

VARIABLE VALVE TIMING PROGRAM

1

The most comprehensive VVT line in the aftermarket now features more than 650 VVT Solenoids, Sprockets and Kits

2

Our advanced engineering and manufacturing processes deliver premium-quality VVT components

3

Many NAPA® Echlin® and Tech Expert® VVT components include gaskets and seals where required for an complete repair

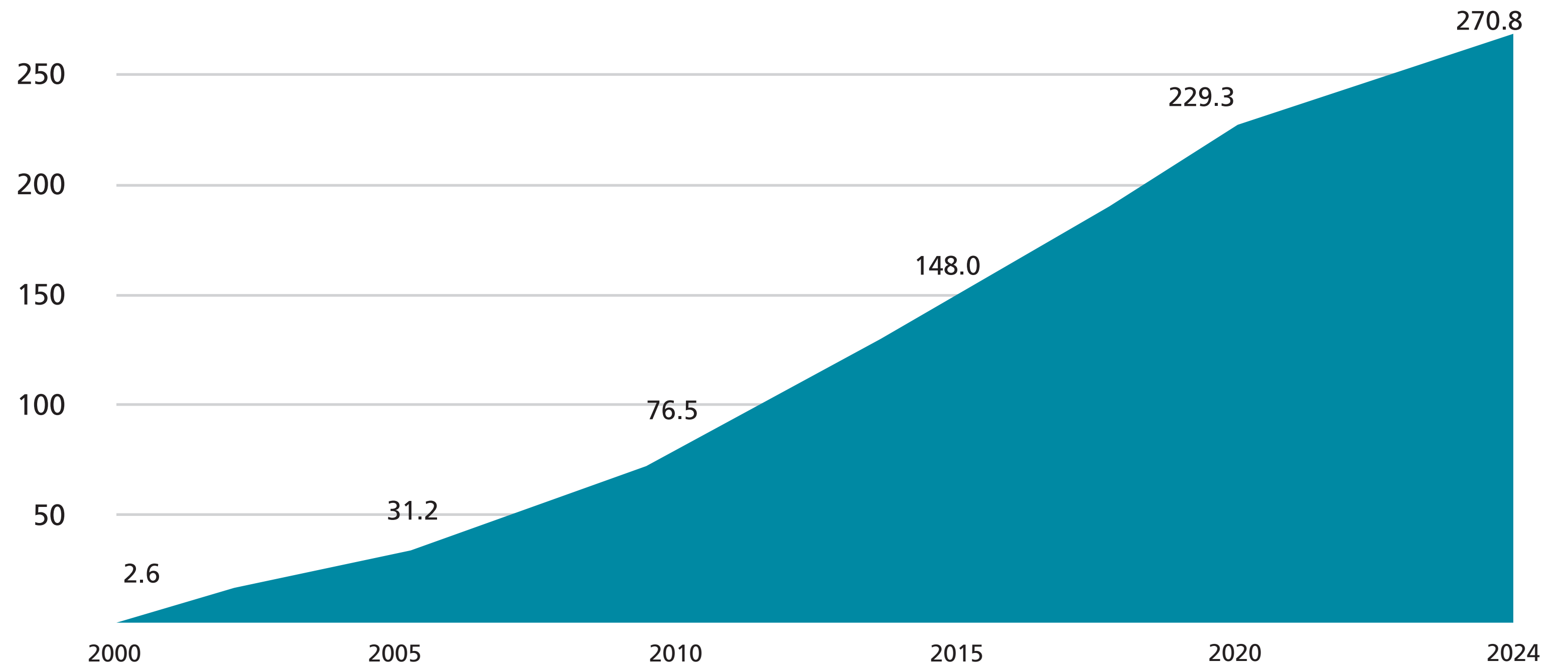
**What's in your box?™
Here's what's in ours.**



Growing Market

Almost every new vehicle with an internal combustion engine is now equipped with variable valve timing. There are already more than 270 million VVT-equipped vehicles on the road and they are getting older each day. As an industry that generally services 8-15 year old vehicles, the future for VVT maintenance and repair is bright.

Registered Vehicles with Variable Valve Timing
(in millions)



From 2015 to 2024, the number of vehicles on the road with variable valve timing grew by over 120 million! Service opportunities will see significant growth as these vehicles age.



Source: SMP Internal Data



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Variable Valve Timing

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Opportunities

The VVT components on the Ford 5.4L are known for their high failure rates. Ford has even released a Technical Service Bulletin on this topic and recommends replacing the VVT solenoids when there is a rattling noise or a rough idle.

5.4L 3V – INTERMITTENT RATTLE NOISE WHILE DRIVING / ROUGH IDLE WHEN ENGINE IS AT OPERATING TEMPERATURE

TSB 14-0114

FORD:
2004-2010 F-150
2005-2010 F-250, F-350
2005-2013 Expedition
LINCOLN:
2006-2008 Mark LT
2005-2013 Navigator

This article supersedes TSB 12-7-10 to update the vehicle model years and Service Procedure.

ISSUE
Some 2004-2010 F-150, 2005-2010 F-Super Duty 250/350, 2005-2013 Expedition, Navigator and 2006-2008 Mark LT vehicles equipped with 5.4L 3V engine may exhibit an intermittent rattle noise while driving from idle up to 1200 RPM when the engine is at operating temperature. In severe cases, a rough idle and diagnostic trouble codes (DTCs) P0022, P0021, P0340, and/or P0341 may be stored in the powertrain control module (PCM).

ACTION
Follow the Service Procedure steps to correct the condition.

SERVICE PROCEDURE
Replace the left and right variable cam timing (VCT) solenoids. Refer to Workshop Manual (WSM), Section 303.

PART NUMBER	PART NAME
8L3Z-6M280-B	VCT Solenoid
7L1Z-6584-B	Left Side Cam Cover Gasket—14 Bolt Cam Cover
7L1Z-6584-A	Right Side Cam Cover Gasket—8/9 Bolt Cam Cover
3L3Z-6584-EA	Right Side Cam Cover Gasket—14 Bolt Cam Cover
3L3Z-6584-DB	Left Side Cam Cover Gasket—15 Bolt Cam Cover
3L3Z-6C535-AA	VCT Solenoid To Cam Cover Gasket

OPERATION	DESCRIPTION	TIME
140114A	2005-2006 Expedition, Navigator F-Super Duty 250/350 2004-2006 F-150, 2006 Mark LT 5.4L 3V: Retrieve DTCs And Replace Both VCT Solenoids (Do Not Use With Any Other Labor Operations)	0.6 Hr.
140114A	2008-2010 F-Super Duty 250/350 5.4L 3V: Retrieve DTCs And Replace Both VCT Solenoids (Do Not Use With Any Other Labor Operations)	2.6 Hrs.
140114A	2007-2013 Expedition, Navigator, 2007 F-Super Duty 250/350 5.4L 3V: Retrieve DTCs And Replace Both VCT Solenoids (Do Not Use With Any Other Labor Operations)	3.1 Hrs.
140114A	2007-2010 F-150, 2007-2008 Mark LT 5.4L 3V: Retrieve DTCs And Replace Both VCT Solenoids (Do Not Use With Any Other Labor Operations)	3.5 Hrs.

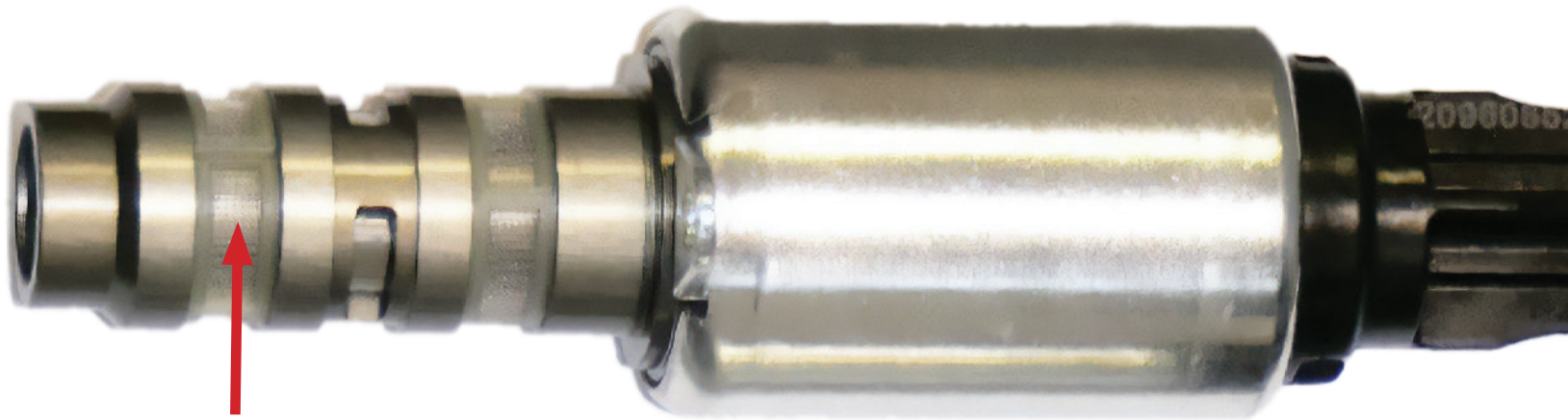
NOTE: The information contained in Technical Service Bulletins is intended for use by trained, professional technicians with the knowledge, tools, and equipment to do the job properly and safely. It informs these technicians of conditions that may occur on some vehicles, or provides information that could assist in proper vehicle service. The procedures should not be performed by "do-it-yourselfers". Do not assume that a condition described affects your car or truck. Contact a Ford, Lincoln, or Mercury dealership to determine whether the bulletin applies to your vehicle. Warranty Policy and Extended Service Plan documentation determine Warranty and/or Extended Service Plan coverage unless stated otherwise in the TSB article. The information in this Technical Service Bulletin (TSB) was current at the time of printing. Ford Motor Company reserves the right to supersede this information with updates. The most recent information is available through Ford Motor Company's on-line technical resources.

