

PROBLEM:
IMS FAILURE.
SOLUTION:
LN ENGINEERING

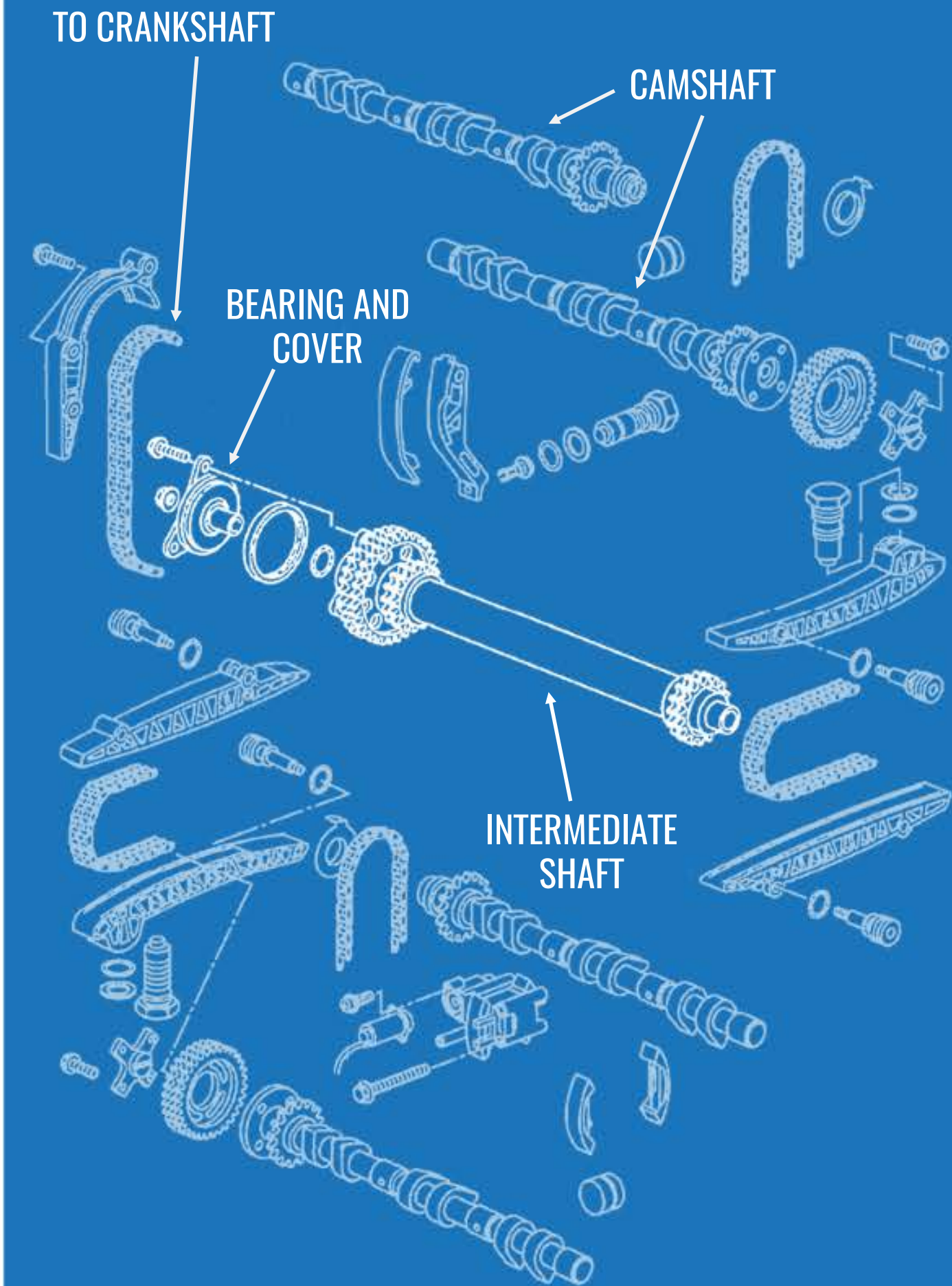


**Catastrophic engine failure caused by intermediate
shaft bearing is preventable**

NEW TO THE IMS?

