High Performance Converters:
Stall Speed, Core Selection and More

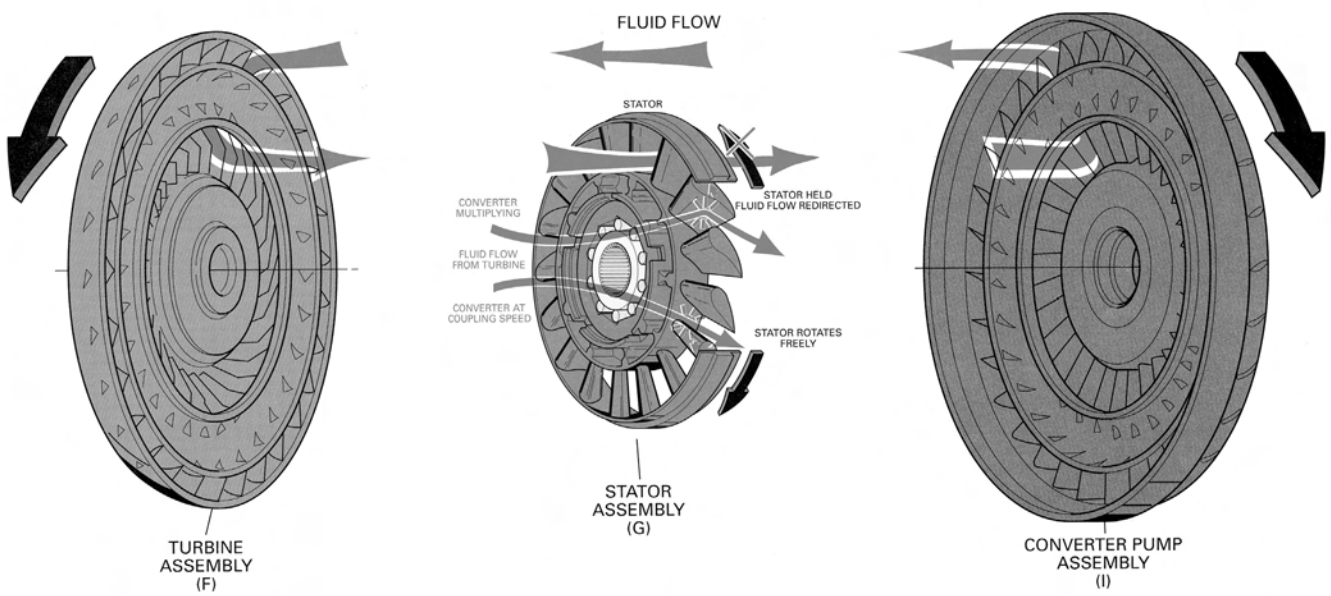
Presented by
Joe Allen & Andy Dumas
Now You're Torkin' Seminar 2004

sonnax®
TIME TESTED • INDUSTRY TRUSTED®

800-843-2600 • 802-463-9722 • F: 802-463-4059 • www.sonnax.com • info@sonnax.com

Table of Contents

How Does The Torque Converter Work?



The torque converter's impeller is directly connected to the engine; therefore, the impeller will rotate at the same RPM as the engine. This rotation pulls fluid from the stator and pushes it towards the outside of the impeller. The fluid then leaves the impeller and pushes on the outside of the turbine blades, causing the turbine to rotate. From there, the fluid flows toward the inside of the turbine and flows over the stator. Instead of rotating, the stator is held stationary by the one-way clutch. Fluid flowing over the stator blades is redirected before entering the impeller. Since the stator redirects the fluid, the impeller expends less energy redirecting the fluid. Less energy used by the impeller means there is more torque to transmit to the turbine. **The redirection of fluid by the stator gives the torque converter the ability to multiply torque.**

As the turbine speed increases and approaches the speed of the impeller, the amount of fluid that the stator redirects decreases. The less the stator redirects the fluid, the lower the torque multiplication. When the stator stops redirecting the fluid, the torque converter no longer multiplies torque. At this point there is no torque multiplication and the stator begins to rotate with the turbine and impeller. In applications without a one-way clutch, the stator would create drag causing heat and slowing down the vehicle speed.

What Is Stall Speed?

Stall speed is a term frequently used but it is also commonly misunderstood. Stall speed is the maximum RPM at which the impeller/engine can rotate if the transmission output is constrained. The engine RPM can no longer increase and the engine speed "stalls." Flash stall is the RPM at which the converter will "flash" right after the transbrake (or brake) is released. Car weight, tire size, suspension setup, etc. all affect flash stall speed, making it very difficult to predict.