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Ford Technical Service Bulletin TSB-14-0114

OE Problem:

The oil screen often separates or the solenoids become clogged, causing a premature failure on the Ford 5.4L



Plastic Oil Screen:

Can separate or break down, clogging the solenoid

Echlin® Solution:

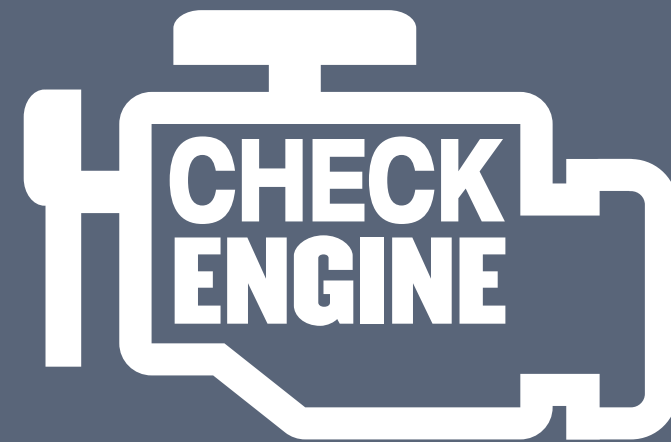
Features an improved steel oil screen welded to the solenoid body, which won't break down or clog



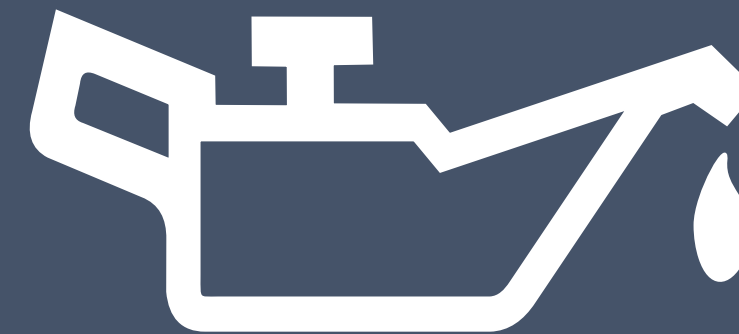
Steel Oil Screen:

Can't separate from the body or break down like plastic

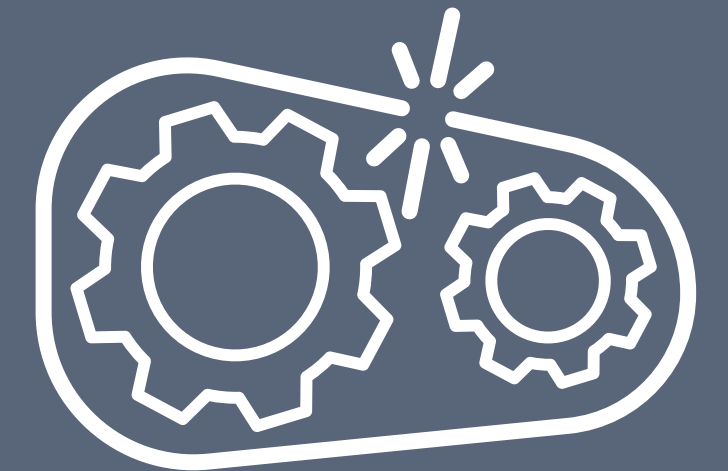
Impact on Engine Systems



Rough idle, stalling, poor acceleration, decreased fuel economy, engine noise, and a check engine light may be signs of an issue with a VVT system



Using the correct oil weight is critical to the health of any variable valve timing system



Low oil pressure will affect VVT system performance – Prior to installing new components, ensure that base engine oil pressure is within specifications

What's New

VVT Solenoids

VVT solenoids, also known as control valves or spool valves, come in a variety of designs depending on their application.

Echlin® is committed to regularly introducing new VVT Solenoids, adding to our industry-leading coverage.

For the most recent applications, check the online catalog at NAPAEchlin.com.



VVS2089

Audi Cars & SUVs
2.0L (2023-17)
VIO: 205K



VVS2082

Mitsubishi Eclipse Cross
1.5L (2022, 2020-18)
VIO: 55K



VVS2086

GM Cars, Trucks & SUVs
2.0L / 2.7L (2020-19)
VIO: 68K



VVS2088

Volkswagen Cars
2.0L (2023-22)
VIO: 21K



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VVT Solenoids

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What's New

VVT Sprockets

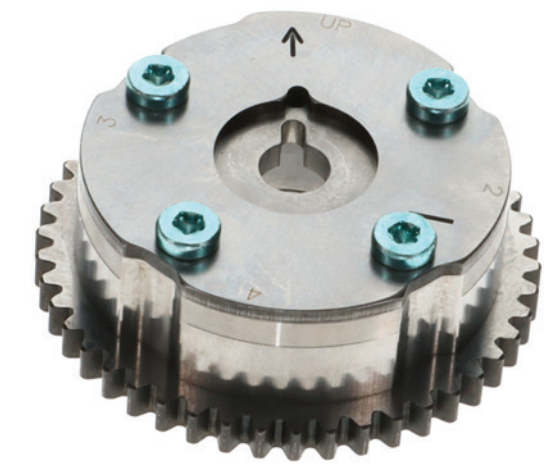
VVT Sprockets, also known as cam phasers, account for nearly 300 SKUs in Echlin's ever-expanding line of VVT component coverage.

For the most recent applications, check the online catalog at NAPAEchlin.com.



ECP1991

Volvo Cars & SUVs
2.0L (2023-14)
VIO: 721K



ECP1999

Honda Cars & SUVs
1.5L (2020-16)
VIO: 2.5M



ECP1996

Toyota Cars & SUVs
1.8L / 2.0L (2022-14)
VIO: 838K



ECP1977

Subaru Cars & SUVs
2.0L / 2.4L (2023-18)
VIO: 1.2M



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VVT Sprockets

NAPAEchlin.com

Top Movers: VVT Solenoids & Sprockets

IMPORT APPLICATIONS



VVS1512

Honda / Acura Cars & SUVs
(2012-02)



VVS1542

Nissan Cars & SUVs
(2020-13)



VVS1933

Nissan / Infiniti
Cars, Trucks & SUVs
(2023-13)



ECP1723

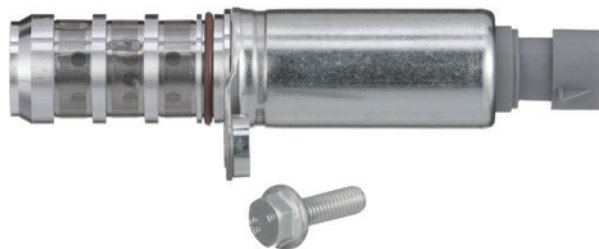
Honda Cars & SUVs
(2015-08)



ECP1920

Hyundai / Kia Cars & SUVs
(2023-14)

DOMESTIC APPLICATIONS



VVS1754

GM Cars & SUVs
(2017-06)



VVS1755

GM Cars & SUVs
(2017-06)



VVS1100

Ford / Lincoln
Cars, Trucks & SUVs
(2014-04)



ECP1805

Chrysler / Dodge / Jeep / RAM
(2023-11)



ECP1905

Ford / Lincoln
Cars, Trucks & SUVs
(2021-17)



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VVT Components

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Related Parts

In addition to the highest quality Sprockets and Solenoids, Echlin® and Tech Expert® offer the complementary parts necessary to maintain and repair today's VVT systems.



VVT Spool Filters

Spool filters can become clogged over time, hindering performance and potentially causing damage to the solenoids

Tech Expert® replacement VVT Spool Filters allow technicians to service the filter and gaskets without replacing solenoids

Available for popular Honda and Acura applications through 2019



VVT Chain Tensioner Kits

Worn chain tensioners can cause a vehicle to run poorly and can even lead to a catastrophic engine failure

Tech Expert® VVT Chain Tensioner Kits include a new chain tensioner, gasket and seal for a complete repair

Available for popular Audi and VW vehicles with high failure rates



VVT Position Sensor Magnets

Newer VVT systems may also incorporate adjuster magnets

Echlin's VVT Position Sensor Magnets are a drop-in replacement part and include new seals to help prevent oil contamination

37 SKUs available with coverage through 2023



Camshaft & Crankshaft Position Sensors

Grime, water damage and bad wiring can all cause camshaft and crankshaft sensors to fail

Each Echlin® Cam and Crank Sensor undergoes a testing regimen that includes a 35-hour vibration test, chamber test, and more to ensure durability

More than 1,000 Cam and Crank Sensors available for import and domestic vehicles



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VVT Components

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Product Spotlight

VVT is a complex system, and solenoid designs can vary from application to application. The Honda / Acura 3.5L engine features a solenoid with an upper and lower portion.

The upper portion contains the moving elements and electric components, and is the part that typically fails, while the lower portion is the cast aluminum housing. Echlin® VVS1838U contains the upper portion as well as the required seals and hardware for an easy installation. Echlin® VVS1838 is also available for a complete solenoid replacement.

