sonnax®
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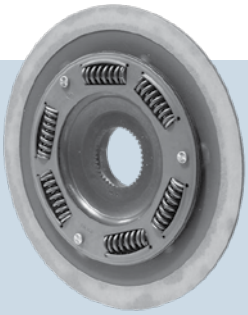
Torque Converter Journal
Vol. 10, No. 2
August 2016

Dampered & Damperless Converters – What's the Story?

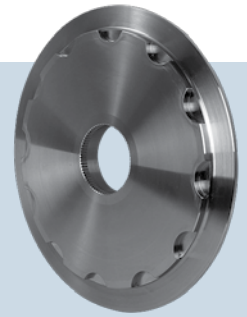
Automotive torque converters were first developed in the 1950s to function as a clutch for automatic transmissions. It worked as intended, but the use of ATF as a fluid connection between the engine output (impeller) and the transmission input shaft (turbine) was inherently inefficient, wasting both energy and fuel.



Piston/Damper Assembly

The energy crisis of the late 1970s drove OEMs to include a friction clutch in the torque converter to create a 1:1 mechanical link between the engine crankshaft and the transmission input shaft. This mechanical link, now known as lockup, meant OEMs also had to create a shock-absorbing device to isolate pulsations of engine cylinder firings from the rest of the drivetrain and protect other drivetrain components. These spring-loaded components we now call dampers cushion the shocks and — in today's market — eliminate NVH (Noise, Vibration & Harshness), a major issue for optimal drivability.

These new lockup converters delivered the same fuel efficiency at cruising speeds as manual transmissions, but a new breed of customer — the performance enthusiast — changed the market once again. Enthusiasts in the 1980s started modifying engines, transmissions and torque converters to make higher levels of horsepower and torque at higher RPM ranges. They then needed torque converters with higher stall speeds to calibrate the launch and driving characteristics to match the added power.



Solid Piston

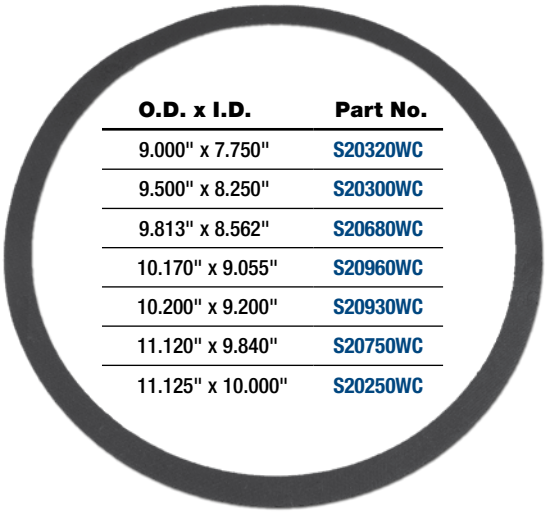
Higher stall speeds are typically achieved with smaller diameter torque converters. With added torque, a stronger damper is needed to cushion the additional power. This posed a dilemma, because a stronger damper requires MORE radial space, not less, to accommodate the quantity and size of the necessary springs. The aftermarket rose to the challenge with a new type of converter that eliminated the damper completely, making room for a thicker, stronger solid piston lockup plate that easily could handle extra horsepower. These damperless converters became the go-to choice for upgrading enthusiast vehicles.

Continued on page 2...

Woven Carbon Friction Rings

Exclusively from Sonnax!

- **Genuine OE Material**
- **Affordable & Durable**
- **Easy to Bond**



O.D. x I.D.	Part No.
9.000" x 7.750"	S20320WC
9.500" x 8.250"	S20300WC
9.813" x 8.562"	S20680WC
10.170" x 9.055"	S20960WC
10.200" x 9.200"	S20930WC
11.120" x 9.840"	S20750WC
11.125" x 10.000"	S20250WC

Genuine OE woven carbon material helps you build outstanding performance and durability into the following GM and Ford applications:

- 4L30-E
- 4T60
- 4T65-E
- 4L60/65/70-E
- 5L40/50-E
- 6T40/45/50-E
- 6F35
- 6T70/75-E
- 6F50/55
- 6L45/50-E
- 6L80/90-E

COMING SOON!

Performance Converter Kits with Woven Carbon

See page 3 for details.

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...Continued from page 1.