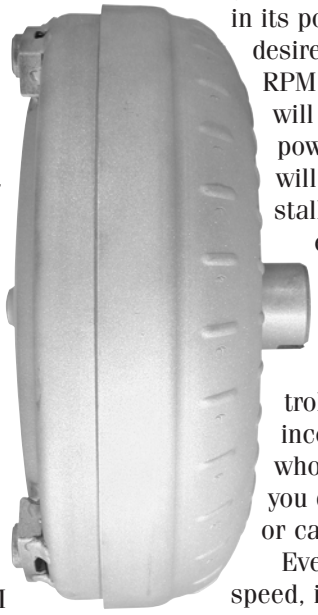
Brake stall is the maximum RPM at which the engine (and impeller) can turn when the turbine rotation is held (car is in gear and the transbrake or brakes are holding). Brake stall is not related to the car's wheel brakes. The two things that determine the brake stall speed are the engine's peak torque and the blade geometry (or K Factor) of the impeller, stator and turbine blades. Suspension, tires, weight, gear ratios, etc. do not influence brake stall. Brake stall can easily be calculated and can be summed up in the following formula:

$$\text{Stall Speed (Brake)} = \text{K factor} \times \sqrt{\text{Engine Torque (lb.ft. or Nm)}}$$

The key point to remember is that stall speed is dependent on engine torque and the converter blade geometry. Change the impeller, stator or internal clearance and the stall speed will change. If the engine torque changes, the stall speed will also change. In other words, the stall speed on a given converter will not be the same when coupled to a tame small block engine as it is when coupled to a high performance big block engine.

How Can I Determine The Stall Speed of My Converter?

Use extreme caution when performing any stall tests. First and foremost, make sure the car is secure and that there is plenty of room in front of the car in case the transbrake (or brakes) fail. Also, fluid temperature in the torque converter rises very rapidly when the converter is held at stall. A 10-second maximum stall time, with several minutes of operation for cool down before conducting another test, is strongly recommended.



Brake stall speed testing is performed by putting the car into gear and holding the drivetrain while bringing the engine to wide-open throttle. Using a transbrake is the easiest and surest method for doing this. Testing the brake stall speed by holding the wheel brakes and running the engine against the locked brakes will usually result in wheel rotation before true stall speed is reached. The engine simply overpowers the ability of the brakes to hold the car. When rotation starts, you are no longer at stall and you cannot check the stall speed using this method.

An alternate method is to check the flash stall. This is done by observing the engine RPM reached right after release of the transbrake (or brakes) at launch. Inconsistencies caused by wheel spin and the short time allowed for RPM observation makes the use of this method questionable. Changes to car weight (and distribution), suspension, tires, tire pressure, track conditions or weather can affect the flash stall speed.

The Vehicle Is Running Stronger Than Ever. What Happened To The Converter?

Engine output is what really determines the stall speed for a given torque converter. For this reason, the converter you have been using may not be adequate when you increase the performance of your engine. This is particularly true when using a higher performance camshaft, improved heads, carburetion or manifolds. If you increase the available power going into the same converter, the stall speed will be higher. The higher stall speed may be nowhere near the optimum for the new engine combination to the point where the overall performance may not only remain unchanged, but could actually suffer. Remember, you want to have the stall speed matched to the particular engine and vehicle combination. Changes in altitude, temperature and humidity can greatly affect engine torque, which will change the stall speed.

Torque Converter Selection

Picking the correct stall speed and Stall Torque Ratio (or torque multiplication) is crucial in making a car perform the way the customer desires. Selection of the stall speed and STR for the customer's vehicle should be matched to the engine's peak torque, torque curve and the vehicle weight. You want a stall speed that will keep an engine in its powerband as much as possible. Typically, the desired brake stall speed would be 500 to 700 RPM below the engine RPM at peak torque. This will allow the car to accelerate through the powerband. Too low a stall speed and the car will "bog down" at launch. Conversely, too high a stall speed and the engine will "wind out" at the end of the run. The STR should be as high as track conditions will allow. The right STR will allow the car to have it's best 60 foot times, which translates into lower E.T.s. With an STR too high, the car will be difficult to control and 60 foot times and elapsed times will be inconsistent. On the other hand, for customers who use their car for cruising or daily driving, you do not want to keep the engine rpm too high or cause the car to launch hard at every stoplight.