There are several versions of the IMS bearing used from 1997 through 2008.

- 1997-1999: Dual row
- 2000-2001: Dual or Single Row
- 2002-2005: Single Row
- 2006-2008: Non-serviceable



IMS BY THE NUMBERS



According to the figures made public by the “Eisen” class action lawsuit, 1% of original dual row bearings failed under warranty and 8% of original single row bearings failed.



<http://eisenimssettlement.com/>



IMS replacement takes an average of 10-14 hours.



Typically coupled with clutch and other maintenance.



Engine rebuilds take 60+ hours and can cost tens of thousands of dollars.

WHY DO IMS BEARINGS FAIL?

- **Lack of lubrication (sealed bearing was used)**
- **Insufficient load capacity (factory single row bearing had high failure rate of 8%)**
- **The factory did not supply a service interval, replacement, or tools for changing the original bearing out - bearing should have had a service interval!**



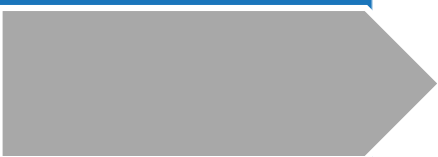
IS IT ORIGINAL?



Has the engine been replaced? Check the engine #



If the engine is not original to the car, it will have whatever bearing was in use when the engine was produced.



Example 1: 1999 Boxster had a replacement engine installed that was built in 2004. It will use the Single Row bearing.



Example 2: 2004 911 had a replacement engine installed that was built in 2007. It will use the non-serviceable bearing.



X

“X” in part number
REMANUFACTURED ENGINE

Y

“Y” in part number
FACTORY NEW REPLACEMENT

ENGINE SERIAL NUMBERS AND M-CODES

M96.20 2.5 Liter 97-99 Boxster

M96.22 2.7 Liter 00-02 Boxster

M96.23 2.7 Liter 03-04 Boxster

M96.25 2.7 Liter 05-06 Boxster

M97.20 2.7 Liter 07-08 Boxster, 08 Boxster Limited Edition, 07-08 Cayman

M96.21 3.2 Liter 00-02 Boxster S

M96.24 3.2 Liter 03-04 Boxster S, 04 Boxster S Special Edition

M96.26 3.2 Liter 05-06 Boxster S

M96.01 3.4 Liter 99 Carrera, Carrera 4

M96.02 3.4 Liter 99 Carrera, Carrera 4

M96.04 3.4 Liter 00-01 Carrera, Carrera 4

M97.21 3.4 Liter 07-08 Boxster S, 08 Boxster S Limited Edition, 06-08 Cayman S

M96.03 3.6 Liter 02-05 Carrera (1996), 02-04 Carrera 4, 02-05 Carrera 4S

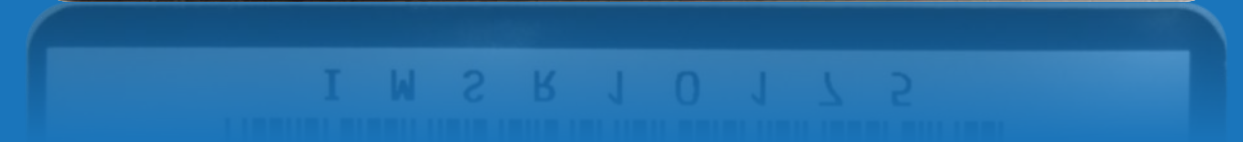
M96.05 3.6 Liter 05-08 Carrera (1997), 06-08 Carrera 4, 07-08 Targa 4

M97.01 3.8 Liter 05-08 Carrera S, 06-08 Carrera 4S, 07-08 Targa 4S



HAS IT BEEN RETROFITTED?