In diesel applications where large diameter converters reign supreme, a lower stall speed is typically desired and built into the OE converter, but even these can't meet the performance expectations of today's enthusiasts. The popular practice of "chipping" diesel engines creates lots of additional horsepower and torque that easily can overpower any damper that would fit in the core envelope. Damperless converter systems similar to those developed by the aftermarket for small diameter converters became a standard upgrade for the most radical diesel applications.

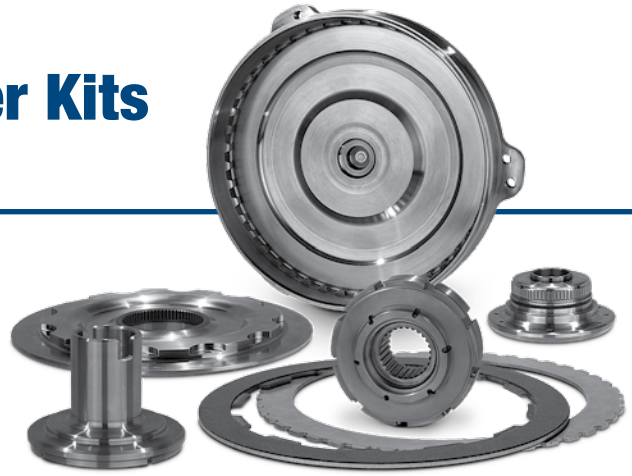
There are some unavoidable downsides to going damperless. In contrast to the cushioned, spring-loaded stock converters, drivers may feel the converter clutch both apply and release as they operate the vehicle. The experience can be jolting and will vary depending on (but not limited to) factors such as TCC computer control strategy, driving speed and throttle control. Because damperless converters create a solid link between the engine and transmission, there also is the problem of additional stress on other drivetrain components such as

Sonnax Performance Converter Kits

Engineered to Deliver Builds that Last

A performance torque converter is highly specialized based on the performance characteristics of the specific vehicle.

From a gearhead's hot rod to a workhorse diesel truck, Sonnax performance converter kits improve acceleration and durability for long-lasting, trouble-free builds.



Transmission Make	Transmission Unit	Converter Core	Dampered	Spline Count	Type	Part No.
GM	4L80-E, 4L85-E, Multi-Plate	GM 258mm	No	35	Multi-Plate Lockup	GM-RK-488
GM	4L60-E, 4L65-E, 4L75-E (300mm)	GM 265mm	No	30	Multi-Plate Lockup	GM-RK-405
Chrysler	68RFE	Chrysler 68RFE	Yes	27	Multi-Plate Lockup	CH-RK-2A
BorgWarner, Chrysler	A618, 47RH/RE, 48RE (310mm)	BorgWarner 310mm	Yes	23	Multi-Plate Lockup	BW-RK-2A
GM	4L80-E, 4L85-E, Multi-Plate	GM 265mm	No	35	Multi-Plate Lockup	GM-RK-485
GM	4L60-E, 4L65-E, 4L75-E (300mm)	GM 258mm	No	30	Multi-Plate Lockup	GM-RK-408
Allison®	1000/2000/2400, Early or 1000/2000/2400, 2006-Later	Allison® 1000/2000/2400	Yes	25	Multi-Plate Lockup	AL-RK-2A
Ford	5R110W, 8-Stud	Ford 5R110W, 8-Stud	Yes	31	Multi-Plate Lockup	FD-RK-16A
Ford	5R110W, 6-Stud	Ford 5R110W, 6-Stud	Yes	31	Multi-Plate Lockup	FD-RK-12A
GM	4L60-E (300mm) (Mounting Ring)	GM 245mm	Yes	30	Single-Plate Lockup	GM-RK-13
GM	4L60-E (298mm)	GM 245mm	Yes	30	Single-Plate Lockup	GM-RK-18
GM	Powerglide, 350, 400, 10"	GM 245mm	No	30	Non-Lockup	GM-RK-1S
GM	350, 400, 8"	Opel	No	30	Non-Lockup	GM-RK-2
GM	Powerglide, 350, 400, 10"	GM 245mm	No	17	Non-Lockup	GM-RK-7
GM	Powerglide, 350, 400, 10"	GM 245mm	No	30	Non-Lockup	GM-RK-1
GM	4L60	GM 245mm	No	30	Non-Lockup	GM-RK-10
GM	4L60/E (298mm) (Mounting Ring)	GM 245mm	Yes	30	Single-Plate Lockup	GM-RK-11
GM	4L60/E (298mm) (Mounting Ring)	GM 245mm	Yes	27	Single-Plate Lockup	GM-RK-12
GM	Powerglide, 350, 400 (Mounting Ring)	GM 245mm	No	30	Non-Lockup	GM-RK-14
GM	Powerglide, 350, 400 (Mounting Ring)	GM 245mm	No	17	Non-Lockup	GM-RK-1417
GM	4L80-E, Single Plate	GM 245mm	Yes	35	Single-Plate Lockup	GM-RK-15
GM	6L80 (300mm)	GM 245mm	Yes	36	Single-Plate Lockup	GM-RK-16
GM	4L60-E (300mm)	GM 245mm	Yes	30	Single-Plate Lockup	GM-RK-17
GM	4L60	GM 245mm	No	27	Non-Lockup	GM-RK-9

