

Segmented Not Solid, Thin Never Thick?

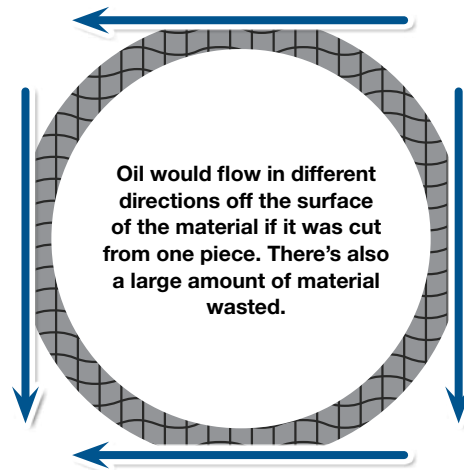
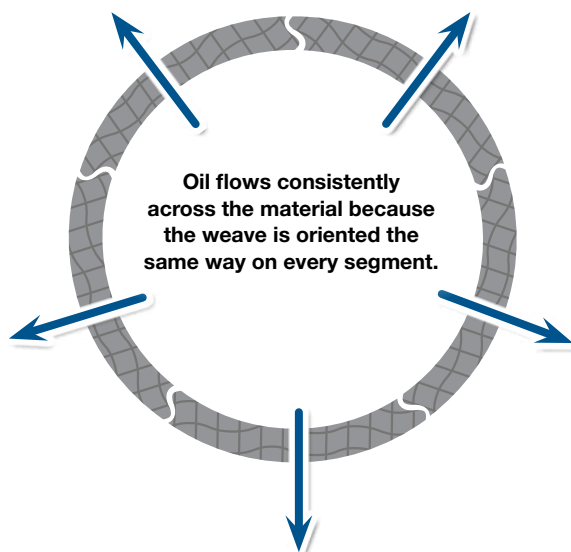
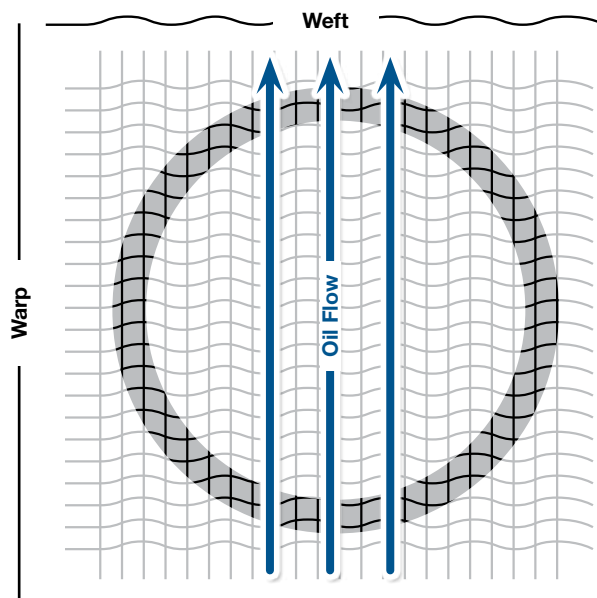
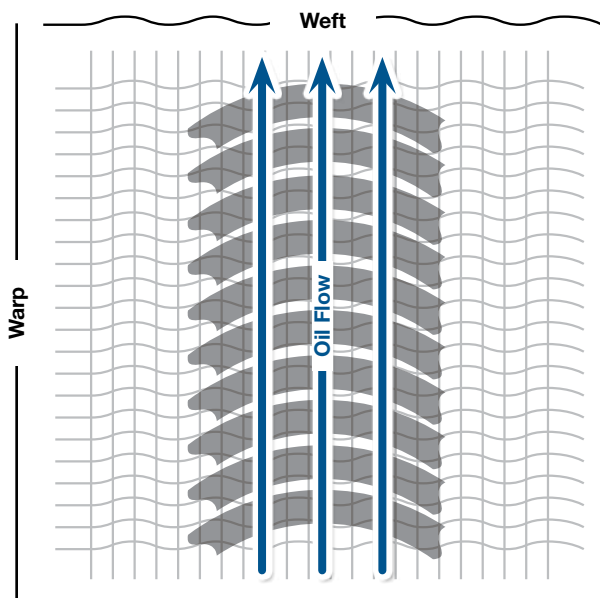
Sonnax Answers Your Biggest Questions About Woven Carbon Friction Rings

