Bosch Industrial Spark Plugs

BOSCH
Invented for life

Introducing the new Double Ir Spark Plugs

"We tested the new Bosch Double Ir spark plug against the current competition in our CAT 3520C engines and were very pleased with the results. The plugs lasted over 4500 hours which is 50% longer than the plugs we had been using and consistently achieved their change interval. Longer life, less downtime, and fewer engine fault codes resulted in one very happy customer."

Warren – Landfill Power Plant Manager

Pin to pin design improves ignitability of air fuel mixture improving efficiency

Nickel plated threads reduce likelihood of seizing

Longer Graphite Resistor for improved durability in high voltage applications

Full length brass terminal nut for improved connection to ignition leads

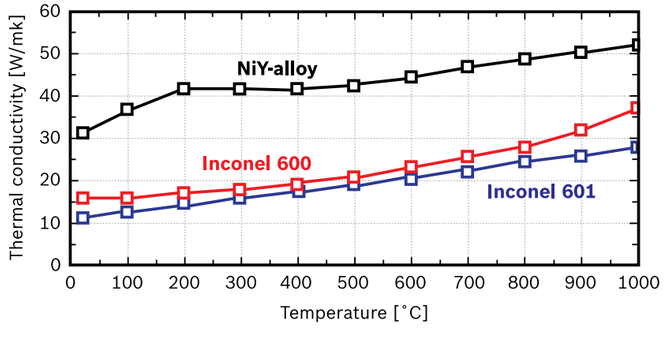
Electrodes

2.4mm high content Iridium center and ground electrode for long life even in biogas/landfillll applications

• Continuous laser welding ensures precious metal stays in place.

Heat Removal Properties

(higher number indicates more heat being removed)



The Nickel Yttrium (NiY) alloy used on the ground electrode of the Bosch Industrial Series spark plugs dissipates heat much better than competitor materials. This results in lower temperatures of the ground electrode and longer run times.

Applications

Two M18 and two M14 designs to fit the most common applications

M18	M14
• 7305	• 7315
• 7308	• 7322

Test Results

Over 4,500 hours in a Cat 3520C running ~52% CH4 landfill gas, 100% load, 1.6MW generator. 50% longer than the current plug used.

New packaging of all Bosch Industrial spark plus is significantly stronger than previous packaging ensuring plugs arrive to the engine well protected and ready for service. A security sticker over the opening of M18 plugs is now used to ensure the plugs you receive are authentic Bosch spark plugs.

Conclusion: Long life performance for your landfill, biogas, or natural gas applications.

Competitive Comparison

Bosch 7305

Competitor A

Competitor B

Competitor C

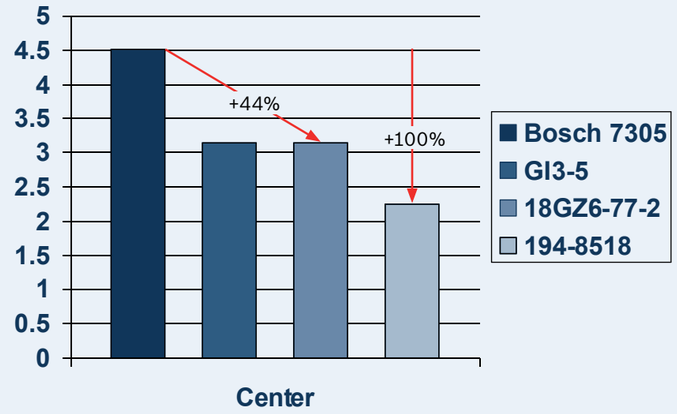
1	Full Length Terminal Stud with Brass Terminal Nut: Terminal Stud increases spark plug strength and the brass terminal nut reduces corrosion ensuring the spark plug has a clean connection to the ignition lead.
2	Ribbed Pyranite Insulator: 95% aluminum oxide reduces likelihood of dielectric punctures in high voltage applications. Ribbed profile reduces possibility of flashover.
3	Graphite Metal Glass Resistor: Increased length improves reliability of the resistor in high voltage applications reducing resistor failures.
4	Nickel Plated Steel Shell: Specially designed for high mechanical strength to prevent breakage during removal. The housing is also nickel coated to prevent seizing in the engine.
5	See electrode comparisons on the next page.