transmission shafts, gears, flex plates, driveshaft components, drive axles, and ring and pinions. In extreme applications where driving comfort and drivetrain durability are not the main concern, these are acceptable trade-offs for a powerhouse converter upgrade. For the everyday driver or casual performance enthusiast, they probably are not.

Whenever the application will support it, a lockup damper should be used in your rebuilt torque converter. If you determine that the vehicle's power levels require a damperless torque converter clutch, be sure to educate customers about the pros and cons. Letting them know up front that driving comfort and drivetrain longevity will be negatively impacted can go a long way in preventing complaints and warranty returns later on.

Buff Up Your Build with Sonnax Performance Converter Kits

Designed from the ground up to outperform OE and other aftermarket components, Sonnax has you covered with a full line of performance converter kits for gas and diesel vehicles.

Enthusiast drivers that want to improve holding capacity without sacrificing stock shift action are a perfect match for Sonnax dampered kits. For extreme performance jobs that demand a high-end racing converter, Sonnax also is now pleased to offer damperless kits. Clear instructions, minimal setup and easy assembly make every kit a foolproof upgrade. Contact your Sonnax sales representative or go online to www.sonnax.com for details.

Transmission Make	Transmission Unit	Converter Core	Dampered	Spline Count	Type	Part No.
Ford	C4, 11" Bolt Circle Dia.	GM 245mm	No	26	Non-Lockup	FD-RK-9
Ford	C6	GM 245mm	No	31	Non-Lockup	FD-RK-4
Ford	C4, 10" or 11" Bolt Circle Dia.	GM 245mm	No	26	Non-Lockup	FD-RK-3
Ford	AODE, 4R70W	GM 245mm	Yes	31	Single-Plate Lockup	FD-RK-10
Ford	AOD	GM 245mm	N/A	35	Non-Lockup	FD-RK-1
Chrysler	727	GM 245mm	No	24	Non-Lockup	CH-RK-4
Chrysler	904	GM 245mm	No	27	Non-Lockup	CH-RK-3

Call for details!