- LN Engineering IMS Retrofit and IMS Solution kits come with serial number tags to be placed on the vehicle when the IMS bearing has been serviced.
- All kits feature date codes on the bearings as well as on the flanges.
- <http://imsretrofit.com/is-it-genuine/>



**HOW DO I IDENTIFY
WHAT BEARING
I HAVE?**



1997-1999

And some 2000-2001 models



DUAL ROW BEARING

2002-2005

And some 2000-2001 models

SINGLE ROW BEARING



2006-2008

**Non-serviceable, larger
single row bearing.**



**WHAT ARE MY
OPTIONS?**



IMS RETROFIT

SINGLE ROW PRO IMS RETROFIT (106-08.2.2)

Fits 2000-05 M96 Engines

Integrates dual-row in place of original single-row

INCLUDES:

- Custom dual row bearing with ceramic balls
- Billet bearing cap / flange
- Internal wire lock
- Set of microencapsulated bolts

RECOMMENDED REPLACEMENT EVERY 75k MILES OR 6 YEARS



SINGLE ROW PRO
IMS
RETROFIT

IMSRETROFIT.COM





IMSRETROFIT.COM



IMS RETROFIT

DUAL ROW IMS RETROFIT (106-08.4)

Fits 1997-2001 M96 Engines with original dual-row bearing

INCLUDES:

- Custom dual row bearing with ceramic balls
- Billet bearing cap / flange
- Custom spiro-loc
- Set of microencapsulated bolts

RECOMMENDED REPLACEMENT EVERY 75k MILES OR 6 YEARS





IMSSOLUTION.COM



IMS SOLUTION

SINGLE ROW IMS SOLUTION (106-08.20)

Fits 2000-05 M96 Engines

Replaces OE single-row bearing with plain bearing

- Eliminates ball bearing completely
- Easy oil changes with spin-on oil filter
- Pressure-fed plain bearing, like in Mezger engine

DESIGNED FOR THE LIFE OF THE ENGINE



IMSSOLUTION.COM



IMS SOLUTION

DUAL ROW IMS SOLUTION (106-08.40)

Fits 1997-2001 M96 Engines with original dual-row bearing

- Eliminates ball bearing completely
- Easy oil changes with spin-on oil filter
- Pressure-fed plain bearing, like in Mezger engine

DESIGNED FOR THE LIFE OF THE ENGINE

MY2006-2008

Bearing replacement is not necessary or possible with 2006-2008 model year Boxster, Cayman, or 911. Engine disassembly is required to change the bearing.

Some late 2005 model year vehicles may have the non-serviceable bearing.

IMS can be updated with IMS Retrofit 106-08.30 or IMS Solution 106-08.60 while engine is disassembled.