A milestone event for the automatic transmission aftermarket occurred in late 2015 when Sonnax became the first company to offer authentic, OE woven carbon friction material to torque converter rebuilders. Ever since GM introduced their EC3 converter clutch strategy in the 1990s, the aftermarket had struggled to find a material that would both slip in a controlled manner and provide good drivability and long life. Without access to the OE material, the options were limited. Rebuilders had to reuse qualified core components or switch to an alternate aftermarket material they hoped might be good enough to meet the demands of a continuous-slip application. As they quickly discovered (often the hard way), some friction materials were better than others at meeting the demands of these slipping applications, but nothing beat the performance and reliability of woven carbon. It's so good at what it does that today it's used in a variety of GM and Ford applications — yes, Ford! Units Ford co-developed with GM, such as the 6F35 and the 6F50, also rely on woven carbon for use of TCC friction material.

When Sonnax released woven carbon to the torque converter aftermarket, the response from our customers was immediate: you loved it! The material is durable, helps eliminate slip codes, bonds easily and is surprisingly affordable. For the applications that originally used it, Sonnax woven carbon gives both torque converter and transmission rebuilders a high level of confidence for long life and great drivability.

It's great you can confidently tell your customers that you have the EXACT OE material, but there's a good chance some basic questions remain, particularly these two: "Can I get a solid ring instead of a segmented ring?" and "I have units where I need to turn down the cover or the piston. Can I get your OE woven

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material, except thicker?" To fully understand the issues and the answers, let's do a little analysis. First, let's tackle the segmented ring request. Then we can look at the variables associated with designing and manufacturing a thicker material.

Q: Can I get a solid ring instead of a segmented ring?

A: No...but you really wouldn't want one.

In all OE applications, the woven carbon friction rings are built from five separate segments. There are two fundamental reasons why making a full ring is not

feasible for the aftermarket: performance and cost.

The higher cost aspect of a full ring is pretty obvious: If you cut solid rings from a piece of fabric, the center of the ring would be wasted material. Everyone understands that wasted material equates to higher costs. What's not so easy to grasp is why a woven carbon solid (or full) ring would perform differently than a segmented ring. To better understand the concept, you have to remember that this material is woven fabric, not a wet-laid paper like traditional friction materials.

Looking at the structure of woven carbon, the fibers that are woven together are done so on a grid. In layman's terms, some fibers are vertical and some are horizontal. These fibers are intertwined in a custom pattern to create the specified material.

In the world of textiles, the vertical fibers are referred to as the "warp" and the horizontal fibers as the "weft." In the design of this carbon fabric, the warp and weft are different. The specific pattern of warp and weft impacts flow across the face of the friction ring and is a factor in the rate of slippage that the material provides. Therefore the flow (and slip rate) along the warp axis is different than the flow along the weft axis. If a full friction ring was made from this fabric, the warp and weft pattern across the face of the ring wouldn't match, causing distinctly variable flow and slip rates. That inconsistency would lead to performance and durability problems, the exact OPPOSITE of what you want to build into a converter.

Q: I have units where I need to turn down the cover or the piston. Can I get your OE woven material, except thicker?

A: No... but you really wouldn't want it thicker.

OE woven carbon material is very thin to begin with; after bonding and full compression, it only has a thickness of .020". Customers often ask for woven carbon in thicknesses ranging from .030" to .045", though, because after they lathe turn covers and pistons, the .020" material doesn't get them the required overall height or clutch release clearance. We again have to go back to the source of woven carbon — the OEM — to understand why a thicker material is not available.

When GM engineered this material, it was created to survive in an environment of continuous slippage. To get the material to live up to the task, GM performed countless tests and invested millions of dollars to develop a friction product that would slip at the desired rate, take the added heat, drive well and be very durable. Once the specifications for the material were set, dedicated production looms were built to weave large quantities of this proprietary material. Fast forward to today and those dedicated production looms are still cranking out rolls of fabric for use in GM and Ford converters. The woven carbon friction rings offered by Sonnax are made from the same OE fabric that comes off those same looms.