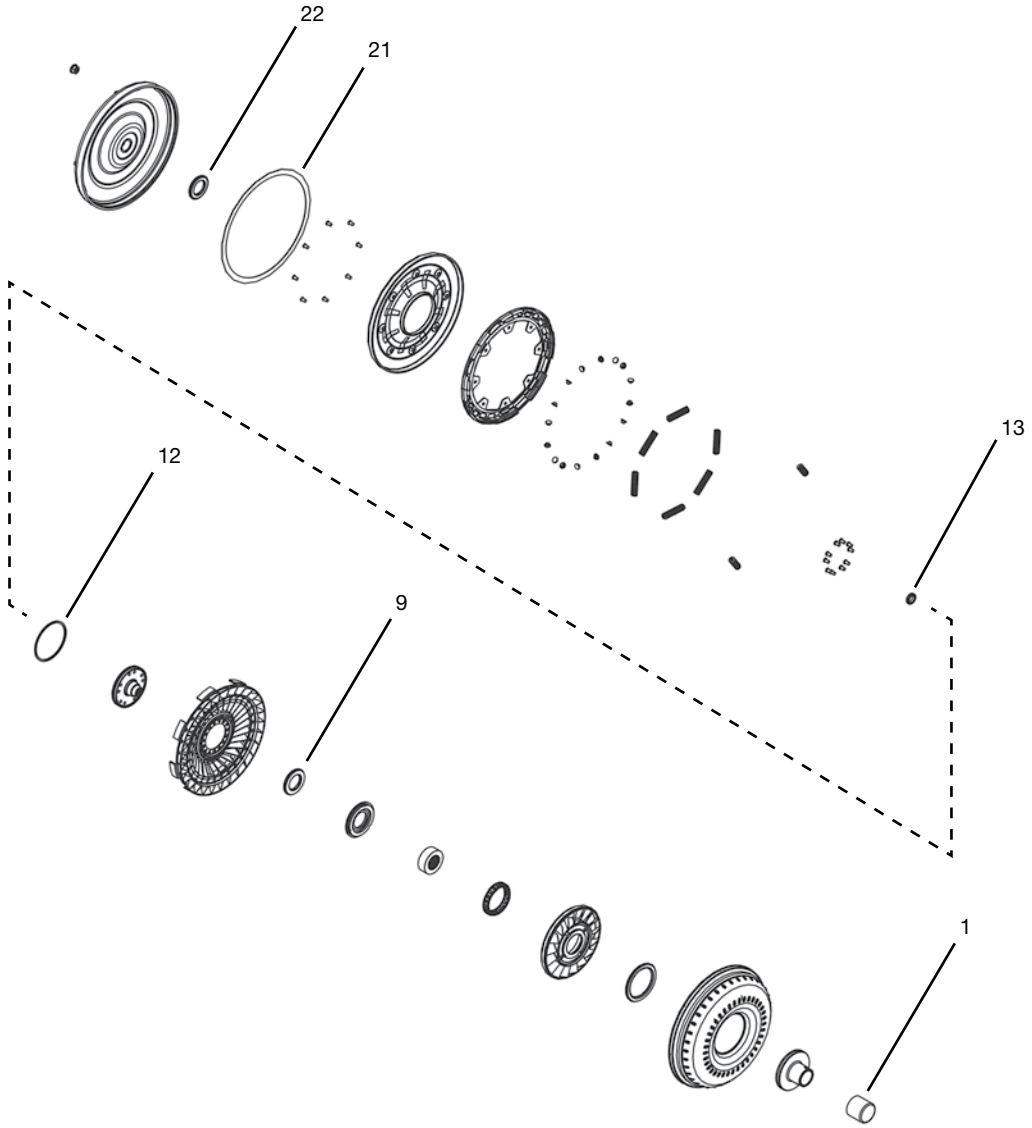
New Kits Coming Soon!

Transmission Make	Transmission Unit	Converter Core	Dampered	Spline Count	Type	Part No.
Allison®	LCT 1000 (Captive Clutch)	LCT 1000 (Captive Clutch)	Yes	25	Multi-Plate Lockup	AL-RK-4
Allison®	1000/2000/2400, Early or 1000/2000/2400, 2006-Later	Allison® 1000/2000/2400	No	25	Multi-Plate Lockup	AL-RK-3
BorgWarner, Chrysler	A618, 47RH/RE, 48RE (310mm)	BorgWarner 310mm	No	23	Multi-Plate Lockup	BW-RK-3
Chrysler	68RFE	Chrysler 68RFE	No	27	Multi-Plate Lockup	CH-RK-6
Ford	A618, 47RH/RE, 48RE (310mm)	Ford 5R110W	Yes	23	Multi-Plate Lockup	BWFD-RK-1