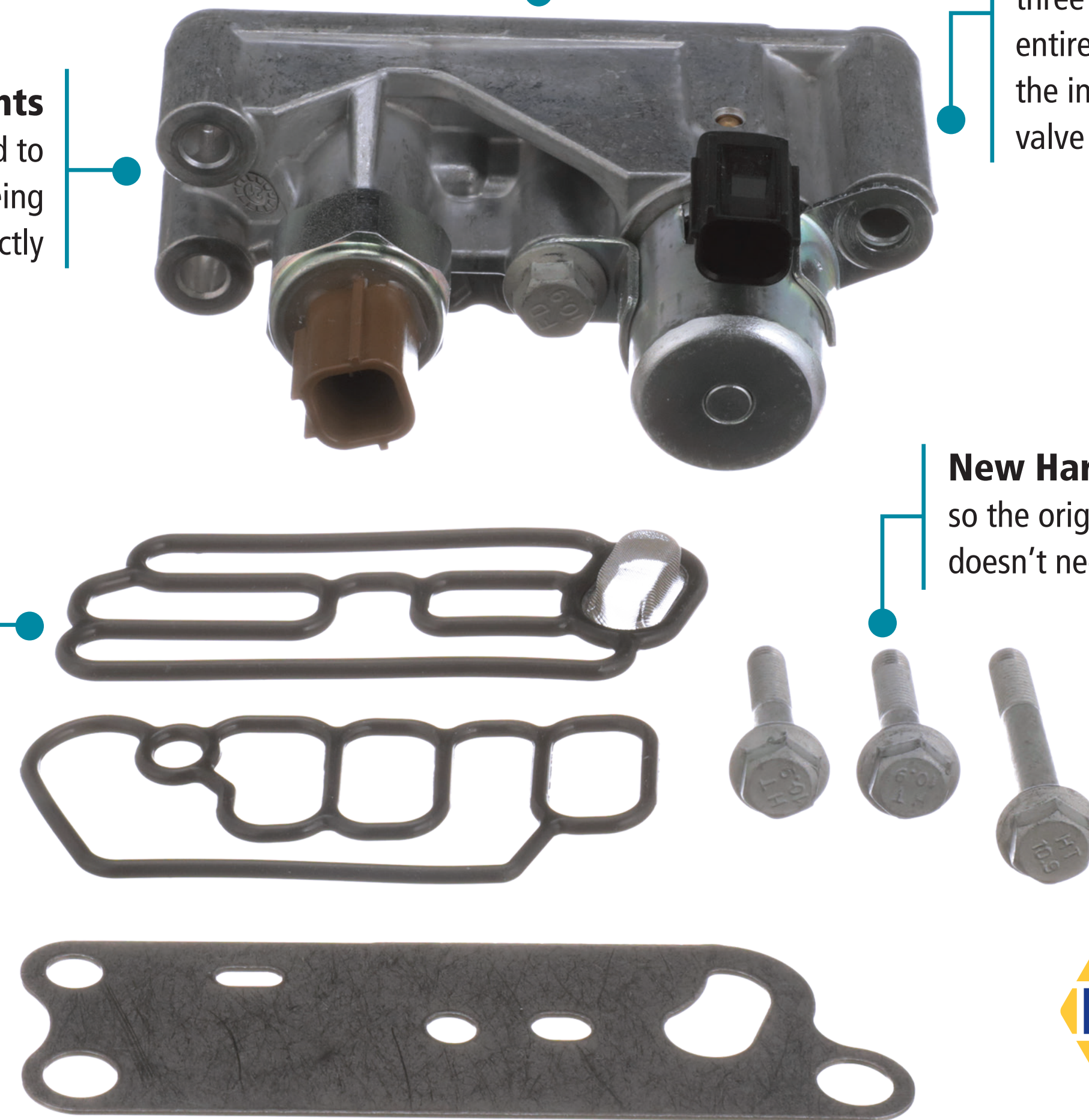
Precision Manufactured
in our state-of-the-art
Poland facility

Design Improvements
Retaining surface increased to
prevent the bushing from being
pressed incorrectly

Simplified Installation
Installation requires removing only
three screws, while replacing the
entire solenoid requires disassembling
the intake manifold, valve cover, and
valve train components

New Seals Included
which are easily replaced
during installation

New Hardware Included
so the original hardware
doesn't need to be reused



VVS1838U
Acura / Honda 3.5L
(2016-08)

Complete Timing Repair Kits

Ford 5.4L engines feature highly technical VVT systems which are susceptible to failure. They typically fail due to low engine oil levels, poor oil circulation, or oil and filter change irregularities.

Tech Expert® offers a Complete Timing Repair Kit to solve this OE problem.

VVK1000 Complete VVT Repair Kit Ford / Lincoln (2014-02) VIO: 3.1M



VVT Kit Components

- | | |
|--|-------------------------------|
| 1 – VVT Sprockets | 6 – Drive Gear Sprocket |
| 2 – VVT Solenoids | 7 – Crankshaft Position Wheel |
| 3 – Timing Chain Tensioners | 8 – Crankshaft Seal |
| 4 – Timing Chains | 9 – Gaskets |
| 5 – Timing Chain Guides & Tensioner Arms | |

Engineering Improvements

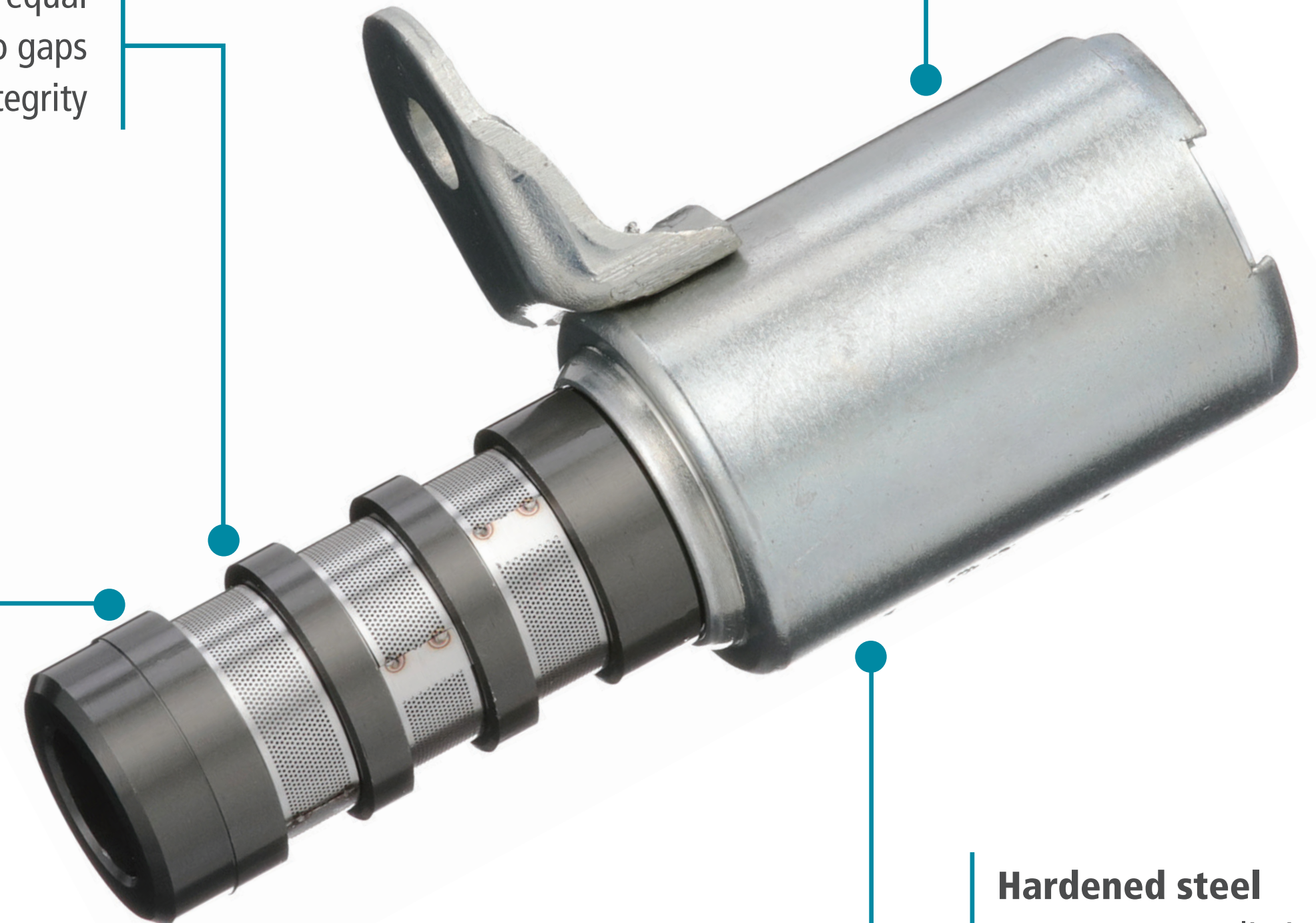
Generally located on and/or around the cylinder head, VVT solenoids meter the oil flow to control the actuation of the VVT sprocket.

Each Echlin® VVT Solenoid features anodized steel componentry, which limits sludge buildup and protects against sticking. Echlin® Solenoids also feature premium O-rings and gaskets to prevent oil leaks, as well as an OE-match harness connector.

Precision Engineered
Designed for optimum performance and a long service life

Welded Filters have equal overlapping diameters with no gaps to maintain structural integrity

Welded reinforcement ensures a stronger connection between screen and body



Hardened steel componentry limits sludge buildup

VVS1508

Ford Cars, Trucks & SUVs
(2023-11)