Even after you have picked the correct stall speed, it is still challenging to build the correct torque converter. The more accurately you can determine the engine's torque, the closer you can come to getting the stall speed you desire. Customers rarely know the amount of torque their engine produces. In these situations, it is better to conservatively estimate the engine torque than it is to overestimate it. If you overestimate the torque output, the resulting stall speed will be lower than intended and is likely to make the vehicle slow off the line, increasing the E.T.

Does Stall Speed Affect Normal Street Driving?

Generally speaking, torque converters with stall speeds up to approximately 3000 RPM do not adversely affect normal driving. The vehicle will begin to roll normally and acceleration will be favorably influenced when higher stall speed converters are used. A very high stall speed converter (above 3000 RPM) would not be satisfactory for street use.

What Core Do I Use?

When building a performance converter based on the GM 245mm core, the easiest and quickest way to determine the correct core is to use the Sonnax Stall Speed Chart. Start by determining how much torque the engine produces and what stall speed you wish to achieve. On the

lefthand column of the chart, find the torque level that is closest to the engine torque. Next, scan the row to the right until you find the stall speed required. Listed below the stall speed is the maximum output torque (based on STR). The GM 245mm torque converter core listed at the top of the column is the one that you will need.

In many instances, there is more than one core that will give you a stall speed that will work for the customer's vehicle. The STR will help to determine which core to use.

245mm Torque Converter Identification Codes

125-C, 180-C, 200-C, 440-T4, 4T60, 4T60E, 4T65E, 700-R4

F J 2 B

1st Digit Trans Type	**2nd Digit** K-factor	**3rd Digit** Damper Style	**4th Digit** Bolt Circle
F=Front-wheel Drive	A=240	Ø=No Clutch	A=FWD Opel
125C & 440T4	B=220	1=120#	B=FWD 237mm 125C & 440T4
J=Front-wheel Drive	C=205	2=170#	C=FWD Viscous Cadillac
4T65E	D=180	3=	D=RWD 247.65mm L/U
S=THM 180 & 180C	E=160	4=215# Heavy Duty	E=RWD 237mm Non-L/U
(Straussburg)	F=148	5=215# RTC	F=RWD 237mm L/U 180C
H=Rear-wheel Drive	G=140	6=170# H/D	G=RWD 247.65mm L/U 180C
200C & 700R4	H=130	7=215# RTC-H/D	H=RWD 247.65mm Non-L/U 180C
	J=177	8=Viscous Clutch	J=RWD 247.65mm L/U 180C
	K=237	9=240# 4-Lobe 10 Degree	K=RWD 237mm L/U 180C
	L= 163	A=215#	M=FWD 247.65mm L/U 4T65E
	M=131	B=215# Co-Axial RTC	N=RWD 237mm Non-L/U 180C
	P=240	C=Carbon Filled	P=RWD 237mm L/U 180C
	S=	D=Paper Clutch	S=RWD 237mm L/U 180C 1.254" Pilot
	T=	E=Carbon Filled	T=RWD 247.65 L/U 180C
	Y=122	F=Woven Graphite	U=RWD 208mm L/U 180C
	Z=203	H=Carbon Filled	X=RWD 237mm L/U 180C
		K=Carbon Filled	Z=RWD 247.65mm L/U 180C
		L=Paper Clutch	
		M=Paper Clutch (Luk)	
		P=Carbon Filled	
		Q=Woven Graphite	
		R=140# RTC Paper Clutch	
		V=Woven Graphite	