Tips for extending original bearing life:
<http://imsretrofit.com/my06-08/>



IMS Retrofit 106-08.30



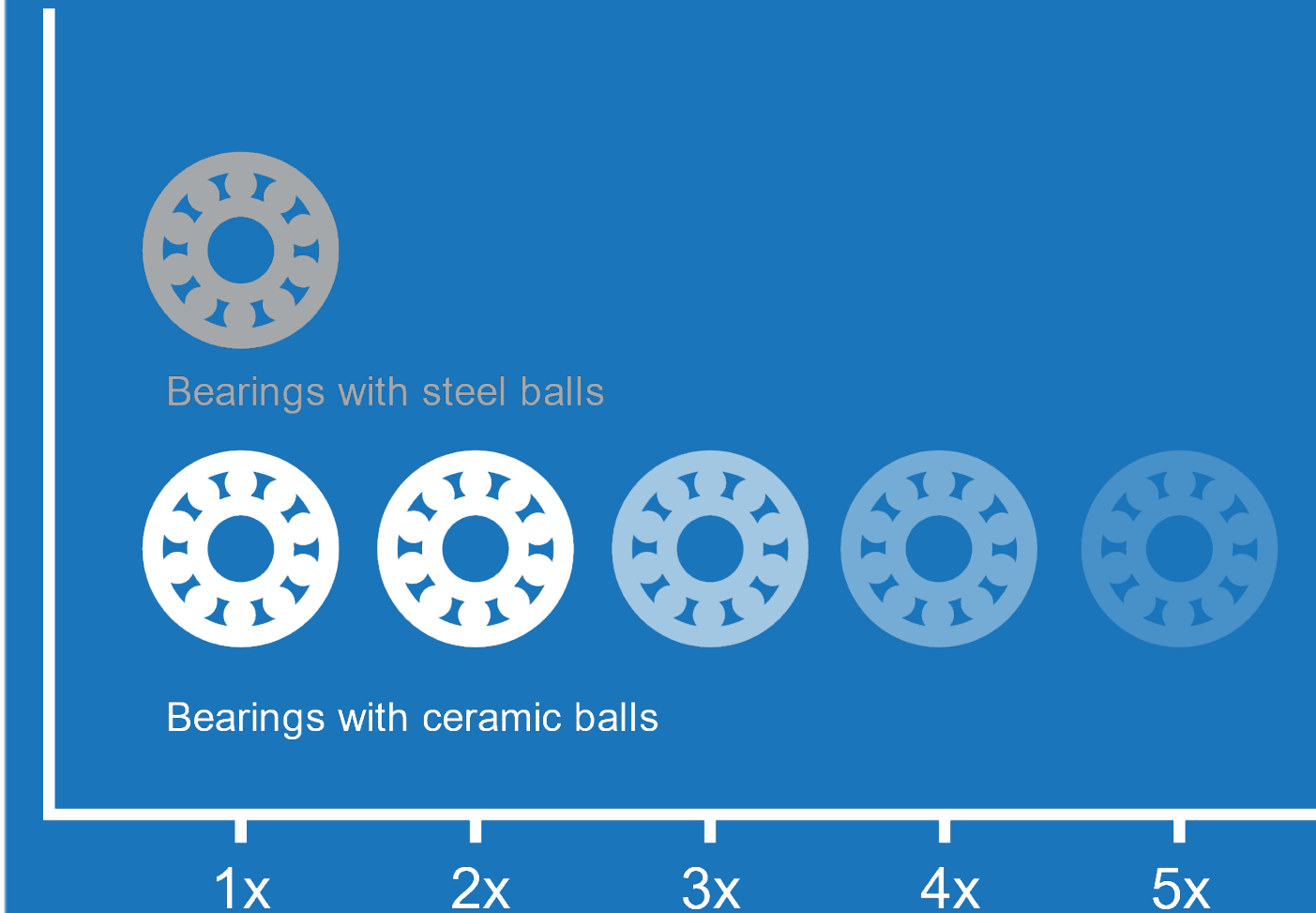
IMS Retrofit 106-08.60

WHY IMS RETROFIT?

The ceramic hybrid ball bearings utilized in IMSR kits have longer life over the conventional ball bearings used by the factory.

The Single Row Pro allows installation of higher load rating bearing into an intermediate shaft originally fitted with the weakest factory bearing.