Optimize Performance with Woven Carbon Converter Kits

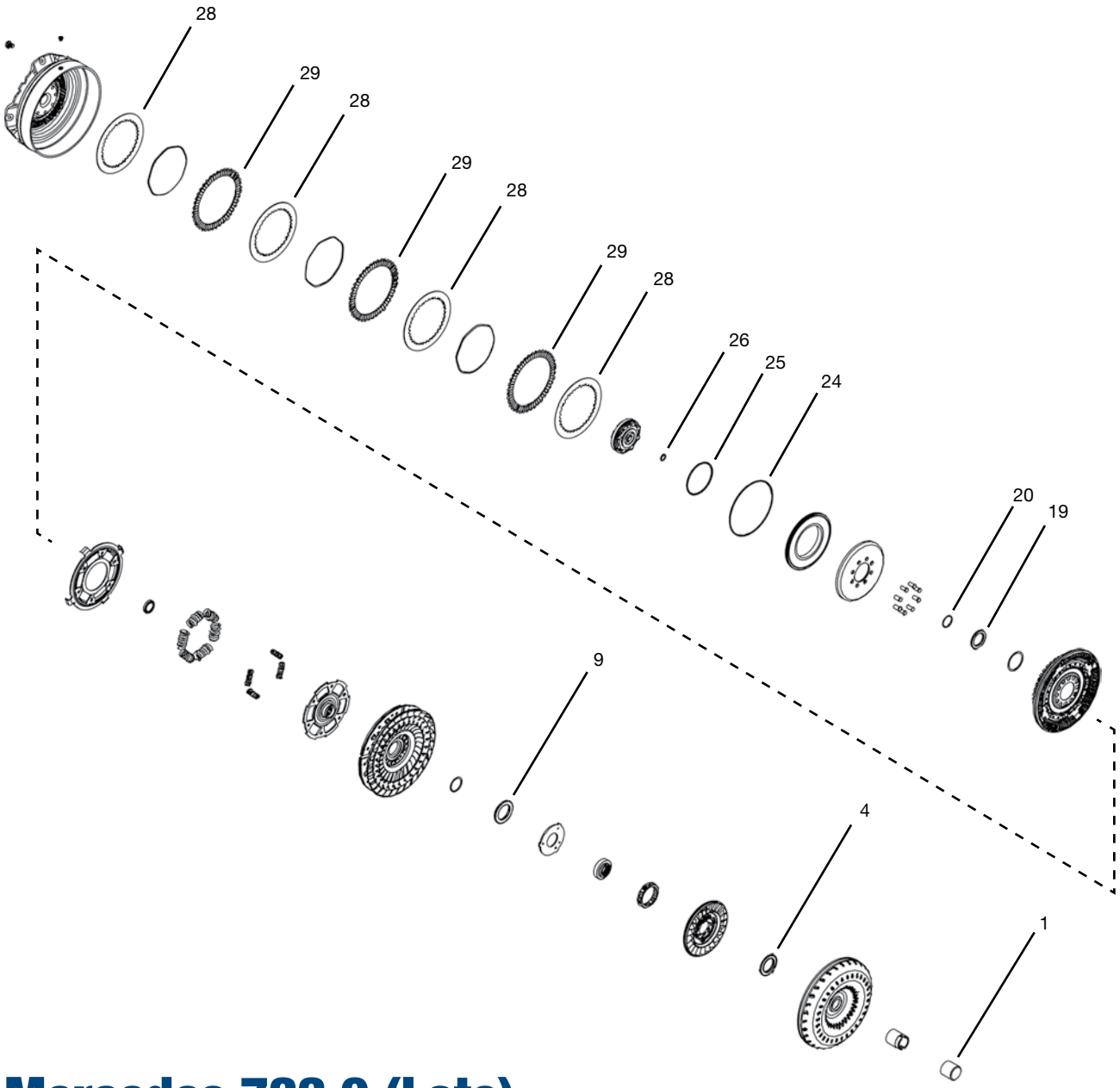
Authentic, OE-quality woven carbon delivers the ultimate in performance and durability, and it's available EXCLUSIVELY from Sonnax. Ask your sales rep. for details on the new woven carbon versions of these six powerhouse performance converter kits.

GM	6L80, 6L90	GM 265mm	No	36	Multi-Plate Lockup	GM-RK-685WC
GM	6L80, 6L90	GM 258mm	No	36	Multi-Plate Lockup	GM-RK-688WC
GM	4L60-E, 4L65-E, 4L75-E (300mm)	GM 265mm	No	30	Multi-Plate Lockup	GM-RK-405WC
GM	4L60-E, 4L65-E, 4L75-E (300mm)	GM 258mm	No	30	Multi-Plate Lockup	GM-RK-408WC
GM	4L80-E, 4L85-E, Multi-Plate	GM 265mm	No	35	Multi-Plate Lockup	GM-RK-485WC
GM	4L80-E, 4L85-E, Multi-Plate	GM 258mm	No	35	Multi-Plate Lockup	GM-RK-488WC



Ford/Mazda FNR5 (FS5A-EL)