K Factor Code – 2nd Digit of the 4 Digit GM I.D. Code

		Y Combo # 3 Blade pump 380, 383 Stator	H Combo # 3 Blade pump 082, 085 Stator	M Combo # 4 Blade pump 380, 383 Stator	# O Blade pump 380, 383 Stator	G Combo # O Blade pump 082, 085 Stator	F Combo # X Blade pump 082, 085 Stator	# 6 Blade pump 380, 383 Stator	E Combo # 6 Blade pump 082, 085 Stator	L Combo # O Blade pump 086, 089 Stator
Engine Torque										
Standard	**Metric**	**122 K-factor 1.60 STR**	**131 K-factor 1.78 STR**	**131 K-factor 1.69 STR**	**134 K-factor 1.77 STR**	**140 K-factor 2.00 STR**	**148 K-factor 1.98 STR**	**152 K-factor 1.97 STR**	**160 K-factor 2.16 STR**	**163 K-factor 1.68 STR**
250 ft-lb	339 N-M	2246 RPM 400 ft-lb	2412 RPM 445 ft-lb	2412 RPM 423 ft-lb	2460 RPM 443 ft-lb	2577 RPM 500 ft-lb	2725 RPM 495 ft-lb	2797 RPM 493 ft-lb	2946 RPM 540 ft-lb	3001 RPM 420 ft-lb
275 ft-lb	373 N-M	2356 RPM 440 ft-lb	2530 RPM 490 ft-lb	2530 RPM 465 ft-lb	2580 RPM 487 ft-lb	2703 RPM 550 ft-lb	2858 RPM 545 ft-lb	2933 RPM 542 ft-lb	3089 RPM 594 ft-lb	3147 RPM 462 ft-lb
300 ft-lb	407 N-M	2460 RPM 480 ft-lb	2642 RPM 534 ft-lb	2642 RPM 507 ft-lb	2694 RPM 531 ft-lb	2823 RPM 600 ft-lb	2985 RPM 594 ft-lb	3063 RPM 591 ft-lb	3227 RPM 648 ft-lb	3287 RPM 504 ft-lb
325 ft-lb	441 N-M	2561 RPM 520 ft-lb	2750 RPM 579 ft-lb	2750 RPM 549 ft-lb	2804 RPM 575 ft-lb	2939 RPM 650 ft-lb	3107 RPM 644 ft-lb	3189 RPM 640 ft-lb	3359 RPM 702 ft-lb	3422 RPM 546 ft-lb
350 ft-lb	475 N-M	2658 RPM 560 ft-lb	2854 RPM 623 ft-lb	2854 RPM 592 ft-lb	2910 RPM 620 ft-lb	3050 RPM 700 ft-lb	3224 RPM 693 ft-lb	3309 RPM 690 ft-lb	3485 RPM 756 ft-lb	3551 RPM 588 ft-lb
375 ft-lb	508 N-M	2751 RPM 600 ft-lb	2954 RPM 668 ft-lb	2954 RPM 634 ft-lb	3012 RPM 664 ft-lb	3157 RPM 750 ft-lb	3337 RPM 743 ft-lb	3425 RPM 739 ft-lb	3608 RPM 810 ft-lb	3675 RPM 630 ft-lb
400 ft-lb	542 N-M	2841 RPM 640 ft-lb	3051 RPM 712 ft-lb	3051 RPM 676 ft-lb	3111 RPM 708 ft-lb	3260 RPM 800 ft-lb	3447 RPM 792 ft-lb	3537 RPM 788 ft-lb	3726 RPM 864 ft-lb	3796 RPM 672 ft-lb
425 ft-lb	576 N-M	2929 RPM 680 ft-lb	3145 RPM 757 ft-lb	3145 RPM 718 ft-lb	3207 RPM 752 ft-lb	3361 RPM 850 ft-lb	3553 RPM 842 ft-lb	3646 RPM 837 ft-lb	3841 RPM 918 ft-lb	3913 RPM 714 ft-lb
450 ft-lb	610 N-M	3013 RPM 720 ft-lb	3236 RPM 801 ft-lb	3236 RPM 761 ft-lb	3300 RPM 797 ft-lb	3458 RPM 900 ft-lb	3656 RPM 891 ft-lb	3752 RPM 887 ft-lb	3952 RPM 972 ft-lb	4026 RPM 756 ft-lb
475 ft-lb	644 N-M	3096 RPM 760 ft-lb	3324 RPM 846 ft-lb	3324 RPM 803 ft-lb	3390 RPM 841 ft-lb	3553 RPM 950 ft-lb	3756 RPM 941 ft-lb	3855 RPM 936 ft-lb	4060 RPM 1026 ft-lb	4136 RPM 798 ft-lb
500 ft-lb	678 N-M	3176 RPM 800 ft-lb	3411 RPM 890 ft-lb	3411 RPM 845 ft-lb	3478 RPM 885 ft-lb	3645 RPM 1000 ft-lb	3853 RPM 990 ft-lb	3955 RPM 985 ft-lb	4166 RPM 1080 ft-lb	4244 RPM 840 ft-lb