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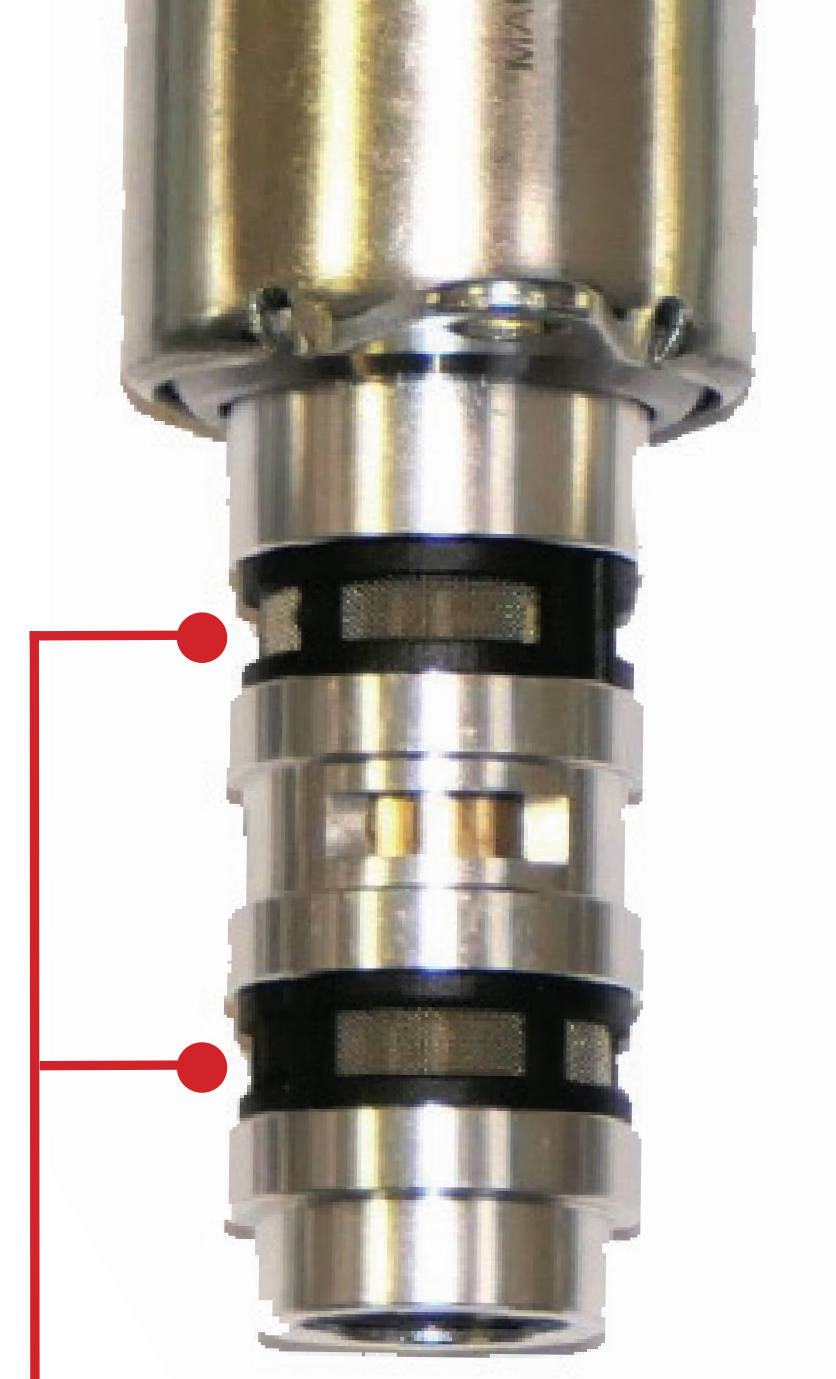
VVT Solenoids

NAPAEchlin.com

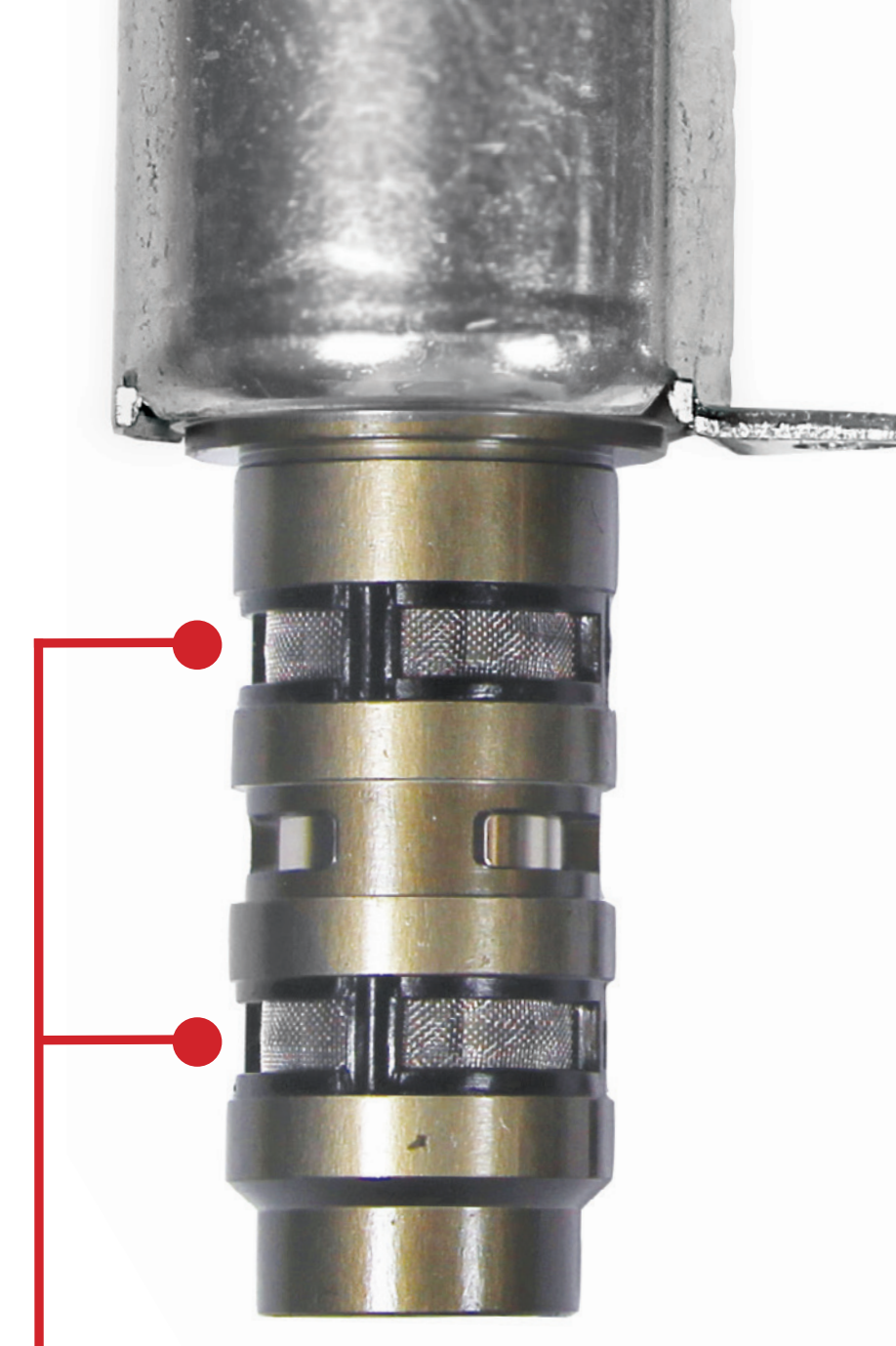
Engineering Improvements

Echlin® VVT Solenoids feature design improvements over the original and the competition.

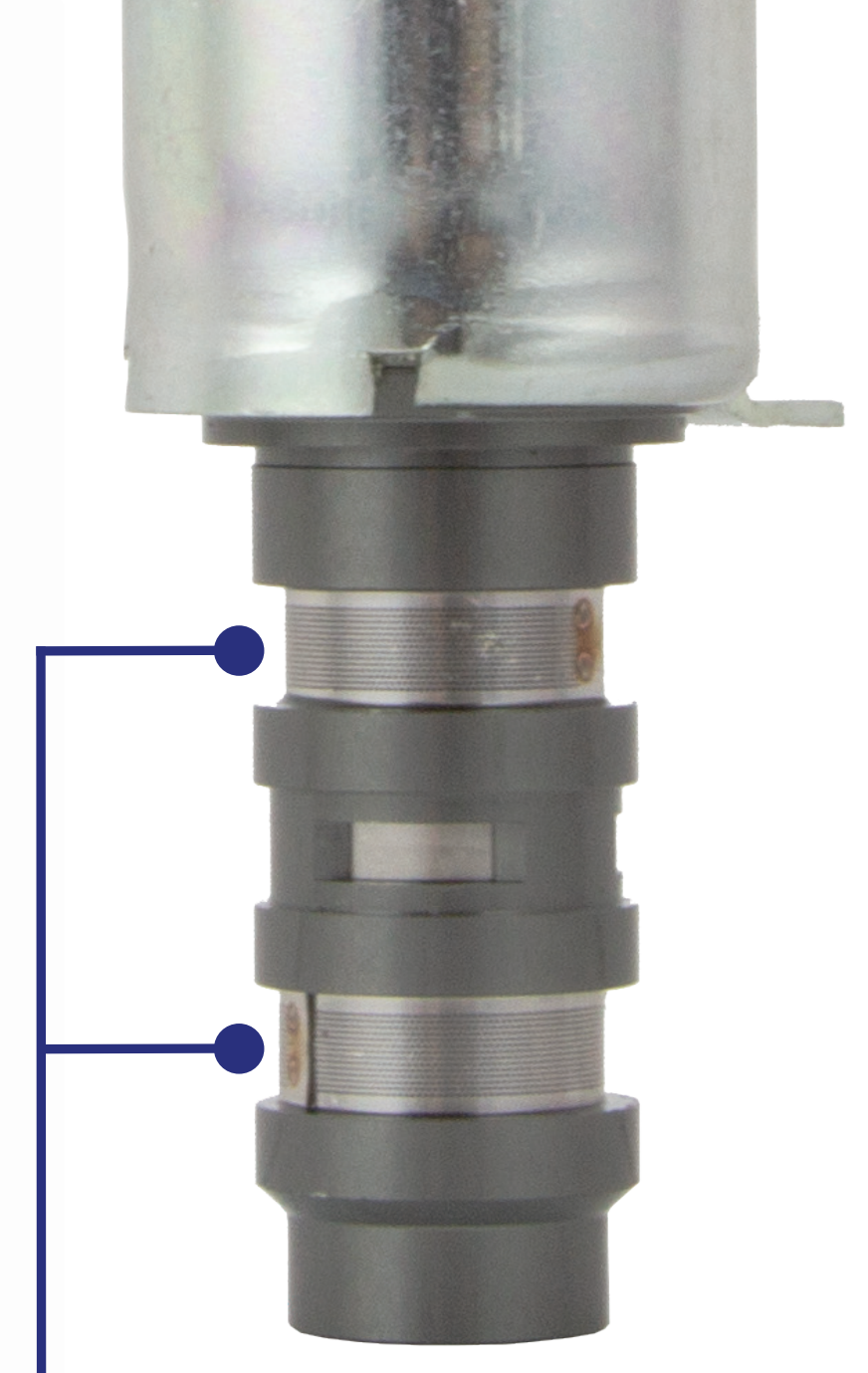
For instance, OE and competitors' solenoids use plastic on the oil screen, which is prone to deteriorating and separating, failing to hold the screen to the body. Our improved screen stamp and welded reinforcement are the result of Echlin's commitment to high-quality design and rigorous testing.