I.D. No.	Part No.	Part Name	Description
1	MI-HC-P	Hub Cover	Plastic, Purple, 1-5/8" Dia.
9	MT-N-2	Thrust Bearing	2.237" O.D., 1.307" I.D., .226" Thick, Enclosed, Hardened steel
12	MZ-O-3	Piston Seal	3.493" O.D., .093" Width, .113" Height, PTFE, Black, Scarf cut
12	FD-O-11	Seal	3.499" O.D., .094" Width, .113" Height, PTFE, Square cut,
13	FD-O-10V	Radial Lip Seal	.906" Housing bore, .590" Shaft dia., Fluorocarbon
21	B45370HTE	Friction Ring	10.000" O.D., 9.000" I.D., .045" Thick, HTE
	B66370HTE	Friction Ring	10.000" O.D., 9.000" I.D., .066" Thick, HTE
	B66370HTL	Friction Ring	10.000" O.D., 9.000" I.D., .066" Thick, HTL
22	FD-N-17	Thrust Bearing	2.047" O.D., 1.260" I.D., .216" Thick, Enclosed
	FD-N-17T	Thrust Bearing	2.047" O.D., 1.260" I.D., .232" Thick, Enclosed

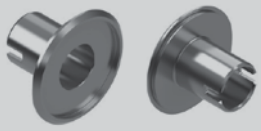


Mercedes 722.9 (Late)

I.D. No.	Part No.	Part Name	Description
1	MI-HC-P	Hub Cover	Plastic, Purple, 1-5/8" Dia.
4	MB-N-1	Thrust Bearing	Impeller-side, 2.589" O.D., 1.713" I.D., .195" Thick, 3-Tab, Enclosed, Hardened steel
9	MB-N-5	Thrust Bearing	Turbine-side, 2.820" O.D., 1.900" I.D., .195" Thick, Enclosed, Hardened steel
19	MB-N-4	Thrust Bearing	Front cover, 2.270" O.D., 1.580" I.D., .180" Thick, Enclosed, Hardened steel
20	MB-O-10	Seal	1.489" O.D., .104" Width, .083" Height, Torlon®, Compound finger joint
24	MB-O-12V	Seal Ring	4.047" O.D., .076" Width, .110" Height, Fluorocarbon, Double chamfer
25	MB-O-11V	Seal Ring	7.020" O.D., .076" Width, .108" Height, Fluorocarbon, Double chamfer
26	MB-O-5V	Seal Ring	.834" O.D., .082" Width, .112" Height, PTFE-Coated, Orange, Solid
28	MB-CP-14S	Clutch Plate	7.383" O.D., 5.587" I.D., .071" Thick, 36 Internal spline tooth count, Steel*
	MB-CP-15S	Clutch Plate	7.383" O.D., 5.587" I.D., .079" Thick, 36 Internal spline tooth count, Steel*
29	MB-CP-8	Clutch Plate	3 Required, 7.717" O.D., 6.105" I.D., .108" Thick, 40 Tab count (external flat), Steel