Bosch	Competitor A	Competitor B	Competitor C
1 2.4mm Iridium center electrode continuous laser welded	2.0mm Iridium center electrode continuous laser welded	2.4mm Iridium center electrode pulse laser welded with cross grooves	2.0 Iridium center electrode pulse laser welded
2 2.4mm Iridium pad projected from ground electrode continous laser welded and resistance welded	2.2mm Iridium pad projected from ground electrode, continous laser welded	2.4mm Iridium pad flush with ground electrode, pulse laser welded	2.4mm Iridium pad flush with ground electrode, pulse laser welded
3 Ground electrode profile 2.8mm x 1.7mm	Ground electrode profile 2.8mm x 1.7mm	Ground electrode profile 4.2mm x 1.6mm	Ground electrode profile 4.2mm x 1.6mm

1. Bosch Advantage: With a larger center electrode it yields a 44% larger wear area over 2.0mm electrodes increasing longevity. Cross grooves remove ~10% of surface area from electrode increasing gap erosion, but reduce ignition voltage.
2. Bosch Advantage: Projected precious metal improves access to air fuel mixture reducing quenching and improving ignitability, laser and resistance welding reduces likelihood of precious metal separation.
3. Bosch Advantage: Smaller width of ground electrode reduces quenching and eases ability to gap.

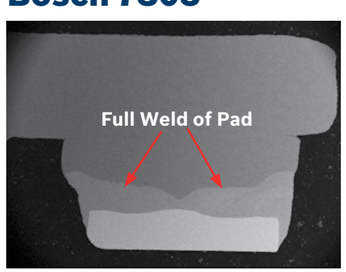
Electrode Comparison

Center Electrode Surface Area

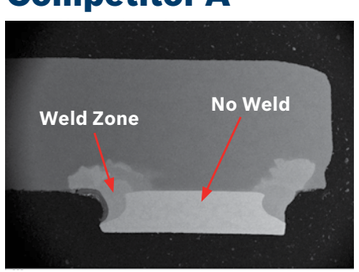


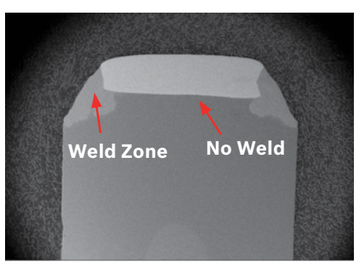
The larger surface area of the center electrode helps increase longevity. The increased precious metal available reduces gap expansion resulting in longer run times.

Bosch 7305

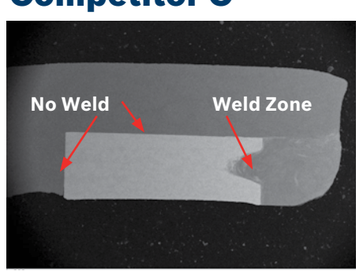


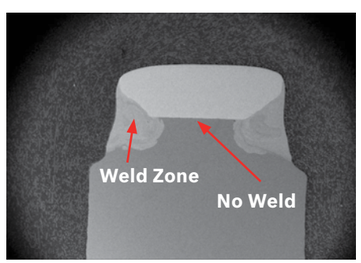
Competitor A





Competitor C





In these cross sections of the electrodes, note that the welding of the Bosch spark plug supports the entire iridium pad. In the other plugs, the welded zone is only on the edges of the precious metal pins. This complete weld, ensures the precious metal pin has the strongest connection possible to the base material and will not separate even in the most demanding applications.

Product Cross Reference Guide

Bosch Part#	Denso Part#	Champion Part#	Beru
7302	–	RB75N / RB75PP*	18GZ20
7303	–	RM77N / RM77PP	18GZ22
7305	GI-5	–	18GZ6-77-2
7306	GI3-1 / GI3-3	RB77WPCC / KB77WPCC / RB77CC / RB77WPC	18GZ6-77
7307	GL3-1 / GL3-3	RB75WPCC	18GZ5-77
7308	GL3-5	–	18GZ5-77-2
7311	GE3-1	RN79G	14R-4CDP
7313		RN5C	
7315	GE3-5		14R-4CIU-2
7321 (FR3KII332)	GK3-1/GK3-3	RC78PYP / RC78PYP15 / RC78WYP	14FR-4DPU0
7322	GK3-5		14FR-4DIU