**Competition
uses plastic**



OE uses plastic



**Echlin® uses a
reinforced metal screen**

Reinforced Plunger Design



**Competitor design has no
reinforcement**



**Echlin® features a reinforced plunger
and spring**

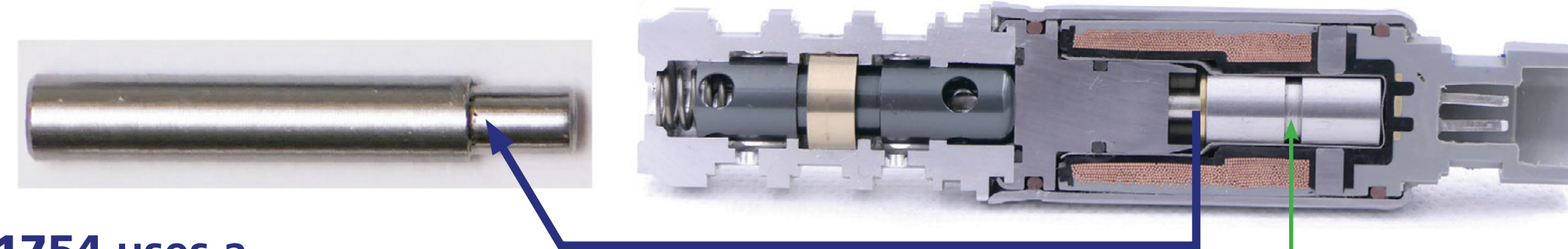
VVT Design Improvements

Echlin® VVT Solenoids feature a stainless steel shaft for a durable and more reliable solution while the OE and competitor units use lesser materials prone to deformation and wear.

In addition, Echlin® VVT Solenoids include a groove on the armature for improved lubrication, allowing for faster valve switching and decreased wear of the armature, while competitors do not use grooves for lubrication, resulting in slower valve switching and accelerated wear.

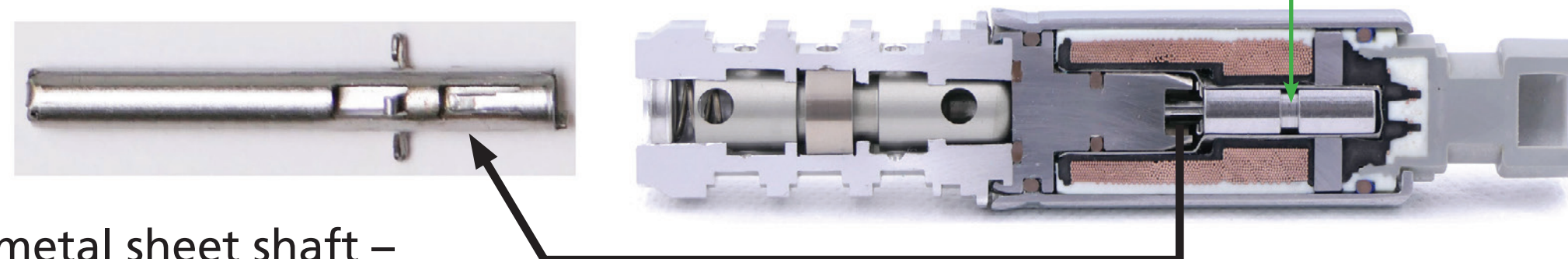
Durable Shaft & Lubrication Grooves

The Echlin® VVS1754 uses a stainless steel shaft, pressed all the way to the armature for durability and reliability

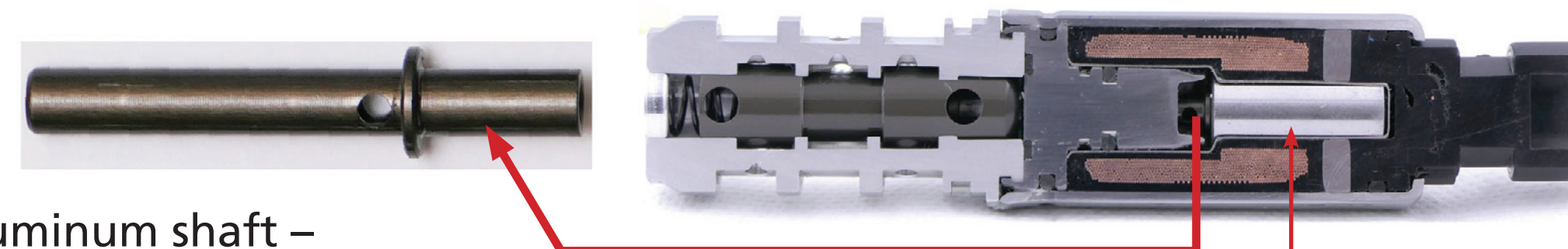


Echlin® & OE:
Groove on the armature for improved lubrication

OE: Thin formed metal sheet shaft – prone to deformation, and change of valve characteristics

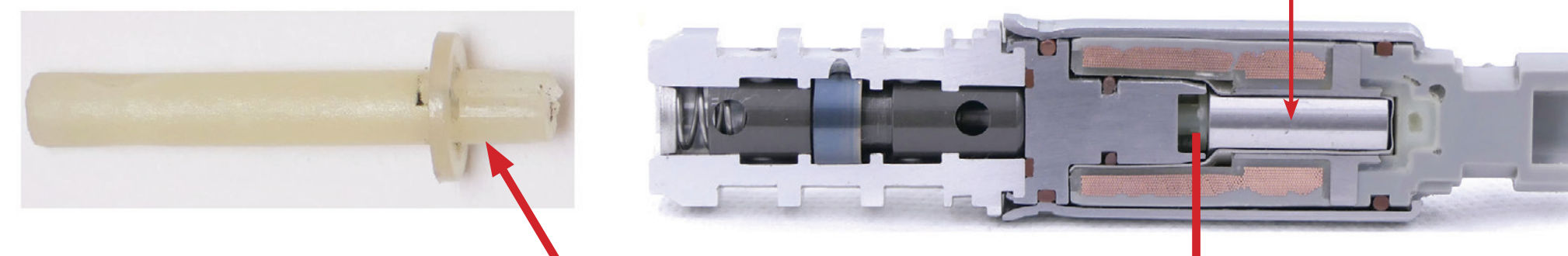


Competitor 1: Aluminum shaft – which can deform over time and alter valve timing



Competitor 1 & Competitor 2:
No grooves for lubrication

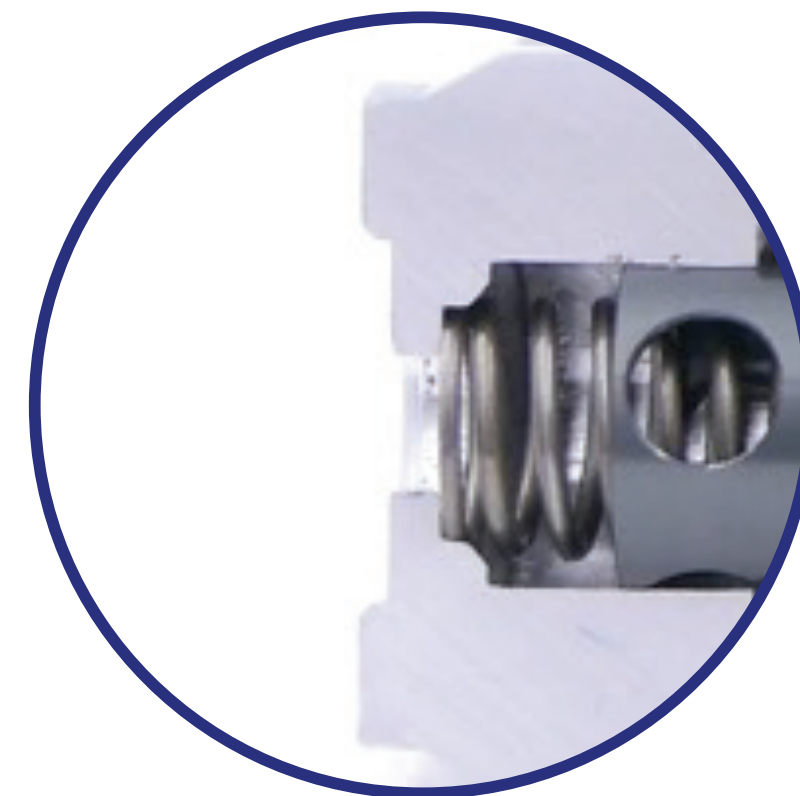
Competitor 2: Plastic shaft – prone to breaking, cracking, or premature wear