Changing how woven carbon is produced is a tall order. For one thing, creating a thicker material would necessitate an extensive R&D effort. Sure, a thicker

fabric could be woven from thicker fibers used in the warp and weft, but what would that do to slip rates, flow characteristics, durability or drivability? Without a new R&D effort to support a thicker material, there would be no certainty as to the performance and life span of the product. The other big factor is that, when compared with large OE volumes, the aftermarket uses a miniscule amount of woven carbon. Setting up looms to weave a thicker material would require large capital expenditures that would need a calculated pay back. The hypothetical price of a .040" aftermarket-only woven carbon friction ring would need to be astronomically high for developing a thicker material to make any economic sense.

Q: OK, I DON'T want a thicker ring, but I still need to repair converters that originally came with woven carbon friction material. What do I do?

A. You call Sonnax!

Core components are often damaged, and either the front cover or the clutch piston (or both) need to be lathe turned. The non-captive clutch, 300mm version of the 6L80/90 is a classic example. As rebuilders know, there is a limit as to how much material can be removed before compromising the integrity of the cover and piston, and quite often these 6L80/90s are damaged to the point where they can't be salvaged. In these cases, shops can rebuild these units (and use woven carbon!) by replacing the OE stamped cover and piston with new, stronger parts from Sonnax — ask your sales rep about the [GM-CC-13](#) cover and the new [GM-DA-17P](#) piston. Incorporating these heavy-duty, forged components into your build make for a great upgrade that does not take any more time to assemble than a stock unit.

In applications where new covers or pistons are not available and your inventory of core components requires salvaging covers and pistons, BorgWarner HTE and HTS friction material from Sonnax is a great alternative. While it's a paper-based friction ring instead of woven carbon, it's proven that it can survive in continuous slip applications. If you need to make up for the material lost from the turning and facing of core components, the BorgWarner HTE and HTS materials come in thicknesses of .045" and .066".

The bottom line: Woven carbon friction rings from Sonnax are designed to deliver the absolute best in both value and performance. Whether you want the OE friction material for your GM and Ford continuous slip applications or need a material that will allow you to make up for steel faced from component parts in your core salvage operations, Sonnax has you covered! ◀