525 ft-lb	712 N-M	3255 RPM 840 ft-lb	3495 RPM 935 ft-lb	3495 RPM 887 ft-lb	3564 RPM 929 ft-lb	3735 RPM 1050 ft-lb	3949 RPM 1040 ft-lb	4053 RPM 1034 ft-lb	4269 RPM 1134 ft-lb	4349 RPM 882 ft-lb
550 ft-lb	746 N-M	3331 RPM 880 ft-lb	3577 RPM 979 ft-lb	3577 RPM 930 ft-lb	3648 RPM 974 ft-lb	3823 RPM 1100 ft-lb	4041 RPM 1089 ft-lb	4148 RPM 1084 ft-lb	4369 RPM 1188 ft-lb	4451 RPM 924 ft-lb
575 ft-lb	780 N-M	3406 RPM 920 ft-lb	3658 RPM 1024 ft-lb	3658 RPM 972 ft-lb	3730 RPM 1018 ft-lb	3909 RPM 1150 ft-lb	4132 RPM 1139 ft-lb	4241 RPM 1133 ft-lb	4467 RPM 1242 ft-lb	4551 RPM 966 ft-lb
600 ft-lb	813 N-M	3480 RPM 960 ft-lb	3736 RPM 1068 ft-lb	3736 RPM 1014 ft-lb	3810 RPM 1062 ft-lb	3993 RPM 1200 ft-lb	4221 RPM 1188 ft-lb	4332 RPM 1182 ft-lb	4563 RPM 1296 ft-lb	4649 RPM 1008 ft-lb
625 ft-lb	847 N-M	3551 RPM 1000 ft-lb	3813 RPM 1113 ft-lb	3813 RPM 1056 ft-lb	3889 RPM 1106 ft-lb	4075 RPM 1250 ft-lb	4308 RPM 1238 ft-lb	4422 RPM 1231 ft-lb	4658 RPM 1350 ft-lb	4745 RPM 1050 ft-lb
650 ft-lb	881 N-M	3622 RPM 1040 ft-lb	3889 RPM 1157 ft-lb	3889 RPM 1099 ft-lb	3966 RPM 1151 ft-lb	4156 RPM 1300 ft-lb	4394 RPM 1287 ft-lb	4509 RPM 1281 ft-lb	4750 RPM 1404 ft-lb	4839 RPM 1092 ft-lb
675 ft-lb	915 N-M	3691 RPM 1080 ft-lb	3963 RPM 1202 ft-lb	3963 RPM 1141 ft-lb	4042 RPM 1195 ft-lb	4235 RPM 1350 ft-lb	4477 RPM 1337 ft-lb	4595 RPM 1330 ft-lb	4840 RPM 1458 ft-lb	4931 RPM 1134 ft-lb
700 ft-lb	949 N-M	3758 RPM 1120 ft-lb	4036 RPM 1246 ft-lb	4036 RPM 1183 ft-lb	4116 RPM 1239 ft-lb	4313 RPM 1400 ft-lb	4559 RPM 1386 ft-lb	4680 RPM 1379 ft-lb	4929 RPM 1512 ft-lb	5022 RPM 1176 ft-lb
725 ft-lb	983 N-M	3825 RPM 1160 ft-lb	4107 RPM 1291 ft-lb	4107 RPM 1225 ft-lb	4189 RPM 1283 ft-lb	4389 RPM 1450 ft-lb	4640 RPM 1436 ft-lb	4762 RPM 1428 ft-lb	5016 RPM 1566 ft-lb	5110 RPM 1218 ft-lb
750 ft-lb	1017 N-M	3890 RPM 1200 ft-lb	4177 RPM 1335 ft-lb	4177 RPM 1268 ft-lb	4260 RPM 1328 ft-lb	4464 RPM 1500 ft-lb	4719 RPM 1485 ft-lb	4844 RPM 1478 ft-lb	5102 RPM 1620 ft-lb	5198 RPM 1260 ft-lb
775 ft-lb	1051 N-M	3955 RPM 1240 ft-lb	4246 RPM 1380 ft-lb	4246 RPM 1310 ft-lb	4331 RPM 1372 ft-lb	4538 RPM 1550 ft-lb	4797 RPM 1535 ft-lb	4924 RPM 1527 ft-lb	5186 RPM 1674 ft-lb	5284 RPM 1302 ft-lb
800 ft-lb	1085 N-M	4018 RPM 1280 ft-lb	4314 RPM 1424 ft-lb	4314 RPM 1352 ft-lb	4400 RPM 1416 ft-lb	4611 RPM 1600 ft-lb	4874 RPM 1584 ft-lb	5003 RPM 1576 ft-lb	5269 RPM 1728 ft-lb	5368 RPM 1344 ft-lb
825 ft-lb	1119 N-M	4080 RPM 1320 ft-lb	4381 RPM 1469 ft-lb	4381 RPM 1394 ft-lb	4468 RPM 1460 ft-lb	4682 RPM 1650 ft-lb	4950 RPM 1634 ft-lb	5080 RPM 1625 ft-lb	5351 RPM 1782 ft-lb	5451 RPM 1386 ft-lb