Engineering Improvements

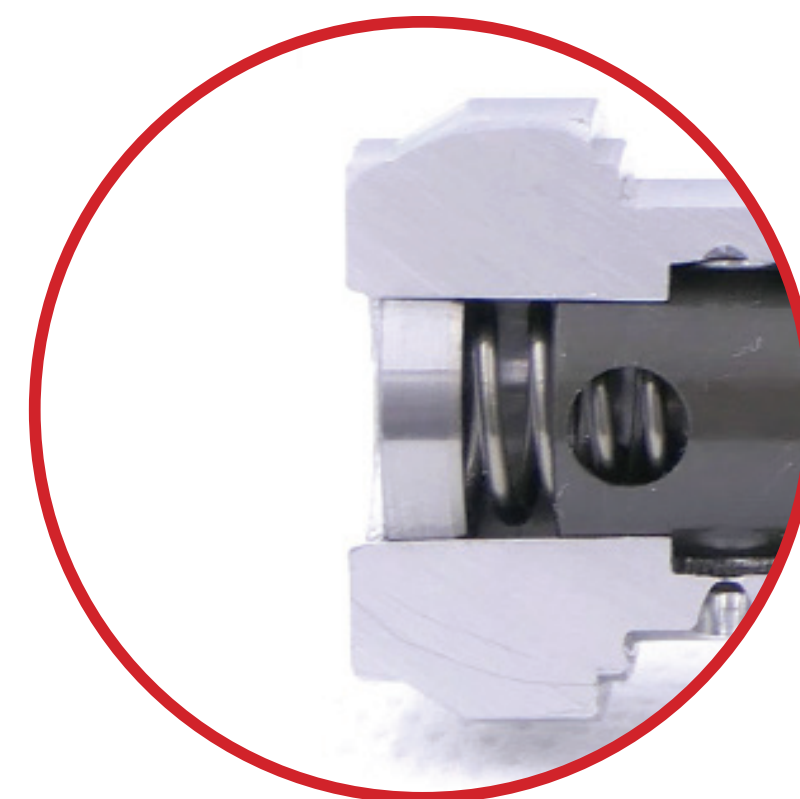
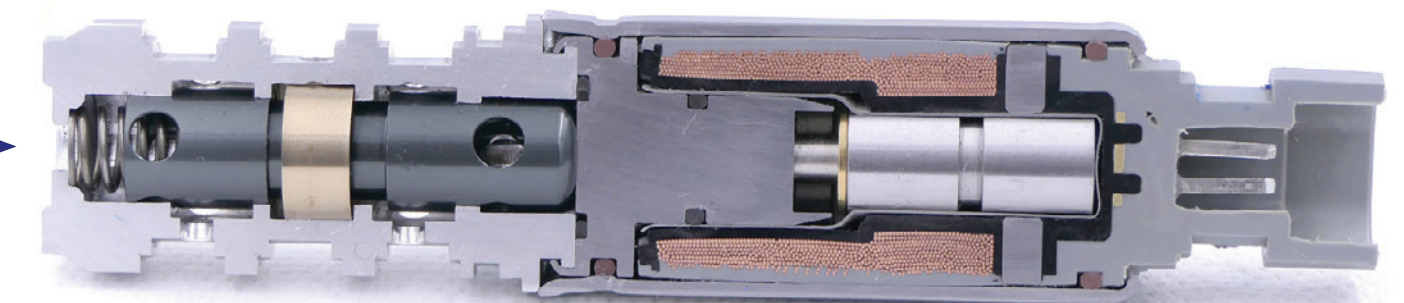
The OE and competitors' VVT solenoids use pressed rings for spring support that can fall apart over time.

Echlin® VVT Solenoids feature a closed valve body for spring support, which keeps the spring intact, even after millions of valve switches.