Make/Unit	Part No.	Part Name	Description	
Aisin Seiki AS69RC	AS-CP-5F	Friction Plate	42 Internal tabs, 8.563" O.D., 6.810" I.D., .099" Thick	
Chrysler 68RFE	GM-RS-3HP	Heavy Duty Spring Retainer	Enhanced wear resistance & durability	
Ford	FNR5	FDMZ-DS-1	Piston/Damper Repair Sleeve	Steel, No disassembly required
	4R100, E40D	FD-90-70G	Impeller Hub	Flanged, 1.997" Journal dia., 2.175" Assembled height, 3.810" Flange O.D., Flats
	6R140	FD-WA-27	Stator Cap	Turbine-side, 4.265" O.D., 1.980" I.D., .460" Thick
	6F50, 6F55	GMFD-WA-1	Stator Cap	Turbine-side, 3.465" O.D., 1.500" I.D., .365" Thick, 4 Outer notches
General Motors	6L80, 6L90 (300mm)	GM-CC-13	Front Cover	Fully machined forging, Three mounting pads
		GM-DA-17P	Piston Plate	Steel-forged for enhanced strength & durability; Use with rivet GM-RV-13
	300mm (4L60-E)	GM-WS-55	Shim	2.000" O.D., 1.656" I.D., .040" Thick
	Buick 350, 400 (3L80), AT-540	GM-RS-3HP	Heavy Duty Spring Retainer	Enhanced wear resistance & durability
	6T70, 6T75	GMFD-WA-1	Stator Cap	Turbine-side, 3.465" O.D., 1.500" I.D., .365" Thick, 4 Outer notches
High Performance	GM 4L60/65/70-E, 298mm	GM-RK-495	265mm Damperless Multi-Plate Racekit	Lockup, 30-Tooth spline count
		GM-RK-495WC	265mm Damperless Multi-Plate Racekit	Woven carbon version, Lockup, 30-Tooth spline count
		GM-RK-498	258mm Damperless Multi-Plate Racekit	Lockup, 30-Tooth spline count
		GM-RK-498WC	258mm Damperless Multi-Plate Racekit	Woven carbon version, Lockup, 30-Tooth spline count
	GM 4L60-E, 4L65-E, 4L75-E (300mm), 4L80-E, 4L85-E, 6L80, 6L90 (JMBX)	GM-WS-53	Shim	3.188" O.D., 2.516" I.D., .020" Thick
		GM-WS-54	Shim	3.188" O.D., 2.516" I.D., .030" Thick
	GM 4L80-E, 4L85-E	GM-PI-22	Pilot	GM Gen. I engines, 1.703" O.D., .430" Length
	GM 6L80, 6L90 (JMBX)	GM-RK-685	265mm Damperless Multi-Plate Racekit	Lockup, 36-Tooth spline count
		GM-RK-685WC	265mm Damperless Multi-Plate Racekit	Woven carbon version, Lockup, 36-Tooth spline count
		GM-RK-688	258mm Damperless Multi-Plate Racekit	Lockup, 36-Tooth spline count
		GM-RK-688WC	258mm Damperless Multi-Plate Racekit	Woven carbon version, Lockup, 36-Tooth spline count
		GM-PI-23	Pilot	GM Gen. III (LS) engines, 1.703" O.D., .890" Length
	GM Powerglide, 350, 400, 10"	GM-90-77G	Impeller Hub	Flanged, 1.874" Journal dia., 2.775" Assembled height, 3.800" Flange O.D., Pump drive slots
	Borg Warner, Chrysler A618, 47RH/RE, 48RE (310mm)	BWFD-RK-1	Racekit	Dampered, Uses 5R110W, 6-stud core & OE piston/damper assembly
		BWFD-90-1G	Impeller Hub	Flanged, BWFD-RK-1 replacement component
BWFD-HT-1HS		Turbine Hub	BWFD-RK-1 replacement component	
BWFD-WS-1		Stator Cap	BWFD-RK-1 replacement component, Steel	
BWFD-WA-1		Stator Cap	BWFD-RK-1 replacement component, Aluminum	
Chrysler 68RFE, BorgWarner 310mm (A618, 47RH/RE, 48RE)	GM-RS-3HP	Spring Retainer	Enhanced wear resistance & durability	

Make/Unit	Part No.	Part Name	Description
Honda	MT4A (MDX)	HO-CP-12K	Clutch Plate & Seal Kit Includes steels, frictions & seals
	MDKA, MDRA (MDX), MT4A (MDX), Also Fits Saturn Vue	HO-O-5V	O-Ring 1.438" I.D., .079" Cross section
Mazda	FS5A-EL	FDMZ-DS-1	Piston/Damper Repair Sleeve Steel, No disassembly required
Mercedes	722.9 (Late)	MB-CP-8BW	Clutch Plate Friction, 40 External tabs, 7.717" O.D., 6.105" I.D., .108" Thick
		MB-FN-2K	Bolt & Washer Kit Captive clutch

Thank you, Ed!

Torque Converter Expert Ed Lee is Calling it a Career

The end of an era — Ed Lee is retiring!

Ed's first official, full-time day at Sonnax was Aug. 2, 2004, but he has been a fixture with the company for the better part of three decades. Rebuilders will remember seeing Ed at tradeshow wearing a Sonnax shirt as far back as the mid-90s. Over the years, Ed's contributions to Sonnax (and to the automotive aftermarket industry in general) included testing, research, writing dozens and dozens of tech articles and so much more.

Ed's last official day at Sonnax is set for Friday, Sept. 29. While we, at Sonnax, will miss him greatly, we are happy to report that Ed will be devoting more of his time to some of his other passions: rail cars, high-wheel bicycles (of which he owns many) and horseshoes. Please join all of us at Sonnax in thanking Ed for his many years of dedication and wishing him the best!