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

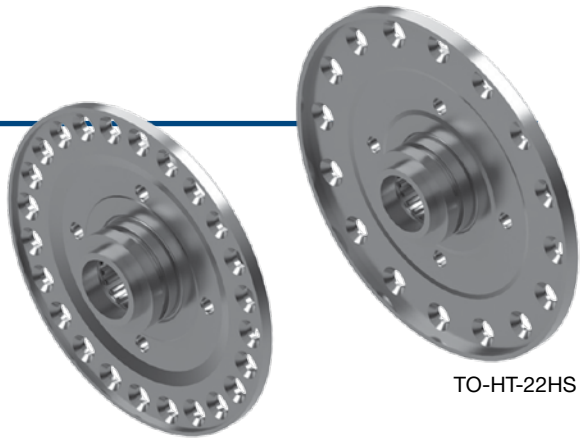
sonnax® New Parts Guide

Make/Unit		Part No.	Part Name	Description
	Aisin AW TF-80SC, TF-81SC (Ford AF21)	GMFD-WP-1T	Thrust Washer	Plastic, 1.484" O.D., 1.010" I.D., .154" Thick (thicker than OE)
	Aisin Seiki AS69RC	AS-CP-4S	Clutch Plate	Steel, 9.175" O.D., 7.340" I.D., .072" Thick, 16 Tab Count
	Chrysler 66RFE	CH-WP-8	Thrust Washer	Plastic, 2.769" O.D., .693" I.D., .473" Thick
Ford	4R27E (Focus)	FD-90-69G	Impeller Hub	Flanged, Flats, 1.573" Journal dia., 1.473" Assembled height, 3.750" Flange O.D.
Ford	4R100, 5R110W, 6-Stud	FD-WP-17A	Thrust Washer	Plastic, 3.970" O.D., 2.728" I.D., .060" Thick
Ford	6R80, 280mm (Early & Late), 260mm (Late)	FD-N-16	Ball Bearing	1.654" O.D., 1.181" I.D., .276" Thick
Ford	6F50/6F55, GM 6T70/6T75	GMFD-WP-1T	Thrust Washer	Plastic, 1.484" O.D., 1.010" I.D., .154" Thick (thicker than OE)
Ford	FNR5	FD-N-17	Thrust Bearing	Enclosed, 2.047" O.D., 1.260" I.D., .216" Thick
Ford	FNR5	FD-N-17T	Thrust Bearing	Enclosed, 2.047" O.D., 1.260" I.D., .232" Thick
Ford	6R80, 6R75W	FD-CP-15A	Clutch Plate	8.071" O.D., Bonded with HTE friction rings
GM	6T70/6T75, Ford 6F50/6F55	GMFD-WP-1T	Thrust Washer	Plastic, 1.484" O.D., 1.010" I.D., .154" Thick (thicker than OE)
GM	6L45, 6L50	GM-CP-5	Clutch Plate	8.700" O.D., 6.300" I.D., .137" Thick, 24 Tang count
Honda/Acura	MT4A, MDX	HO-O-3V	Seal Ring	Inner piston, 1.850" O.D., .068" Width, .118" Height, D-Shaped
Honda/Acura	MT4A, MDX	HO-O-4V	Seal Ring	Outer piston, 8.024" O.D., .070" Width, .114" Height, D-Shaped
	Hyundai/Kia A5HF1, A6F24, A6MF1, A6MF2	GMFD-WP-1T	Thrust Washer	Plastic, 1.484" O.D., 1.010" I.D., .154" Thick (thicker than OE)
Jatco/Nissan	RE7R01A (JR710E)	JA-WP-1	Thrust Washer	Plastic, 1.487" O.D., 1.020" I.D., .189" Thick, 8 Outer notch count
Jatco/Nissan	JF015E (RE0F11A)	NI-O-1V	O-Ring	1.299" I.D., .103" Cross section
Mazda	FS5A-EL	FD-N-17	Bearing	Enclosed, 2.047" O.D., 1.260" I.D., .216" Thick
Mazda	FS5A-EL	FD-N-17T	Bearing	Enclosed, 2.047" O.D., 1.260" I.D., .232" Thick
Mercedes	722.9 (Late)	MB-O-11V	Seal Ring	Outer piston, 7.020" O.D., .076" Width, .108" Height, Double chamfer
Mercedes	722.9 (Late)	MB-O-12V	Seal Ring	Inner piston, 4.047" O.D., .076" Width, .110" Height, Double chamfer
Subaru	TR690, TR58	FD-N-17	Thrust Bearing	Enclosed, 2.047" O.D., 1.260" I.D., .216" Thick
Subaru	TR690, TR58	FD-N-17T	Thrust Bearing	Enclosed, 2.047" O.D., 1.260" I.D., .232" Thick
Toyota/Lexus	A340H	TO-90-25G	Flanged Impeller Hub 	Slots, 1.499" Journal dia., 1.875" Assembled height, 3.250" Outer flange dia. Featuring an oversized bearing pocket, TO-90-25G is specifically designed and machined for use with Sonnax thrust bearing CH-N-1 and bearing adapter TO-WA-16. This combination of parts adds more durability to the impeller-side bearing assembly than the OE bearing and bearing race and eliminates the rework needed with Sonnax TO-90-5G or OE impeller hubs.
Toyota/Lexus	U660E, U760E (TM-60LS)	TO-RV-4	Rivet	Turbine hub, Solid, Flat head, .352" Length, .203" Shank dia., .340" Head dia.
Friction Rings	Ford 6R60, 6R75W	B45606HTE	Friction Ring	8.080" X 6.930" X .045", HTE, Cutouts
Friction Rings	Honda MDKA & MDRA (MDX), Saturn Vue	B45965HTE	Friction Ring	10.300" X 9.300" X .045", HTE
Friction Rings	Honda MDKA & MDRA (MDX), Saturn Vue	B66965HTE	Friction Ring	10.300" X 9.300" X .066", HTE
ZF	ZF6HP19/21, 245mm (LuK)	ZF-RV-1	Rivet	Piston-to-Spring strap, .272" Length, .200" Shank dia., .280" Head dia., Flat head, Solid