850 ft-lb	1152 N-M	4142 RPM 1360 ft-lb	4447 RPM 1513 ft-lb	4447 RPM 1437 ft-lb	4535 RPM 1505 ft-lb	4753 RPM 1700 ft-lb	5024 RPM 1683 ft-lb	5157 RPM 1675 ft-lb	5432 RPM 1836 ft-lb	5533 RPM 1428 ft-lb
875 ft-lb	1186 N-M	4202 RPM 1400 ft-lb	4512 RPM 1558 ft-lb	4512 RPM 1479 ft-lb	4602 RPM 1549 ft-lb	4822 RPM 1750 ft-lb	5098 RPM 1733 ft-lb	5232 RPM 1724 ft-lb	5511 RPM 1890 ft-lb	5614 RPM 1470 ft-lb
900 ft-lb	1220 N-M	4262 RPM 1440 ft-lb	4576 RPM 1602 ft-lb	4576 RPM 1521 ft-lb	4667 RPM 1593 ft-lb	4890 RPM 1800 ft-lb	5170 RPM 1782 ft-lb	5306 RPM 1773 ft-lb	5589 RPM 1944 ft-lb	5694 RPM 1512 ft-lb
925 ft-lb	1254 N-M	4320 RPM 1480 ft-lb	4639 RPM 1647 ft-lb	4639 RPM 1563 ft-lb	4731 RPM 1637 ft-lb	4958 RPM 1850 ft-lb	5241 RPM 1832 ft-lb	5379 RPM 1822 ft-lb	5666 RPM 1998 ft-lb	5772 RPM 1554 ft-lb
950 ft-lb	1288 N-M	4378 RPM 1520 ft-lb	4701 RPM 1691 ft-lb	4701 RPM 1606 ft-lb	4795 RPM 1682 ft-lb	5024 RPM 1900 ft-lb	5312 RPM 1881 ft-lb	5452 RPM 1872 ft-lb	5742 RPM 2052 ft-lb	5850 RPM 1596 ft-lb
975 ft-lb	1322 N-M	4436 RPM 1560 ft-lb	4763 RPM 1736 ft-lb	4763 RPM 1648 ft-lb	4857 RPM 1726 ft-lb	5090 RPM 1950 ft-lb	5381 RPM 1931 ft-lb	5523 RPM 1921 ft-lb	5817 RPM 2106 ft-lb	5926 RPM 1638 ft-lb
1000 ft-lb	1356 N-M	4492 RPM 1600 ft-lb	4824 RPM 1780 ft-lb	4824 RPM 1690 ft-lb	4919 RPM 1770 ft-lb	5155 RPM 2000 ft-lb	5450 RPM 1980 ft-lb	5593 RPM 1970 ft-lb	5891 RPM 2160 ft-lb	6002 RPM 1680 ft-lb
1025 ft-lb	1390 N-M	4548 RPM 1640 ft-lb	4883 RPM 1825 ft-lb	4883 RPM 1732 ft-lb	4980 RPM 1814 ft-lb	5219 RPM 2050 ft-lb	5517 RPM 2030 ft-lb	5663 RPM 2019 ft-lb	5965 RPM 2214 ft-lb	6076 RPM 1722 ft-lb
1050 ft-lb	1424 N-M	4603 RPM 1680 ft-lb	4943 RPM 1869 ft-lb	4943 RPM 1775 ft-lb	5041 RPM 1859 ft-lb	5282 RPM 2100 ft-lb	5584 RPM 2079 ft-lb	5731 RPM 2069 ft-lb	6037 RPM 2268 ft-lb	6150 RPM 1764 ft-lb
1075 ft-lb	1457 N-M	4658 RPM 1720 ft-lb	5001 RPM 1914 ft-lb	5001 RPM 1817 ft-lb	5100 RPM 1903 ft-lb	5345 RPM 2150 ft-lb	5650 RPM 2129 ft-lb	5799 RPM 2118 ft-lb	6108 RPM 2322 ft-lb	6223 RPM 1806 ft-lb
1100 ft-lb	1491 N-M	4711 RPM 1760 ft-lb	5059 RPM 1958 ft-lb	5059 RPM 1859 ft-lb	5159 RPM 1947 ft-lb	5407 RPM 2200 ft-lb	5716 RPM 2178 ft-lb	5866 RPM 2167 ft-lb	6179 RPM 2376 ft-lb	6295 RPM 1848 ft-lb
1125 ft-lb	1525 N-M	4765 RPM 1800 ft-lb	5116 RPM 2003 ft-lb	5116 RPM 1901 ft-lb	5218 RPM 1991 ft-lb	5468 RPM 2250 ft-lb	5780 RPM 2228 ft-lb	5932 RPM 2216 ft-lb	6249 RPM 2430 ft-lb	6366 RPM 1890 ft-lb
1150 ft-lb	1559 N-M	4817 RPM 1840 ft-lb	5173 RPM 2047 ft-lb	5173 RPM 1944 ft-lb	5275 RPM 2036 ft-lb	5528 RPM 2300 ft-lb	5844 RPM 2277 ft-lb	5998 RPM 2266 ft-lb	6318 RPM 2484 ft-lb	6436 RPM 1932 ft-lb
1175 ft-lb	1593 N-M	4869 RPM 1880 ft-lb	5229 RPM 2092 ft-lb	5229 RPM 1986 ft-lb	5332 RPM 2080 ft-lb	5588 RPM 2350 ft-lb	5907 RPM 2327 ft-lb	6063 RPM 2315 ft-lb	6386 RPM 2538 ft-lb	6506 RPM 1974 ft-lb