Ed Lee — A friendly fixture at the Sonnax tradeshow booth for many years!

Ed's Top 10 Greatest Hits! Have you read these popular tech articles?

1. Troubleshooting Lockup Issues

April 22, 2012 | Unit(s): Mercedes 722.6, 722.9

2. Properly Diagnose a 722.6 Shudder in Vehicles with MDS System Engines

July 27, 2016 | Unit(s): Mercedes 722.6, 722.9

3. Subarus Have Their Own Set of Problems

Sept. 12, 2004 | Unit(s): Subaru 4EAT & R4AX-EL

4. Don't Blame the Torque Converter — Part 1

Sept. 27, 2008 | Unit(s): VW/Audi 096 LU (01M)

5. Rebuilders Rally to Crack the Code: Converter Identification

July 26, 2006 | Unit(s): GM 400 (3L80), AT-540; GM 298mm LU (250C, 350C, 200-4R, 4L60 & E); Ford AOD (FIOD); Ford AODE, 4R70W, 4R75W; Ford V4C6, FMX 12", C411-1/4"

6. Cold/Stall/TCC Shudder, Part 2

June 24, 2010 | Unit(s): Mercedes 722.6, 722.9

7. 4L60-E: No Move After Rebuild

July 28, 2012 | Unit(s): GM 300mm (4L60-E)

8. Lockup Surge in Allison 1000s

April 27, 2007 | Unit(s): Allison 1000/2000/2400, Early; Allison 1000/2000/2400, 2006-Later

9. Cast Iron Powerglide Leaks

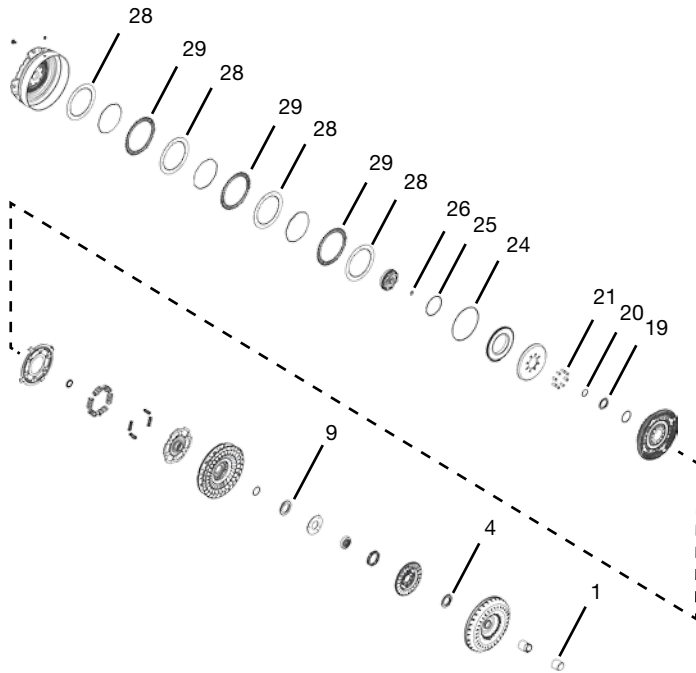
Sept. 30, 2010 | Unit(s): GM Powerglide, Cast Iron

10. Don't Blame the Torque Converter — Part 2

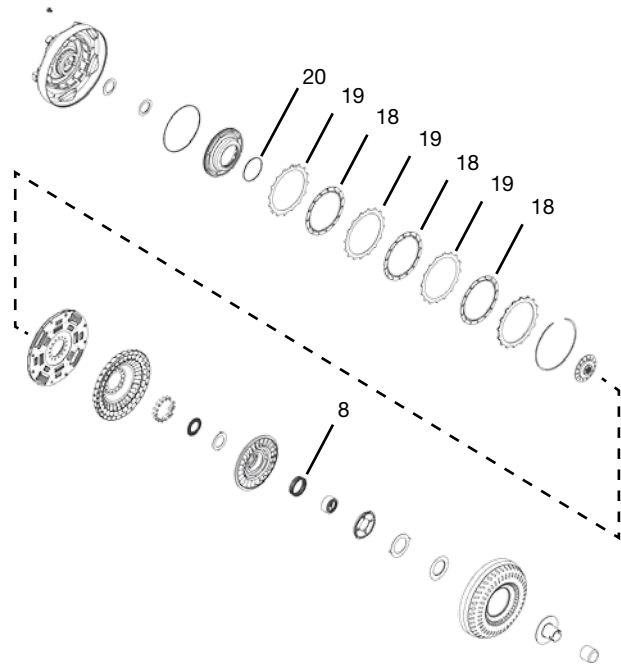
Oct. 27, 2008 | Unit(s): GM 258mm LU (4T65-E); GM 265mm LU (4T60-E, 4T80-E); Aisin AW 55-50SN