*Ceramic length different from RB75PP, adapter may be required

Double Platinum vs. Double Iridium

Bosch 7306

- 2.0mm platinum iridium center electrode: surface area = 3.14mm
- 0.6mm x 2.8mm platinum iridium pin: surface area = 1.68mm
- Continuous laser welding on center and ground

Bosch 7305

- 2.4mm high content iridium center electrode: surface area = 4.52mm – 44% larger than 7306
- 2.4mm x 2.8mm high content iridium ground electrode: surface area = 4.52mm – 169% larger than 7306
- Continuous laser welding on center and ground with additional resistance weld on ground for added strength

Specifications

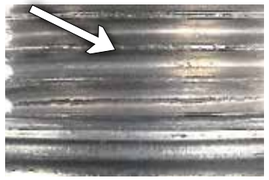
	7302	7303	7305	7306	7307	7308		7311	7313	7315	7321/FR3KII332	7322
Hex:	⅞" (22.2mm)	⅞" (22.2mm)	⅞" (22.2mm)	⅞" (22.2mm)	13⁄16" (20.8mm)	13⁄16" (20.8mm)		13⁄16" (20.6mm)	13⁄16" (20.6mm)	13⁄16" (20.6mm)	⅝" (16mm)	⅝" (22.2mm)
Thread:	18mm	18mm	18mm	18mm	18mm	18mm		14mm	14mm	14mm	14mm	14mm
Reach:	13⁄16" (20.6mm)	½" (12.7mm)	13⁄16" (20.6mm)	13⁄16" (20.6mm)	13⁄16" (20.6mm)	13⁄16" (20.6mm)		¾" (19mm)	¾" (19mm)	¾" (19mm)	¾" (19mm)	¾" (19mm)
Heat Range:	3	3	3	3	3	3		3	7	3	3	3
Electrode Material (c/g):	Fine Wire Pt/Pt	Fine Wire Pt/Pt	Ir/Ir	Pt/Pt	Ir/Pt	Ir/Ir		Pt/Pt	Copper/Yttrium enhanced Nickel	Ir/Ir	Ir/PtIr blend	Ir/Ir
Gap:	0.012" (0.3mm)	0.012" (0.3mm)	0.012" (0.3mm)	0.012" (0.3mm)	0.012" (0.3mm)	0.012" (0.3mm)		0.012" (0.3mm)	0.020" (0.5mm)	0.012" (0.3mm)	0.012" (0.3mm)	0.012" (0.3mm)
10-Digit Part#	0 242 356 501	0 242 356 502	0 242 356 503	0 242 356 504	0 242 356 507	0 242 356 508		0 242 255 512	0 242 236 580	0 242 255 519	0 242 255 511	0 242 255 518

Double Ir | Double Ir | Double Ir | Double Ir

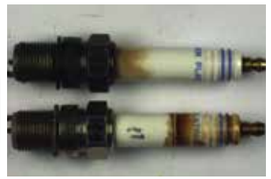
Failure Modes

Over Torquing:

Cracks in the threads

Corona Discharge

M18 plugs should be torqued to 35-45 Nm (26-33 Lb-ft)
M14 plugs should be torqued to 28 Nm (21 Lb-ft)

Over torquing is the most common cause of problems with industrial spark plugs. Over torquing can cause the seal between the ceramic and housing to break and cause cracks in the housing allowing combustion gases to escape. If the ceramic is not loose, the discoloration on the ceramic is called corona discharge and is normal when high voltages are present.

If using anti seize lubricant, 1000°C **"metal free"** lubricant must be used. Hot metal lubricants can cause spark plugs to seize in the cylinder head.

Bosch recommends when installing spark plugs to use a torque wrench and the correct torque in ft.-lbs. As a general guideline, if a torque wrench is not available, hand tighten the plug until it is seated in the cylinder head. Spark plugs with gaskets should be tightened an additional 90˚.

***Note: Avoid overtightening or undertightening as spark plug or engine damage may result. Always follow the manufacturer recommended torque specifications.**

Ignition Lead Maintenance

It is critical to avoid contamination in the ignition leads. The brownish green buildup is contamination and can cause flashover resulting in misfires. This contamination can be dirt, oil, or ozone. The dirt and oil can accumulate with time if the lead is placed over a dirty spark plug. The ozone forms when a poor connection between the lead and the spark plug terminal nut is present. The poor connection forms ozone which builds up on the walls of the lead. As this contamination builds, it increases the chances of flashover resulting in misfires.