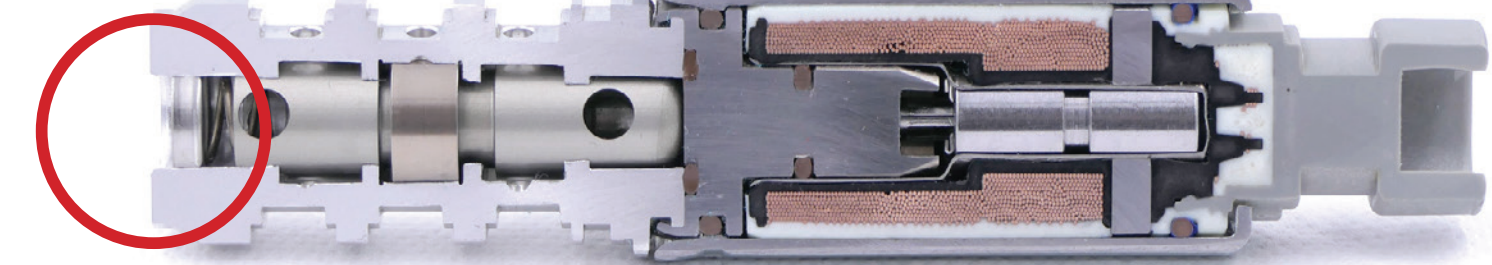
Solid Valve Body

Echlin®

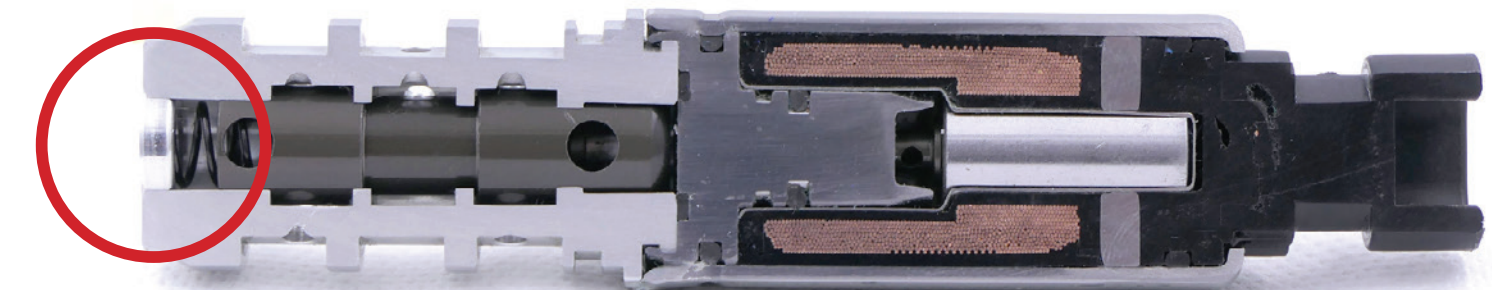


Pressed Ring

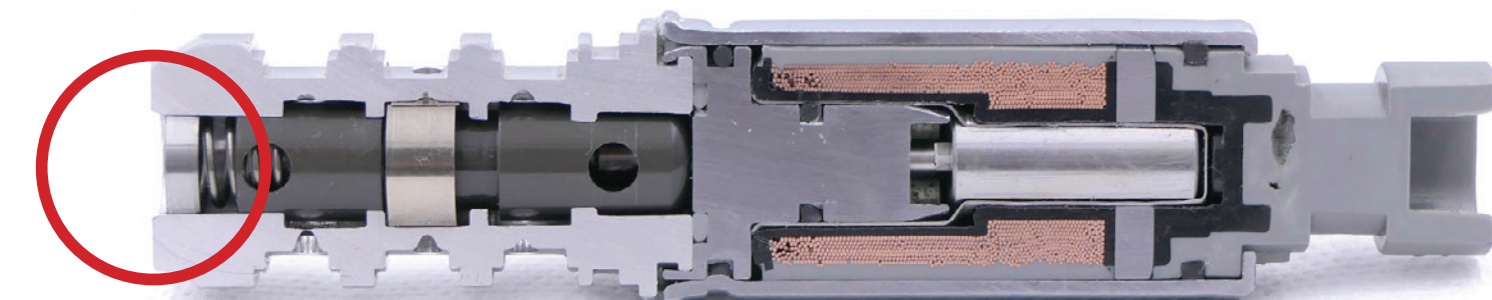
OE



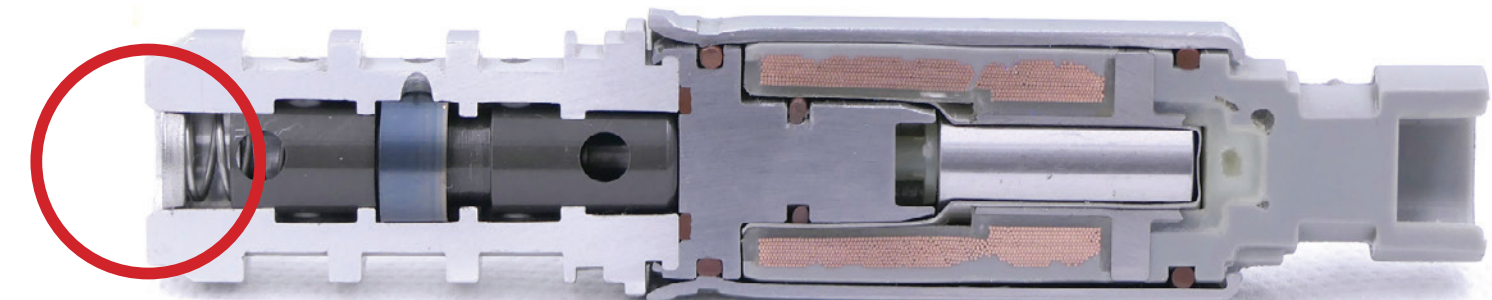
Competitor 1



Competitor 2



Competitor 3

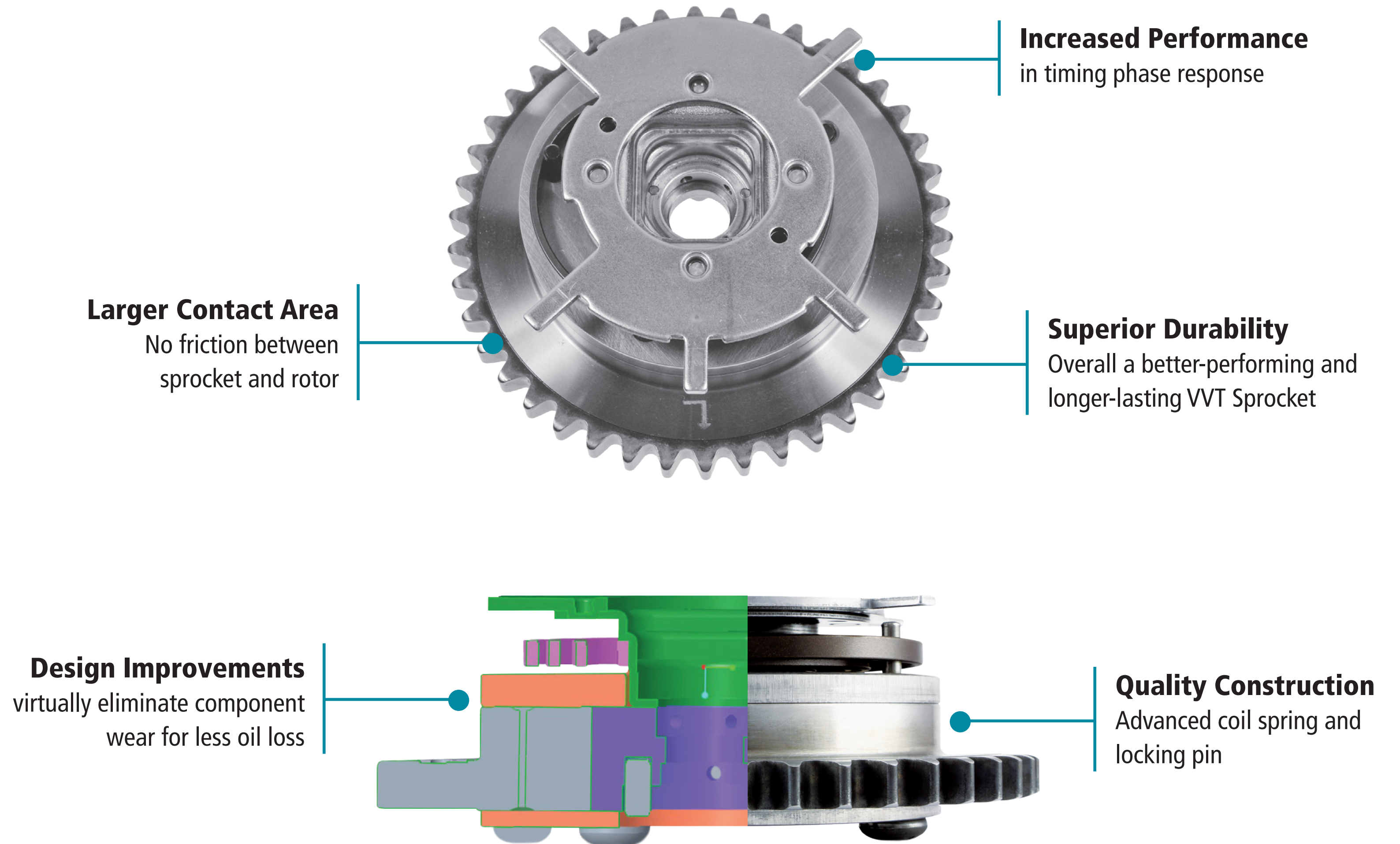


Engineering Improvements

Located on the camshaft, sprockets help maximize horsepower and torque curves, reducing emissions and improving vehicle efficiency. Echlin® engineers have designed numerous improvements to our most popular VVT Sprocket for enhanced performance and long-lasting durability.

To ensure proper performance, Echlin® VVT Sprockets are direct-fit OE replacements and meet tight dimensional tolerances to improve internal sealing, minimize oil drain back, and reduce frequency of PCM correction. The result is a better-performing, longer-lasting Sprocket.

The Echlin® Advantage



ECP1100

Engineering Improvements

Echlin® matches the original in all key tolerances and then improves on it with an all-metal integrated machined design – no paddle inserts to wear out, larger contact area, faster response times and longer service life.

The OE metal paddles may produce iron shavings that impede performance and shorten sprocket wear.

Competitor D uses plastic paddle inserts that wear easily and an “R” chamfer which can affect the timing signal.

OE



Original - Metal Paddles

Produce iron shavings, paddles wear rapidly

Echlin®



Best – Integrated Design

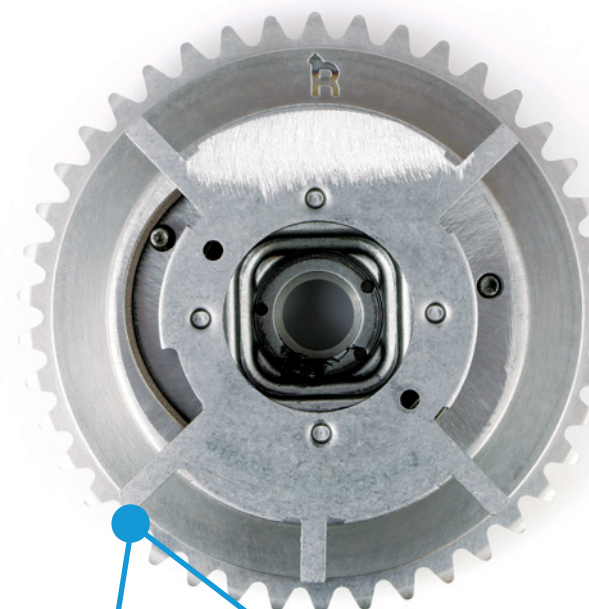
Larger contact area with no paddle to wear out

Competitor D

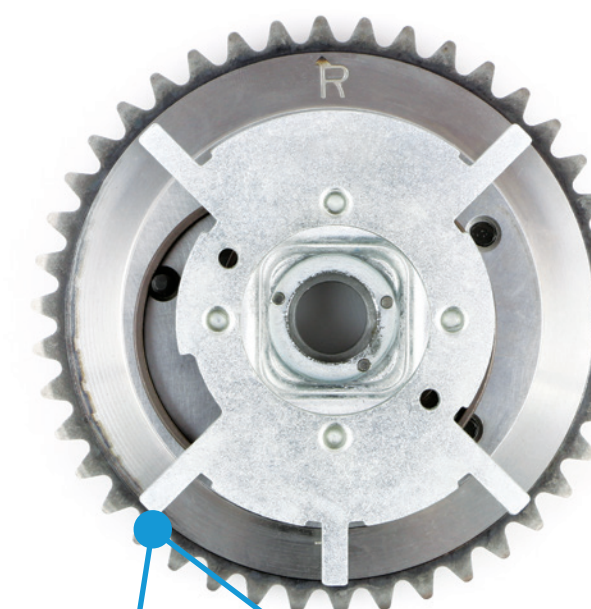


Inferior – Plastic Paddles

Components wear easily



No R chamfer on signal-driven area



No R chamfer on signal-driven area



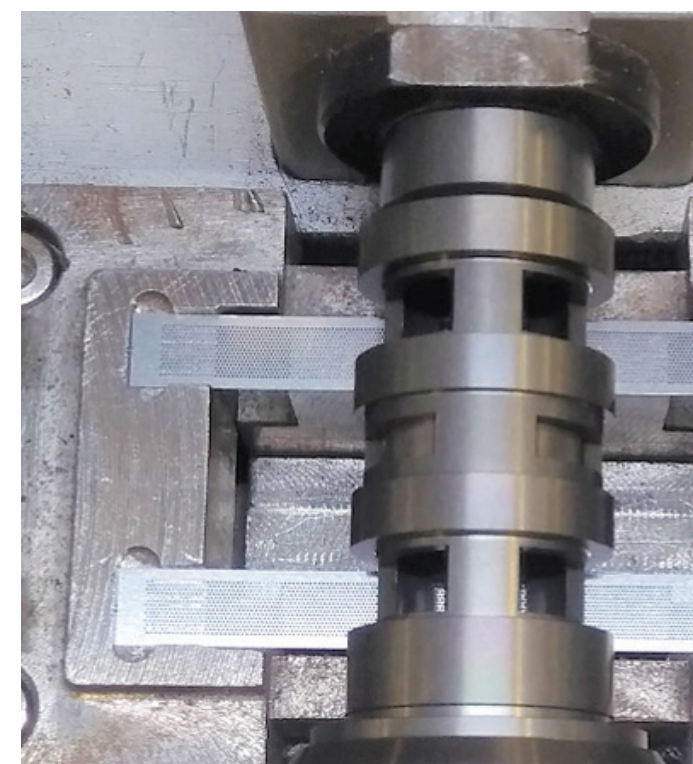
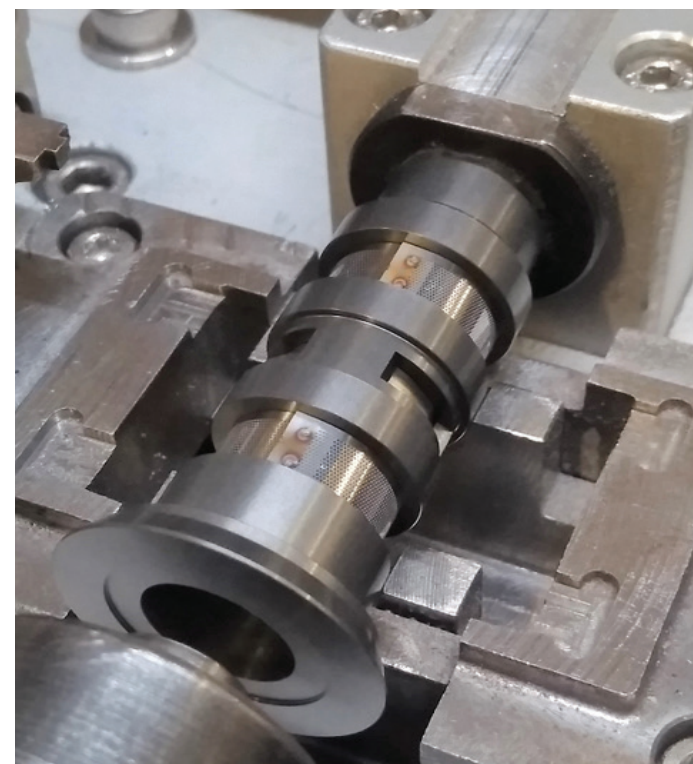
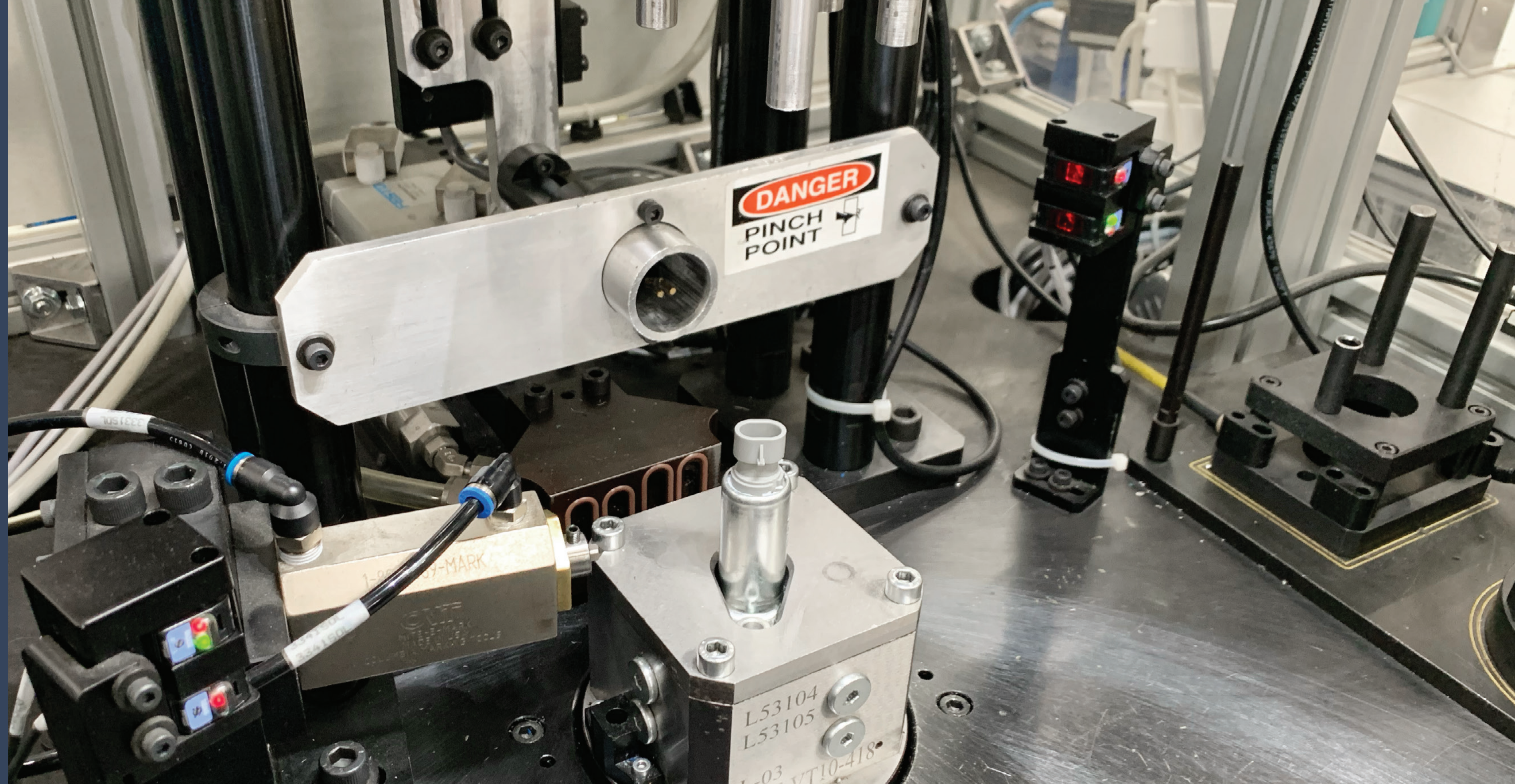
R chamfer on signal-driven area