Read these articles and more in the tech resources section of www.sonnax.com.

Mercedes 722.9 (Late)



Aisin Seiki AS69RC



Mercedes 722.9 (Late)

I.D. No.	Part No.	Part Name	Description
1	MI-HC-P	Hub Cover	1-5/8" Dia., Plastic, Purple
4	MB-N-1	Thrust Bearing	Impeller-side, Enclosed, 1.713" I.D., .195" Thick, 3 External tabs, 2.589" O.D., Hardened steel
9	MB-N-5	Thrust Bearing	Turbine-side, Enclosed, 1.900" I.D., .195" Thick, 2.820" O.D., Hardened steel
19	MB-N-4	Thrust Bearing	Front cover, Enclosed, 1.580" I.D., .180" Thick, 2.270" O.D., Hardened steel
20	MB-O-10	Seal	Compound finger joint, 1.489" O.D., .104" Width, 0.083" Height, Torlon®
21	MB-FN-2K	Bolt & Washer Kit	
24	MB-O-12V	Seal Ring	Double chamfer, 4.047" O.D., .076" Width, .110" Height, Fluorocarbon
25	MB-O-11V	Seal Ring	Double chamfer, 7.020" O.D., .076" Width, .108" Height, Fluorocarbon
26	MB-O-5V	Seal Ring	Solid, .082" Width, .112" Height, .834" O.D., PTFE-Coated, Orange
28	MB-CP-14S*	Clutch Plate	36-Tooth internal spline count, 7.383" O.D., 5.587" I.D., .071" Thick, Steel
	MB-CP-15S*	Clutch Plate	36-Tooth internal spline count, 7.383" O.D., 5.587" I.D., .079" Thick, Steel
29	MB-CP-8BW	Clutch Plate	3 Required, Flat, 40 External tabs, 7.717" O.D., 6.105" I.D., .108" Thick, Steel

*A total of four steel plates are required per converter. Measure and select accordingly between MB-CP-14S and MB-CP-15S.

