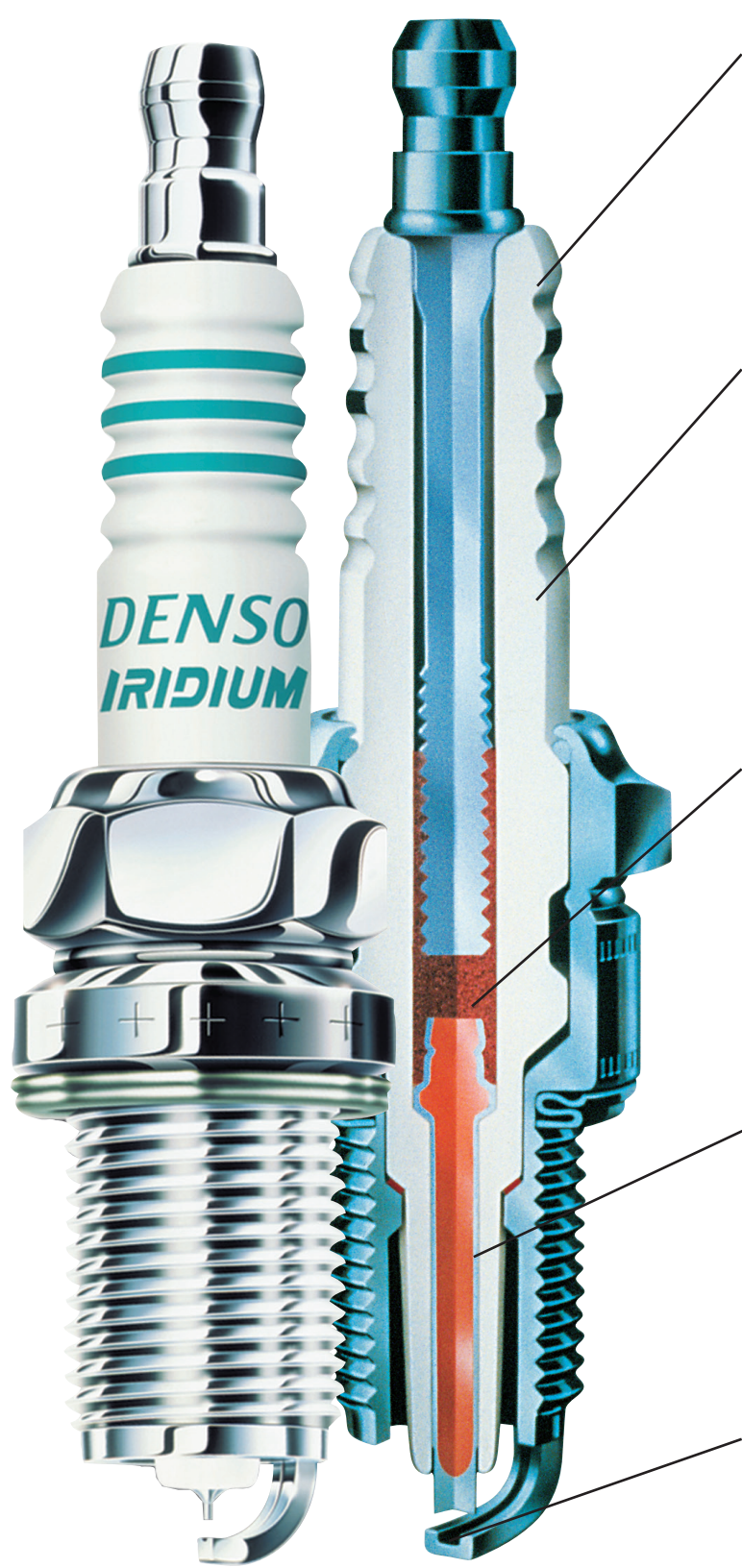


Technical Overview DENSO Spark Plugs

Discovering DENSO Technology



Characteristics DENSO Spark Plugs



The insulators are made from a highly purified alumina powder, which has exceptional insulation and thermal conductivity. Another advantage of this material is its great physical strength.

The five-rib design prevents flashover and reduces voltage loss. It offers 20% more insulation than conventional plugs. This improves performance, especially in wet and damp conditions, and in plugs with a large gap operating under high voltage. The ribs are rounded to make them more resistant to breakage.

A special mixture of copper and glass powder bonds the centre electrode and insulator together for a gastight seal. This seal has high electrical and thermal conductivity, and contributes to an even heat distribution. The seal also prevents escape of hot combustion gases.

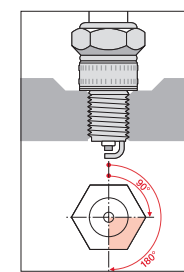
The centre electrode is made of a wear-resistant nickel-chrome binary alloy with a deeply inserted copper core. This gives the centre electrode high resistance against overheating and increases the operating range.

The gap formed by the U-groove provides extra space which is filled by the spark. This gives the flame kernel more room to expand, creating a bigger and hotter flame front. The result is a more complete combustion.