Always check the o-rings at the bottom of the ignition lead. A proper fitting o-ring reduces the likelihood of flashover and misfires. If misfires are occurring, changing the o-rings may solve the problem and save money.

Ceramic Failures

Ceramic Puncture: Punctures in the ceramic caused by high ignition voltages

Flashover: Spark is traveling over ceramic from the terminal stud to the housing. Check insulator boots for proper fit and replace if necessary

High Transversal Forces

Damage caused by socket


During installation and removal, if the socket is not fully seated on the plug or is applied at an angle, the side force can cause cracks in the ceramic between the housing and insulator.

Socket with supports (not recommended)

Use a torque wrench with a wide bore. Wrenches with supports, as seen to the right, are more likely to damage the ceramic.

Deposits

Normal operating conditions


Plugs are covered with normal oil ash. Engine is operating as desired.

High Electrode Wear


Engine is operating as desired, but plugs have reached the end of their life. Replace plugs.

Excessive Engine Oil


Plugs are coated with oil indicating high oil consumption. This could lead to a spark plug failure such as cracked insulator or oil fouling resulting in difficulty starting.

Iron Deposits

The red coating is iron. The conductive iron leads to misfires as the spark travels from the center electrode to the housing instead of jumping between the electrodes (note white lines on the ceramic). The engine is not operating as desired. Valves may not be seating correctly.

Mishandling or Impact

Plug was damaged during installation or impacted during use. Use caution when installing new plugs. Do not drop plugs into cylinder head during installation.

Excessive heat

A melted ground electrode indicates pre-ignition. Ensure proper heat range of the plug is used and check ignition timing.

Industrial Spark Plug Application Guide

Engine Make	Model	Double Ir	Long Life	Standard
Caterpillar	G3306, G333 3/4" Reach	7315	7311	
	G343	7315	7311	
	G3304	7315	7311	
	G3400 Series	7315	7311	
	G3500 Series (except C and E series with prechamber plugs)	7305	7306	7302
	G3600 Series	7305	7306	7302
Cooper Bessemer	ENG, CNG		7303	
	GDJ, GMA, GMB, GMC, w/G402 reducing Bushing		7303	
	GDT, GFB, GFE, GFK, w/G402 reducing Bushing		7303	
Cummins	L-10	7322	7321	
	QSV 81G	7305	7306	7302
	QSV 91G	7305	7306	7302
	QSK 19G	7305	7306	
	QSK 45G	7305	7306	
	QSK 60G	7305	7306	
	QSK 38G	7305	7306	
	QSK 50G	7305	7306	
Deutz	G620 V-8, TBG616 V-8, TBG616 V-12	7308	7307	
	TBG616K V-8K, TBG616K V-12, TBG616K V-16K	7308	7307	
	TBG620 V-8, TBG620 V12, TBG620 V-16	7308	7307	
	TBG620K V-12K TBG620K V-16K	7308	7307	
Dresser Clark	TLA6	7322	7321	
Dorman	3DAG, 4DAG, 6DAG	7315	7311	
	6QG	7315	7311	
	6PG, 12PG		7303	
	6SEG, 8SEG, 12SEG	7315	7311	
	6SETCWG Min Nox	7315	7311	
	12SG		7303	
	12S, 12STCWG, 12STCAG		7303	
	DATG-4	7315	7311	
General Motors	305, 351, 401, 478, 702 Gasoline and LPG	7315	7311	
Guascor	FG180, FGLD180	7305	7306	7302
	FG240, FGLD240	7305	7306	7302
	FGLD360	7305	7306	7302
	FGLD480	7305	7306	7302
John Deere	300 Series	7315	7311	
	400 Series (Nat. Gas and LPG)		7303	
	500 Series (Nat. Gas and LPG)		7303	
Liebherr	G 924T, G 924TC	7315	7311	