1200 ft-lb	1627 N-M	4921 RPM 1920 ft-lb	5284 RPM 2136 ft-lb	5284 RPM 2028 ft-lb	5389 RPM 2124 ft-lb	5647 RPM 2400 ft-lb	5970 RPM 2376 ft-lb	6127 RPM 2364 ft-lb	6454 RPM 2592 ft-lb	6575 RPM 2016 ft-lb
1225 ft-lb	1661 N-M	4972 RPM 1960 ft-lb	5339 RPM 2181 ft-lb	5339 RPM 2070 ft-lb	5445 RPM 2168 ft-lb	5706 RPM 2450 ft-lb	6032 RPM 2426 ft-lb	6190 RPM 2413 ft-lb	6521 RPM 2646 ft-lb	6643 RPM 2058 ft-lb
1250 ft-lb	1695 N-M	5022 RPM 2000 ft-lb	5393 RPM 2225 ft-lb	5393 RPM 2113 ft-lb	5500 RPM 2213 ft-lb	5763 RPM 2500 ft-lb	6093 RPM 2475 ft-lb	6253 RPM 2463 ft-lb	6587 RPM 2700 ft-lb	6710 RPM 2100 ft-lb
1275 ft-lb	1729 N-M	5072 RPM 2040 ft-lb	5447 RPM 2270 ft-lb	5447 RPM 2155 ft-lb	5555 RPM 2257 ft-lb	5821 RPM 2550 ft-lb	6153 RPM 2525 ft-lb	6316 RPM 2512 ft-lb	6652 RPM 2754 ft-lb	6777 RPM 2142 ft-lb
1300 ft-lb	1763 N-M	5122 RPM 2080 ft-lb	5500 RPM 2314 ft-lb	5500 RPM 2197 ft-lb	5609 RPM 2301 ft-lb	5878 RPM 2600 ft-lb	6213 RPM 2574 ft-lb	6377 RPM 2561 ft-lb	6717 RPM 2808 ft-lb	6843 RPM 2184 ft-lb
1325 ft-lb	1796 N-M	5171 RPM 2120 ft-lb	5552 RPM 2359 ft-lb	5552 RPM 2239 ft-lb	5663 RPM 2345 ft-lb	5934 RPM 2650 ft-lb	6273 RPM 2624 ft-lb	6438 RPM 2610 ft-lb	6781 RPM 2862 ft-lb	6909 RPM 2226 ft-lb
1350 ft-lb	1830 N-M	5219 RPM 2160 ft-lb	5604 RPM 2403 ft-lb	5604 RPM 2282 ft-lb	5716 RPM 2390 ft-lb	5990 RPM 2700 ft-lb	6332 RPM 2673 ft-lb	6499 RPM 2660 ft-lb	6845 RPM 2916 ft-lb	6974 RPM 2268 ft-lb
1375 ft-lb	1864 N-M	5268 RPM 2200 ft-lb	5656 RPM 2448 ft-lb	5656 RPM 2324 ft-lb	5768 RPM 2434 ft-lb	6045 RPM 2750 ft-lb	6390 RPM 2723 ft-lb	6559 RPM 2709 ft-lb	6908 RPM 2970 ft-lb	7038 RPM 2310 ft-lb
1400 ft-lb	1898 N-M	5315 RPM 2240 ft-lb	5707 RPM 2492 ft-lb	5707 RPM 2366 ft-lb	5821 RPM 2478 ft-lb	6099 RPM 2800 ft-lb	6448 RPM 2772 ft-lb	6618 RPM 2758 ft-lb	6971 RPM 3024 ft-lb	7101 RPM 2352 ft-lb
1425 ft-lb	1932 N-M	5362 RPM 2280 ft-lb	5758 RPM 2537 ft-lb	5758 RPM 2408 ft-lb	5872 RPM 2522 ft-lb	6154 RPM 2850 ft-lb	6505 RPM 2822 ft-lb	6677 RPM 2807 ft-lb	7033 RPM 3078 ft-lb	7165 RPM 2394 ft-lb
1450 ft-lb	1966 N-M	5409 RPM 2320 ft-lb	5808 RPM 2581 ft-lb	5808 RPM 2451 ft-lb	5924 RPM 2567 ft-lb	6207 RPM 2900 ft-lb	6562 RPM 2871 ft-lb	6735 RPM 2857 ft-lb	7094 RPM 3132 ft-lb	7227 RPM 2436 ft-lb
1475 ft-lb	2000 N-M	5456 RPM 2360 ft-lb	5858 RPM 2626 ft-lb	5858 RPM 2493 ft-lb	5974 RPM 2611 ft-lb	6261 RPM 2950 ft-lb	6618 RPM 2921 ft-lb	6793 RPM 2906 ft-lb	7155 RPM 3186 ft-lb	7289 RPM 2478 ft-lb
1500 ft-lb	2034 N-M	5502 RPM 2400 ft-lb	5908 RPM 2670 ft-lb	5908 RPM 2535 ft-lb	6025 RPM 2655 ft-lb	6314 RPM 3000 ft-lb	6674 RPM 2970 ft-lb	6850 RPM 2955 ft-lb	7215 RPM 3240 ft-lb	7351 RPM 2520 ft-lb