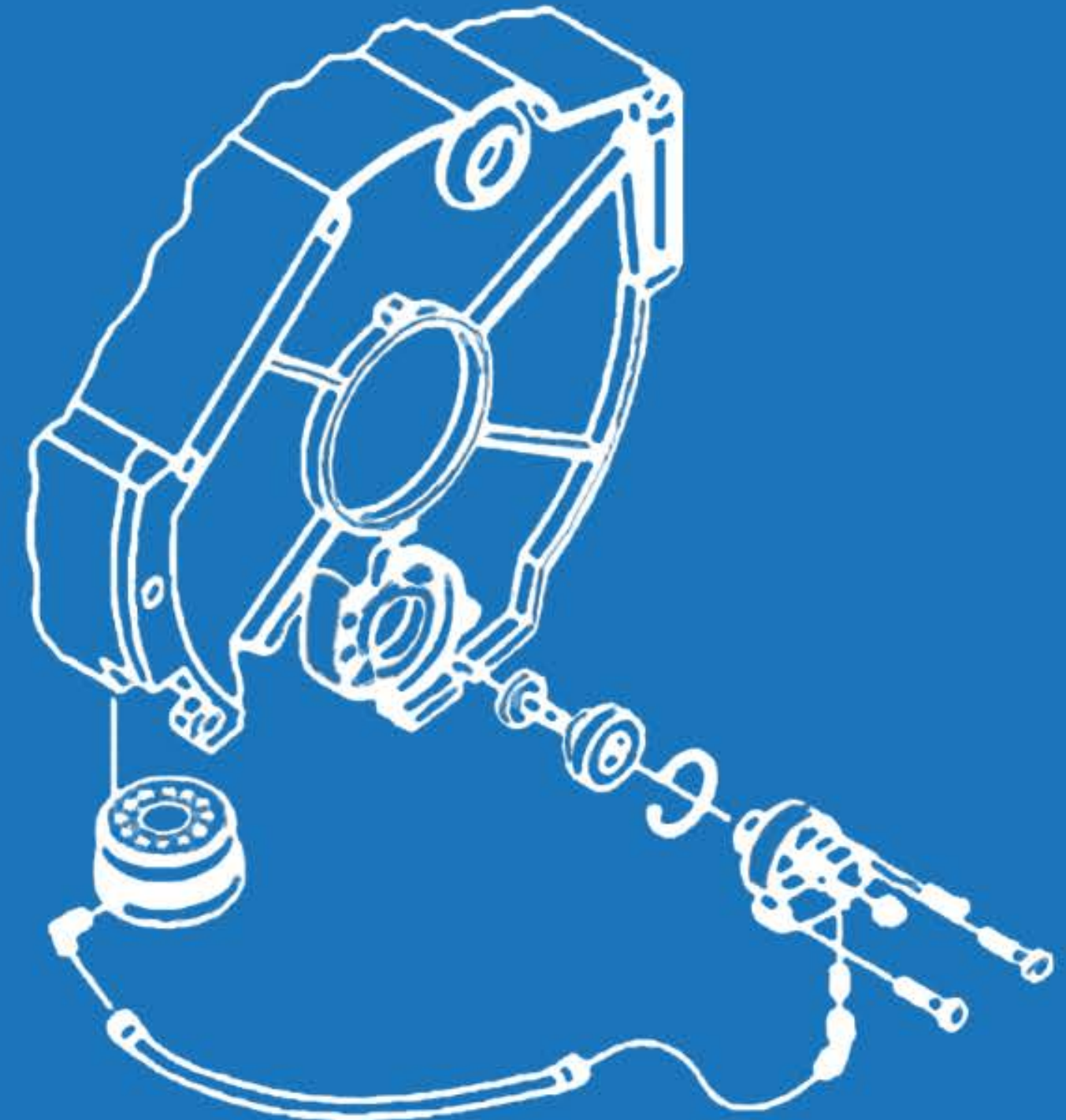
For use as part of preventative maintenance.



Service life for ceramic hybrid bearings is at least double that of conventional steel ball bearings and could last up to five times longer, depending upon operating conditions.

WHY IMS SOLUTION?

- **The IMS Solution backdates the engine to use a plain, oil-fed bearing.**
- **No moving parts to fail.**
- **Does not have a service interval and is designed to last the lifetime of the engine.**



WHEN DO I REPLACE?

IMSR & IMSS Designed for preventative maintenance only!

Once your original bearing has failed it is too late - replacement after a failure will not “save” your engine.

Foreign Object Debris (FOD): One of the most common sources of trouble in bearings is wear and pitting caused by foreign particles and is responsible for 70% of all early bearing and subsequent engine failures.



SERVICE INTERVALS



IMSR Single Row: 50k miles or 4 years



IMSR Dual Row: 75k miles or 6 years



IMSR Single Row Pro: 75k miles or 6 years



IMSS (IMS Solution): Lifetime. No further service required.

WHEN DOES IT NEED TO BE CHANGED AGAIN?

Serial Number	2000	5000	9000	12000	17000	22000
Date of Manufacture	April 2011	April 2012	April 2013	April 2014	April 2015	April 2016

If an IMS Retrofit has already been fitted, look for the serial number tag on the vehicle to identify installation date +/- 6 months.

If you are unsure which bearing technology was used, call LN Engineering to help determine which one was originally installed.

Serial numbers were not employed before mid-late 2010.



WARRANTY



Classic Single Row - 30 days



Dual Row and Single Row Pro - 2 YR / 24K Miles



IMS Solution - 5 YR / 60K Miles



Proper pre-qualification AND registration required for warranty validation.

WHAT IS FOD?