Engine Make	Model	Double Ir	Long Life	Standard
	G 926T, G 926TC, G 926TC 40	7315	7311	
	G 9408 TC, G 9408 TC 40	7322	7321	
MAN	E 0824 E301, E0824 E302	7315	7311	
	E 0826 E301, E0826 E302	7315	7311	
	E 2842, E2842 LE	7315	7311	
	E 2843 LN	7315	7311	
	E 2876	7315	7311	
	E 0834	7322	7321	
	E 0836	7322	7321	
Perkins	G4-203	7315	7311	
	G4-236	7315	7311	
	900 Series	7315	7311	
	4000 Series	7305	7306	
Superior	1706G2	7305	7306	7302
	1712G1	7305	7306	7302
	2400 G Series	7305	7306	7302
Wartsila	W20V	7305	7306	
	W25SG	7305	7306	7302
	W28SG	7305	7306	7302
	W34SG	7305	7306	7302
	34SG	7305	7306	
	W220SG	7322	7321	
Waukesha	**ATGL Series**			
	AT27GL Series - 1/2" Rch Heads		7303	
	AT27GL Series - 13/16" Rch Heads	7305	7306	7302
	VGF Series			
	P48	7305	7306	7302
	L36	7305	7306	7302
	H24	7305	7306	7302
	F18	7305	7306	7302
	VHP Series			
	P9390GSI		7303	
	P9390GL - 1/2" Rch Heads		7303	
	P9390GL - 13/16 Rch Heads	7305	7306	7302
	L7044GSI - 13/16" Rch Heads	7305	7306	
	L7042GSI		7303	
	L7042G		7303	
	7042GL - 1/2" Rch Heads		7303	
	7042GL - 13/16" Rch Heads	7305	7306	7302

Engine Make	Model	Double Ir	Long Life	Standard
Waukesha (cont.)	L5790G		7303	
	L5790GL - 1/2" Rch Heads		7303	
	L5790GL - 13/16" Rch Heads	7305	7306	7302
	F3521G		7303	
	F3521GL - 1/2" Rch Heads		7303	
	F3521GL - 13/16 Rch Heads	7305	7306	7302
	Other			
	L5108G, L5108GSI		7303	
	L5108GL - 1/2" Rch Heads		7303	
	L5108GL - 13/16" Rch Heads	7305	7306	7302
	L5115GL	7305	7306	7302
	F1905GR		7303	
	F11G, F11GSI/GSID	7315	7311	
	F1197GRSI		7303	
	F1905GRSI		7303	
	F2894G, F2894GRSI		7303	
	F2895G, F2895GSI		7303	
	F2895GL - 1/2" Rch Heads		7303	
	F2895GL - 13/16 Rch Heads	7305	7306	7302
	F3520G		7303	
	L5100GR, L5100GRSI		7303	
	L5788GR, L5788GRSI		7303	
	L7040G		7303	
	6BZ, 6LRZ, 6LRZB, 6MZA, 6MZR		7303	
	6NK, 6WAK, 6WAKB		7303	
	140GK, 145GK		7303	
	180G, 180GB, 180GKB, 185GLB		7303	
	190, 190GLB, 195G, 195GK		7303	
	Other Natural and LP Gas (14mm Heads)			
	P2154G, P2154GSI	7315	7311	
	H1077G, H1077GSI	7315	7311	
	L1616G, L1616GSI	7315	7311	
	VRG220, VRG330	7315	7311	
	VRN265, VRN283, VRN310	7315	7311	

The Bosch Group is a global leader in automotive, industrial and household technology. It has more than 350 subsidiaries and regional companies in some 60 countries and employs over 300,000 associates.

In 2011, Bosch spent more than 4 billion euros for research and development and applied for over 4,100 patents worldwide.

BOSCH
Invented for life

With over one hundred years of experience in spark plug development, Bosch is uniquely placed to supply a range of spark plugs that meet the extreme demands of industrial applications.

Bosch combines its engineering experience with robust construction methods and the highest quality, heavy-duty components to produce the Industrial Series of spark plugs.

The use of precious metals in both centre and ground electrodes provides exceptional resistance to wear, unsurpassed reliability and greatly extended service life in natural gas applications.

Robert Bosch (Australia) Pty. Ltd.
Cnr Centre and McNaughton Roads
Clayton Vic 3168

For further information please contact your local automotive distributor or call the Bosch Customer Service Line on:
Australia 1300 307 040
www.bosch.com.au
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www.bosch.co.nz

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