U660E/U760E Turbine Hubs

- Hardened steel
- 22 Internal spline tooth count
- Improved input shaft bore fitment

U660E Part No. TO-HT-22HS
U760E (TM-60LS) Part No. TO-HT-23HS



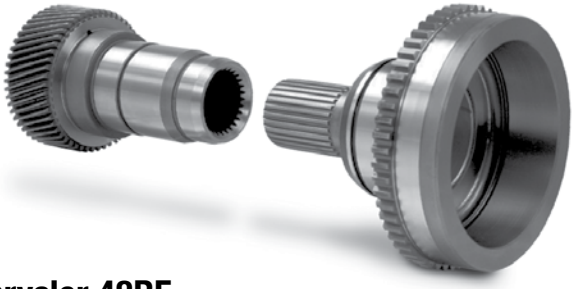
TO-HT-22HS

TO-HT-23HS

Sonnax now offers two Toyota turbine hubs to replace OE hubs where the nose is prone to breaking away from the flange.

In U660E/U760E units, the input shaft does not have a seal — it's sealed by the sizing of the input shaft and the bore in the turbine hub. The accuracy of the size and surface finish of this bore has a direct relationship with the function of the converter. Installing a new Sonnax hub designed with tighter bore tolerances will help guard against drivability issues or failures.

Turn up the Torque with Sonnax Heavy-Duty Output Shafts



Chrysler 48RE

- Larger diameter allows for increased cross-section to protect against breakage.
- High-strength alloy balances the toughness required for shaft strength with the deep case hardness required for the one-way clutch race that is an integral part of the shaft.
- Includes a New Venture 271/273 input gear shortened to match the installation depth of the 48RE tranny.

Part No. 22173D-01K For use in 2003-2006 4WD models with NV271 or NV273 transfer cases.

GM 4L60-E, 4L65-E, 4L70-E

- High-strength 300M steel shaft with rolled splines.
- Specially heat-treated and processed for maximum toughness.
- Torsional design absorbs energy, reducing peak loads to critical areas.

Part No. 74678S-HD Fits 4WD/AWD applications only.

Part No. 74678L-HD Fits 2WD and Corvette applications only.

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Featured in this Issue

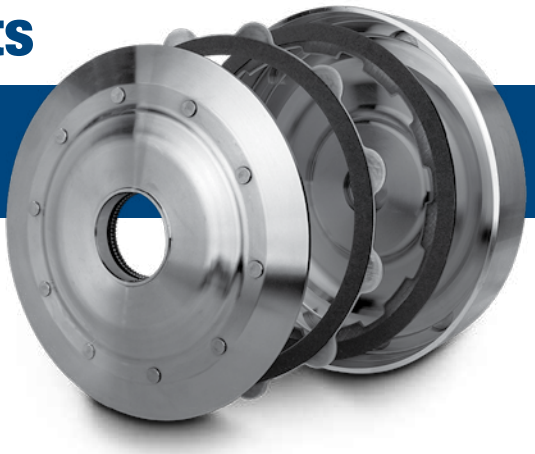
Sonnax designs, manufactures, tests and distributes a wide variety of products used to remanufacture torque converters, rebuild automatic transmissions, upgrade driveshafts and protect the driveline from over-torque damage.

Sonnax is a 100% Employee-Owned Company

Buff Up Your Build with Sonnax Performance Converter Kits

40+ Kits for Chrysler, Ford, GM & Allison®

Small/Large Diameter • Single Plate/Multi-Plate/Non-Lockup • Dampered/Damperless



- **Widest variety of kits available**
- **Designed for ease of assembly**
- **Improve acceleration & durability with confidence**

BorgWarner 310mm Performance Converter Kit

Part No. BWFD-RK-1

The high-demand/low-supply situation with the BorgWarner 310mm has left a lot of money on the bench.

Thanks to Sonnax innovation, a new dampered performance converter kit that converts the Ford 5R110W low-stall core for use in A618, 47RH/RE and 48RE trucks will soon be available. The one-of-a-kind kit is designed exclusively for use with Sonnax piston/damper assembly FD-DA-13.

Look for this ground-breaking new product later this year and ask your sales rep. for details.