As shown in a factory filter after the IMS bearing has failed, foreign object debris carried in the oil will cause damage throughout the engine. Simply replacing the failed part will certainly lead to another failure.

Proper pre-qualification involves identifying engines not suitable for IMS bearing replacement.



IMS BEARING REPLACEMENT PRE-QUALIFICATION PROCEDURE

The following eleven step IMS Pre-Qualification procedure was developed by Jake Raby at Flat 6 Innovations. During the initial development of the original IMS Retrofit Procedure and components, some items of concern were noted from the very beginning. Over the years these procedures have been updated to address them, thus increasing the effectiveness of IMS procedures.

This procedure has been employed at Flat 6 Innovations since the very first IMS Replacement was performed, and to date it has resulted in a 100% success rate for the Flat 6 Innovations Preventative Service program. Having performed the very first IMS Replacement, and after performing more IMS Replacements than any other facility, a perfect record has been maintained by Flat 6 Innovations by employing these procedures verbatim. This means that today roughly 20% of all engines that are inspected will fail this pre-qualification, and will require extensive repairs to be made prior to the IMS replacement being performed.

The biggest mistake that can be made is assuming that every vehicle is healthy enough to have the IMS bearing replaced. The second biggest mistake that can be made is not taking the pre-qualification procedure seriously. **Please pay attention to each and every engine and realize that not every engine is a viable candidate for an IMS bearing replacement.**

- ➔ ☐ Perform controller interrogation (check for any Fault Codes, engine over-revs, Camshaft deviation #'s, etc...)
- ➔ ☐ Five (5) chain M96 engines are known for high camshaft deviation values due to abnormally high wear found on the timing chain adjuster wear pads. This can occur at low mileage points. **Camshaft deviations found over 6 degrees must be addressed prior to performing any IMS procedure.** Failure to do this may result in a loss of valve timing during the procedure, or a Check Engine Light illumination immediately following the IMS procedure. This will be due to camshaft deviations that are operating out of range.
- ➔ ☐ Perform Crankcase Manometer test. Healthy engines with healthy Air/ Oil Separators at sea level will test at 5" of water. (Use CR Tools Manometer for best results)
- ➔ ☐ Check over car completely, perform vehicle safety inspection, and listen to engine to determine overall condition. Inspect for any engine and/or gearbox oil and/or coolant leaks and document. Driving the car prior to the procedure is recommended, as issues may be caught prior to the process.
- ➔ ☐ Drain engine oil, inspect how the oil looks while draining, and inspect engine oil drain plug closely. Inspect for ANY debris. **Again, any debris is concerning and must be taken seriously.** Engines can run perfectly and exhibit no other symptoms of imminent failure, yet can be slowly dying due to debris laden oil.
- ➔ ☐ Remove engine oil filter, cut open and inspect for ANY debris. Look closely at the bottom of the factory filter canister, where debris is often collected. If ANY debris is present, the procedure must be aborted; the source of the debris must be identified. Action must be taken to address these issues prior to the process being carried out. **Replacing the IMSB of ANY engine that has wear metals or other debris in the oil, will lead to collateral damages that can destroy the replacement IMS Bearing, as well as all other internally lubricated engine components.**

- ➔ ☐ Remove Engine Oil Sump plate, inspect for debris. Removal of the sump plate is highly encouraged, as debris will lurk here that is not notable in the oil or in the filter. Again, ANY debris of any sort is concerning and must be investigated.
- ➔ ☐ During all oil, sump, and filter inspections, remember that the tiniest particles are just as concerning as larger pieces. This is because they are even more easily mixed into and suspended from the engine oil, allowing the debris to circulate all throughout the engine with damaging effects.
- ➔ ☐ Perform bore scope inspection of all cylinder bores. Watch closely for scoring and any signs of wear. Wear debris from failing / failed cylinders has been proven to be very damaging to all engine internals, including IMS bearings.
- ➔ ☐ With the transaxle removed, inspect the Rear Main Seal bore to ensure the engine does not have a factory defect known as "crankshaft sag". If this exists oil leakage at the RMS will be a terminal condition that can't ever be remedied.
- ➔ ☐ Once the IMS flange is removed, inspect the original IMS Bearing for signs of failure. Also, check for signs that the engine may have already experienced an IMS Bearing failure and may have had another bearing fitted. Engines that have IMS shaft assemblies that have been through a failure are always damaged; it is very important that these shafts are not fitted with any IMS replacement bearing.