Source: SMP Testing Lab, 2020

Manufacturing

Echlin® VVT components are designed and manufactured at our IATF 16949-certified facility in Bialystok, Poland. This facility is equipped with the most high-tech manufacturing equipment available to produce our VVT Solenoid housings.

Controlling the entire manufacturing process offers significant advantages, resulting in consistent, high-quality outputs, minimized errors and defects, improved customer satisfaction, and enhanced Echlin® brand reputation.



Commitment to Continuous Improvement

Our dedication to continuous improvement practices in design, engineering and manufacturing allows us to make enhancements to the OE design, while maintaining complete control over each Echlin® VVT component.



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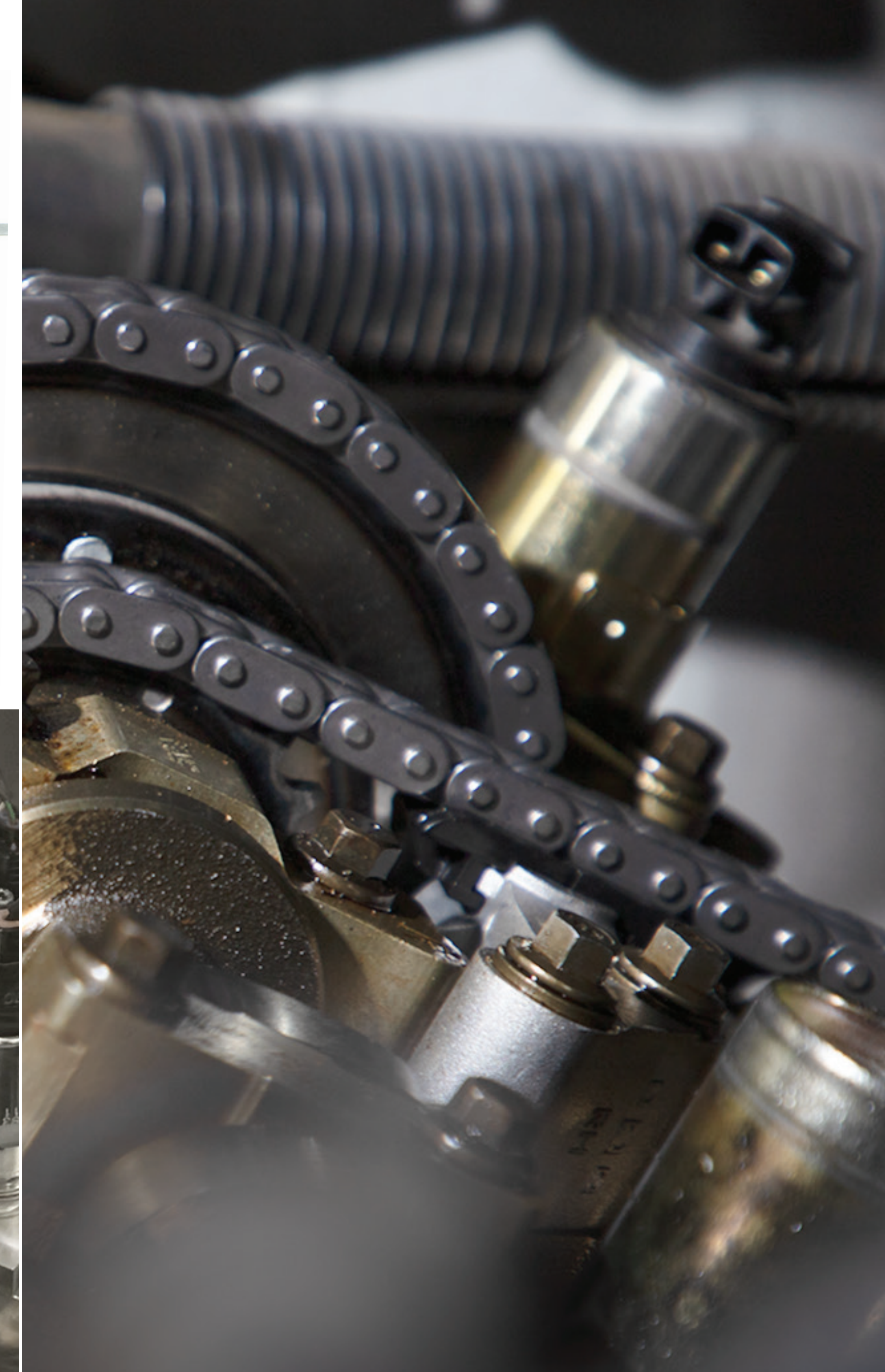
VVT Sprockets

NAPAEchlin.com

Testing and Validation

Echlin®-manufactured VVT Solenoids and Sprockets undergo extensive measurement and life testing, plus a full spectrum of environmental analysis. This regimen includes thermal shock, thermal cycling, salt spray, vibration, storage tests, dirty oil tests, and more. Additionally, our VVT components are tested on vehicles at our Testing Center in Texas to ensure proper fit and performance.

The result is a line of premium VVT components that perform flawlessly and stand up to real-life conditions.



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VVT Components

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Echlin® Pro Training Tech Tips

As experienced ASE-certified automotive technicians themselves, Echlin® Pro Trainers are experts in VVT system technology. Here's what they say to look out for during a VVT component install.



Always test engine oil pressure at warm idle to ensure it is within spec – Low oil pressure will result in VVT components not operating as expected



If one solenoid or sprocket fails, it's likely the other VVT components are nearing the end of their service life too – It's suggested to replace both solenoids and sprockets at the same time and inspect/replace all related timing chain components in the VVT system



Always change the engine oil and filter when replacing a VVT solenoid or sprocket



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Echlin® Professional Training

Award-Winning In-Person, Live Virtual, and Online Learning

Echlin® Pro Training delivers accredited classes that educate technicians in the latest automotive repair technologies, and techs can earn CEU credits.

An extension of Echlin® training, our extensive YouTube video library has over 550 technical and installation videos.



Available Classes

Diagnosing GM Variable Cam Timing
Ford Variable Valve Timing
Modern Valvetrains
Nissan VVT Diagnostics
Variable Valve Timing Fundamentals



Available Classes

Advanced Driveability Diagnostics
Ford EcoBoost
Ignition and Cam /
Crank Synchronization
Labscope Power-User
Toyota / Lexus Diagnostics
Unleash The Power of Your
Scan Tool



For information on replacing VVT and components, search “VVT” on the **NAPA® Echlin®** YouTube channel



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VVT Components

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