS

INSULATOR CRACKS / BREAKAGE

The top of the insulator of a spark plug can become cracked or broken due to physical force applied to the top of the insulator or the top terminal.

A break in the insulation will cause a spark plug to either misfire or not spark at all. The crack is usually visible, but can sometimes be out of sight, below the top of the metal shell.

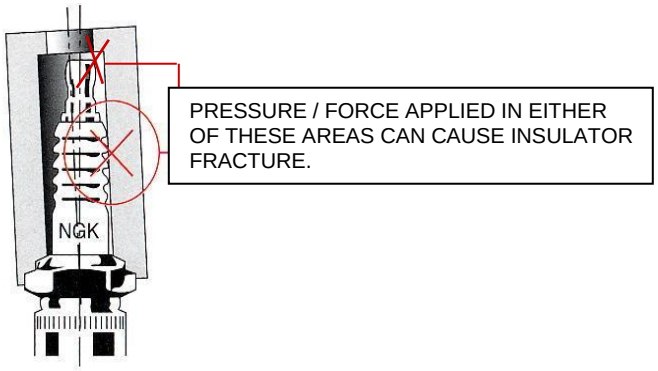
Dropping:

Accidental dropping of the product can break the insulator, but a more common cause is 'Wrench Slip'.

Wrench Slip / Tilt:

If the wrench slips off or tilts at an angle on the spark plug hexagon, a crack in the insulator can occur.

A poorly fitted *or* a poorly designed spark plug socket causes this problem. The diagrams below show how wrench slip occurs and how pressure can cause breakages.



Poor socket design

Preferred socket design

Solution: select a hexagonal type socket design that is the least likely to slip, still ensuring that the socket does not tilt on the spark plug hexagon during tightening or loosening. If an extension bar is required for deeply recessed spark plugs, select one that is as short as possible.

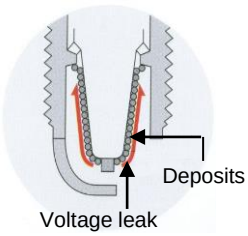
Niterra UK LTD

TECHNICAL INFORMATION SHEET

IGNITION PARTS

FOULING OF SPARK PLUGS

Deposits settling on the insulator surface on the spark plug firing end cause this and is not caused by the spark plugs. Voltage will always take the easiest route to ground (earth).



Deposits are conductive and cause the high-tension voltage to leak from the centre electrode, across the surface of the center electrode insulator to the ground side (threaded side) of the plug. No spark occurs at the spark plug electrode gap and the engine then misfires or fails to start.

Plugs can be fouled by ‘dry’ deposits (deposits left as a result of the burning of an abnormal fuel charge) or ‘wet’ deposits (caused by fuel or oil wash/saturation).

Dry:

Carbon Fouling:

Black deposits on the firing end of the insulator. The most common causes are:

- Excessively rich mixture, dirty air filter, prolonged or incorrect choke/fuel enrichment operation, unsuitable heat range of spark plug, prolonged low speed running, repeated stop and start running, degraded fuel (see also 'Wet' fouling below), engine idling for long periods.

Oil Burning:

The result is often a build-up of an off-white-coloured deposit covering the insulator and electrodes. This is caused by a high amount of oil entering the combustion chamber.

Fuel Additive Fouling:

Some additives used by fuel companies or added to fuel by consumers contain an iron derivative, which acts as an ‘anti-knock’ agent. Sometimes the additives can cause an orange or red appearance to the centre electrode insulator on the firing end. The cure is to check the amount of additive being used per tank is not excessive, to try another additive type or if an additive is not being used, try another fuel supplier.

Wet:

Fuel/Oil Fouling:

Electrodes and insulator are washed/wet with fuel or oil. The reason for the contamination should be found and rectified vehicle-side. (Note that modern fuels are said to degrade more quickly - becoming harder to ignite after perhaps just 3 months. Fuel stored for long periods can cause starting difficulty/plug fouling).

In all the above circumstances, replacing the plug(s) with non-fouled or new ones can temporarily cure the misfire or poor starting. If however the engine tune and/or operating condition remain the same the replacement spark plugs will also eventually foul and the problem will re-occur. The time taken for replacement spark plugs to re-foul varies considerably, but it can be as long as six months or more.

TECHNICAL INFORMATION SHEET

IGNITION PARTS

FLASHOVER

Spark plugs can sometimes be blamed for causing an engine to misfire. What can be overlooked is the vehicles HT connection on to the plugs - which can cause a phenomenon called **'flashover'**.

Flashover is the result of the HT voltage taking an easier path to earth instead of jumping the spark plug gap. In this case, it is from the top terminal of the plug to the metal shell down the outside of the 'ceramic' insulator.

A misfire occurs whenever flashover happens.

This discharge can often leave black markings 'etched' into the insulator over a period of time.

The symptom is caused by a poor connection on to the spark plug top terminal and/or poor sealing of the boot on to the plug.

The problem can occur with plugs made by all spark plug manufacturers and is not caused by the spark plug itself.

Check the overall condition of the HT connection (caps/covers/boots/leads) and that they are secure on to the top of the plugs. Ensure the sealing arrangement fits tightly around the ceramic insulator of the spark plugs – sealing effectiveness can reduce through ageing. If flashover has been occurring over a long period (black lines will clearly be seen on the spark plug insulator) the cover may be damaged. Renew deteriorated items as necessary. Make sure components are clean and dry upon assembly.

Niterra UK Ltd.