Aisin Seiki AS69RC

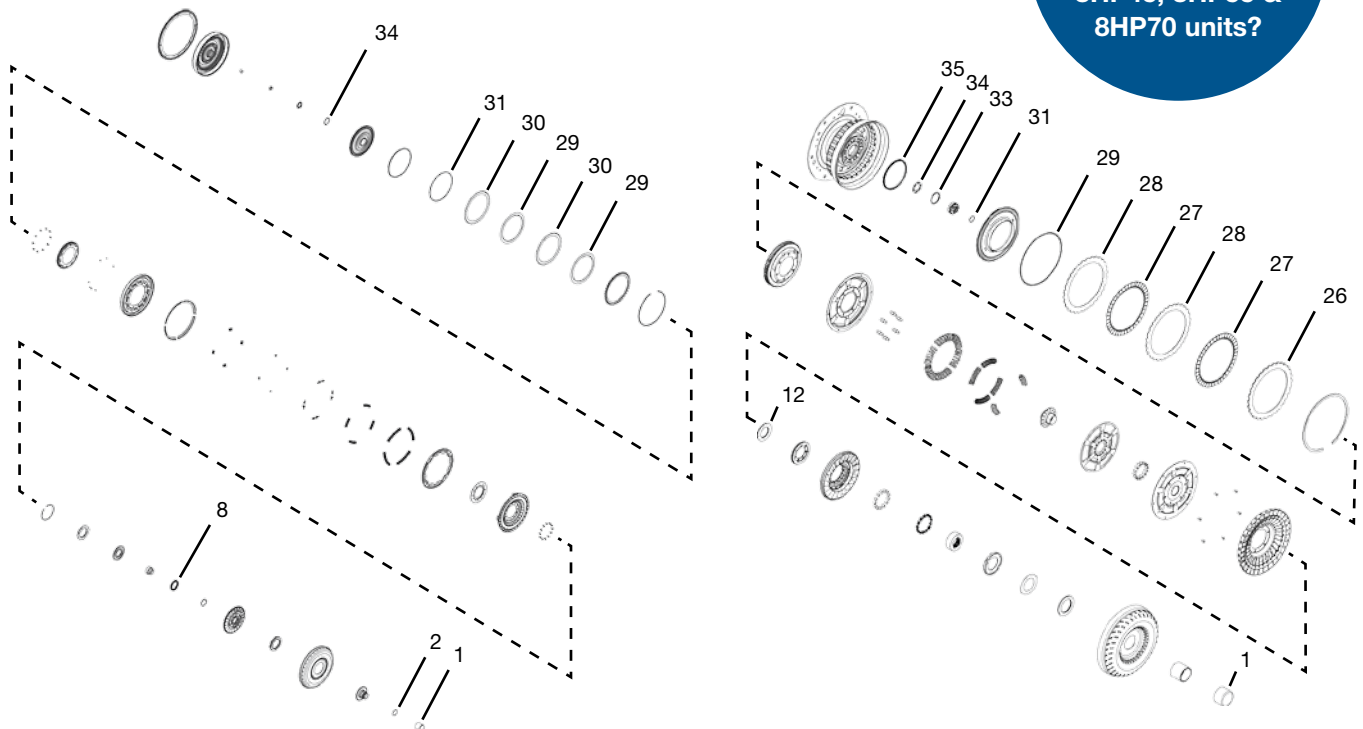
I.D. No.	Part No.	Part Name	Description
8	AL-SP-1	Sprag	Allison® 1000, 2000, 2400, early- & late- ('06-later) style units, 29 Sprag elements, .750" Width, 3.283" Race O.D., 2.627" Race I.D., Hardened Steel
18	AS-CP-5F	Friction Plate	Three required, 42 Internal tabs, 8.563" O.D., 6.810" I.D., .099" Thick, Steel
19	AS-CP-4S	Clutch Plate	Three Required, 16 Internal tabs, 9.175" O.D., 7.340" I.D., .072" Thick, Steel
20	CH-O-16V	Seal	D-shaped, .083" Width, .152" Height, 4.208" O.D., Fluorocarbon

Honda/Acura MT4A (MDX)

ZF8HP70

(ZF8HP55 shown here.)

Did you know that the parts listed below ALL fit 8HP45, 8HP55 & 8HP70 units?



Honda/Acura MT4A (MDX)

I.D. No.	Part No.	Part Name	Description
0	HO-CP-12K	Clutch Plate & Seal Kit	Includes steels, frictions & seals
1	MI-HC-P	Hub Cover	Plastic, Purple, 1-5/8"
2	HO-O-5V	O-Ring	Also fits Saturn VUE, Viton®, .079" Cross section, 1.438" I.D.
8	BW-SP-5	Sprag	22 Sprag elements, .347" Width, 2.522" Race O.D., 1.862" Race I.D.
29	HO-CP-1	Clutch Plate	40 Internal tabs, 8.183" O.D., .076" Thick, Steel
30	HO-CP-2	Clutch Plate	36 External tabs, 8.630" O.D., 7.173" I.D., .047" Thick, Steel
31	HO-O-4V	Seal Ring	D-Shaped, .070" Width, 8.024" O.D., .114" Height, Fluorocarbon
34	HO-O-3V	Seal Ring	D-Shaped, 1.850" O.D., .068" Width, .118" Height, Fluorocarbon

ZF8HP70

(Parts listed here also fit ZF8HP45/55.)