Spark Plug Torque Specification

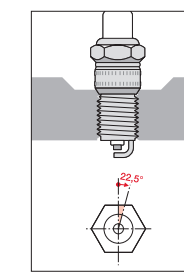
Gasket	Thread size		Recommended Torque	Recommended Turns	
				New Plug	Used Plug
Gasket	M8	Y Type	8-10 Nm	± 1	± 1/12
	M10	U, N Type	10-15 Nm	± 2/3	± 1/12
	M10	Stainless steel gasket	10-15 Nm	± 3/4	± 1/12
	M12	SXU, X, XE, XU, ZXE, ZXU Type	15-20 Nm	± 1/3	± 1/12
	M14	FK, J, K, KJ, P, PK, PKJ, PQ, Q, QJ, QL, S, SF, SK, SKJ, SV, SVK, VK, VKJ, W, ZT Type	20-25 Nm	± 1/2	± 1/12
	M14	Stainless steel gasket	20-25 Nm	± 2/3	± 1/12
Taper seat	M14	PT, PTJ, T Type	20-30 Nm	± 1/16	± 1/16
	M18	MA Type	30-40 Nm	± 1/4	± 1/12

Note: if oil or lubricant is used, tightening torque must be 2/3 of the normal torque (DENSO does not recommend using lubricants).



GASKET TYPE PLUGS

Install the spark plug manually first, then tighten about 1/4 - 1/2 turn with plug wrench.



TAPER SEAT PLUGS

Install the spark plug manually first, then tighten about 1/16 turn with plug wrench.

Spark plug torque specification

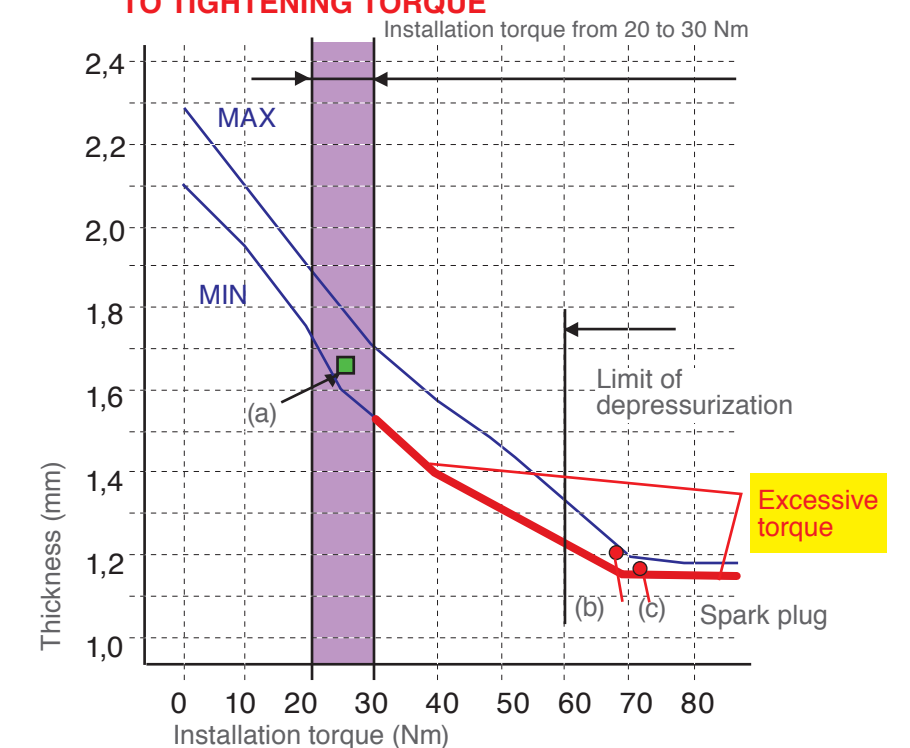
This table gives torque recommendations for proper spark plug installation. Improper installation may result in engine damage and poor performance. Spark plug damage due to overtightening may occur if a spark plug is tightened far beyond the recommended torque. As a result the metal shell will deform and the insulator may be loosened, causing possible damage to the spark plug and engine.

THICKNESS OF GASKET AFTER TIGHTENING

Outlook	Gasket thickness
a	Recommended torque 1.67mm
b	1.20mm
c	1.18mm

Insulator of both spark plugs turns in housing

RELATION OF GASKET THICKNESS TO TIGHTENING TORQUE



Summary:

- Spark Plugs with rotating insulator were over tightened, which is concluded from too small thickness of gasket
- To avoid such effect DENSO recommends to apply correct tightening torque

Used Spark Plug Analysis



Normal

Appearance:
Light grey or tan deposits and slight electrode erosion.

Carbon fouling

Appearance:
Dry, soft black carbon on the insulator and electrodes.
Results:
Poor starting, misfiring, faulty acceleration.
Possible causes:
Faulty choke - over rich air-fuel mixture, delayed ignition timing, bad ignition leads, plug Heat Range too cold.

Lead fouling

Appearance:
Yellow or tan cinder-like deposits or a shiny glaze coating on the insulator.
Results:
Misfiring under sudden acceleration or heavy load conditions but no adverse effect under normal operating conditions.
Possible causes:
Use of petrol with high-lead contents.

Over heating

Appearance:
An extremely white insulator with small black deposits and premature electrode erosion.
Results:
Loss of power at high-speed/heavy load.
Possible causes:
Plug insufficiently tightened, engine insufficiently cooled, ignition timing too advanced, plug heat range too hot, severe detonation.

Pre-ignition

Appearance:
A melted or burned centre and/or ground electrode, blistered insulator and aluminum or other metallic deposits on the insulator.
Results:
Loss of power then causing engine damage.
Possible causes:
Much the same as over heating. Pre-ignition takes place when combustion begins before the timed spark occurs.

Fuel-Additives Fouling

Appearance:
Red ground electrode and insulator nose
Results:
Poor starting, misfiring, faulty acceleration and loss of power
Possible causes:
Use of petrol with Fr / Mn additives. Additives are used to increase the octane number (especially in Russia)