NOTE: Any and all fault codes, and or symptoms of rough running, etc. must be addressed prior to any IMS procedure. It is imperative that ONLY healthy, good running engines be retrofitted.

NEVER, UNDER ANY CIRCUMSTANCE, IS IT PERMISSABLE TO REMOVE A FAILED OR FAILING IMS BEARING AND REPLACE IT WITH A NEW IMS BEARING. IMS COMPONENTS AND PROCEDURES WERE DESIGNED FOR PREVENTATIVE PURPOSES ONLY.



WHAT TOOLS ARE NEEDED?



**IMS PRO TOOL KIT
(106-08.13)**

Required for ALL IMS PROCEDURES



**SUPPLEMENTAL IMS
TOOL KIT (106-08.21)**

Required for IMS Solution
and MY06-08 Upgrade



**FAULTLESS IMS TOOL
(106-08.22)**

Required for Single Row Pro
IMS Retrofit

ALTERNATIVES

Direct Oil Feed. *Commonly confused with IMSS.*

**The IMSS is a plain bearing, like in an air cooled Porsche 911 engine.
Bearing rides on oil film.**

**A ball bearing or roller bearing in the M96/M97 engine does not
require forced oil as the engine is wet sump.**

The IMS is submerged in oil - no further lubrication is necessary.



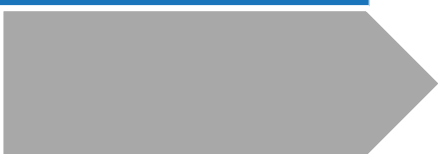
ALTERNATIVES

Roller Bearing: Roller bearings are not ideal due to lower thrust load rating. Not a permanent fix - bearing must be serviced.

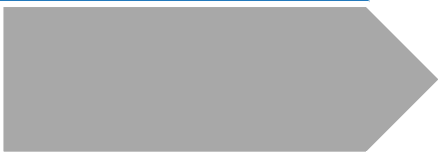
Load ratings advertised by other manufacturers are not indicative of real world ratings. Here are the facts:



A 6204 series ball bearing currently has a dynamic load capacity of 2900# with thrust max load rating of 1450# (factory single row bearing)