I.D. No.	Part No.	Part Name	Description
1	MI-HC-R	Hub Cover	2.000" Dia., Plastic, Red
12	FS-N-4	Thrust Bearing	Enclosed, 2.440" O.D., 1.496" I.D., .181" Thick, Hardened steel
26	ZF-CP-11P	Clutch Plate	30-Tooth external spline count, 8.151" O.D., 6.499" O.D., .169" Thick, Steel
27	ZF-CP-8F	Friction Plate	80-Tooth internal spline count, 7.768" O.D., 6.120" I.D., .096" Thick
28	ZF-CP-10S	Clutch Plate	30-Tooth external spline count, 8.151" O.D., 6.499" I.D., .109" Thick, Steel
29	ZF-O-3V	Seal	Solid, 7.700" O.D., .072" Width, .176" Height, Fluorocarbon, Black
31	ZF-O-5V	O-Ring	.083" Cross section, .703" I.D., Fluorocarbon, Black
33	ZF-O-2	Seal	Compound finger joint, 1.722" O.D., .094" Width, Torton®
34	ZF-WP-1	Thrust Washer	1.516" O.D., .984" I.D., .079" Thick, Vespel®
35	ZF-O-4V	Seal	Solid, Four-lobed, 4.349" O.D., .174" Height, .194" Width, Fluorocarbon, Black

Featured in this Issue

- Answers to Frequently Asked Questions About Sonnax's Woven Carbon
- New Parts Guide
- Ed Lee is Retiring! His Top 10 Tech Articles
- Exploded Views You Might Have Missed

Sonnax designs, manufactures, tests and distributes a wide variety of products used to remanufacture torque converters, rebuild automatic transmissions, upgrade driveshafts and protect the driveline from over-torque damage.

Sonnax is a 100% Employee-Owned Company



Signing off

Industry leader Ed Lee, who has been with Sonnax for the better part of three decades, is retiring.

We say thanks and look back at some of his most popular tech articles on Page 5.

Honda/Acura MT4A (MDX) Clutch Pack Repair

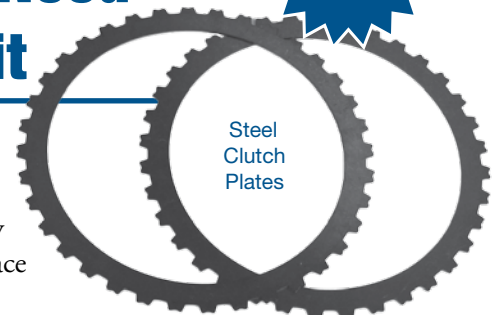
Everything You Need in One Handy Kit

NEW!

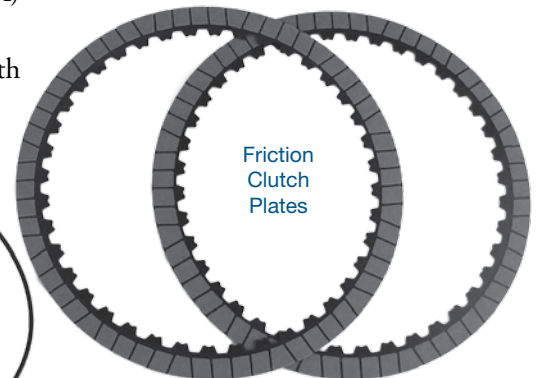
Part No. HO-CP-12K

Sonnax clutch plate and seal kit HO-CP-12K features all the precisely manufactured parts necessary to replace worn or damaged clutch plates and seals in Honda/Acura MT4A (MDX) torque converters.

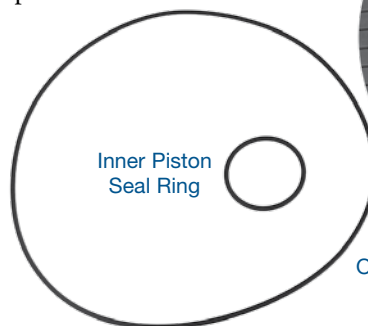
It offers the convenience of a kit with the best value for a quick and easy clutch pack rebuild.



Steel
Clutch
Plates



Friction
Clutch
Plates



Inner Piston
Seal Ring

Outer Piston
Seal Ring