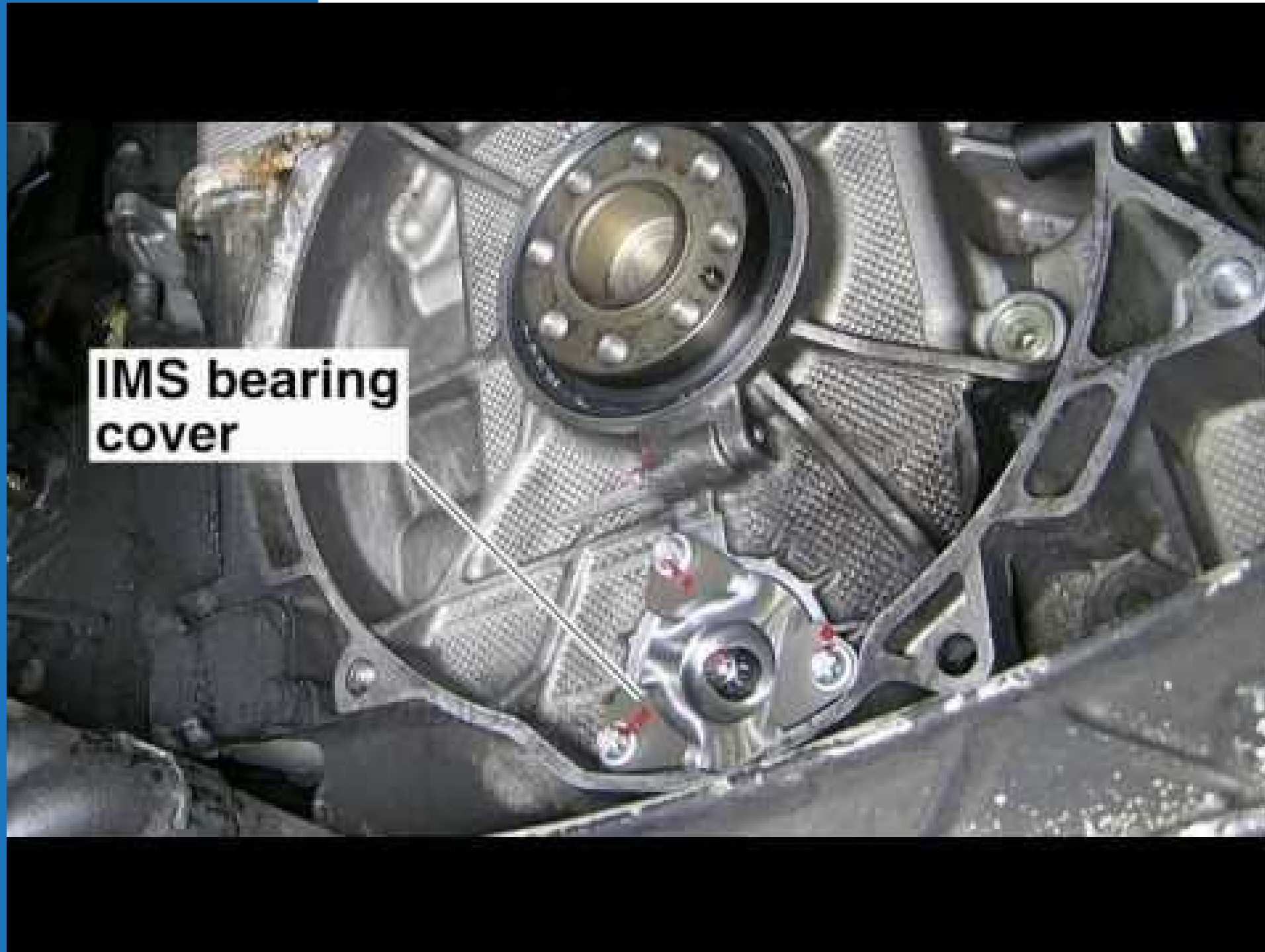
The NJ or NU204 cylindrical roller bearing has a dynamic load capacity of 3750# with thrust max load rating of 375#



The custom Single Row Pro or Classic Dual Row ceramic hybrid bearing has a dynamic load capacity of 4000# w/ Thrust or 2000# and is stronger than the above roller bearing.



VIDEO



Bentley Publishers has produced an excellent video on the IMS Retrofit procedure using the LN Engineering IMS Retrofit kit and IMS Pro Tool Kit based off the procedure developed by Flat 6 Innovations and LN Engineering LLC.

- <https://youtu.be/hAxj6FKMzvM>

COMMON QUESTIONS

- **Q: Why does the IMS Retrofit not use a sealed bearing?**
- **A: The IMS is submerged in engine oil. Using an open bearing rather than the factory sealed bearing allows engine oil to properly lubricate and cool the bearing.**



COMMON QUESTIONS



- **Q: Does the engine have to be removed from the car.**
- **A: Typically no.**

Exception is 996/997 Tiptronic which the engine and transmission must be removed as an assembly and procedure must be carried out with engine removed from the car.

COMMON QUESTIONS

- **Q: What other items should be replaced at time of service?**
- **A: Water pump should be replaced every 4 years/50k miles along with AOS, drive belt, thermostat (with low temp unit). No metal impellers. Genuine Porsche recommended for water pump and AOS.**

Dual mass flywheel must be checked and replaced if bad with OEM or Genuine DMF only and stock clutch disc along with rear main and case bolts.

Address all other concerns found during pre-qualification.



LINKS



IMS Retrofit - <http://imsretrofit.com/>



IMS Solution - <http://imssolution.com/>



IMS Solution Manual - <http://imssolution.com/manual>



Faultless Tool Manual for Single Row Pro – <http://imsretrofit.com/imsr-pro-manual>