J Combo # 7 Blade pump 082, 085 Stator	D Combo # 6 Blade pump 086, 089 Stator	W Combo # G Blade pump 082, 085 Stator	Z Combo # 8 Blade pump 082, 085 Stator	C Combo	N Combo # 2 Blade pump 082, 085 Stator	B Combo # 8 Blade pump 086, 089 Stator	K Combo # 2 Blade pump 082, 085 Stator	A Combo # 8 Blade pump 102, 105 Stator	P Combo # 2 Blade pump 102, 105 Stator
177 K-factor 2.35 STR	180 K-factor 1.95 STR	190 K-factor 2.40 STR	203 K-factor 2.48 STR	205 K-factor 1.98 STR	218 K-factor 2.62 STR	220 K-factor 2.08 STR	237 K-factor 2.70 STR	240 K-factor 2.38 STR	260 K-factor 2.40 STR
3259 RPM 588 ft-lb	3314 RPM 488 ft-lb	3498 RPM 600 ft-lb	3737 RPM 620 ft-lb	3774 RPM 495 ft-lb	4014 RPM 655 ft-lb	4050 RPM 520 ft-lb	4363 RPM 675 ft-lb	4419 RPM 595 ft-lb	4787 RPM 600 ft-lb
3418 RPM 646 ft-lb	3476 RPM 536 ft-lb	3669 RPM 660 ft-lb	3920 RPM 682 ft-lb	3958 RPM 545 ft-lb	4209 RPM 721 ft-lb	4248 RPM 572 ft-lb	4576 RPM 743 ft-lb	4634 RPM 655 ft-lb	5020 RPM 660 ft-lb
3570 RPM 705 ft-lb	3630 RPM 585 ft-lb	3832 RPM 720 ft-lb	4094 RPM 744 ft-lb	4134 RPM 594 ft-lb	4397 RPM 786 ft-lb	4437 RPM 624 ft-lb	4780 RPM 810 ft-lb	4840 RPM 714 ft-lb	5244 RPM 720 ft-lb
3715 RPM 764 ft-lb	3778 RPM 634 ft-lb	3988 RPM 780 ft-lb	4261 RPM 806 ft-lb	4303 RPM 644 ft-lb	4576 RPM 852 ft-lb	4618 RPM 676 ft-lb	4975 RPM 878 ft-lb	5038 RPM 774 ft-lb	5458 RPM 780 ft-lb
3856 RPM 823 ft-lb	3921 RPM 683 ft-lb	4139 RPM 840 ft-lb	4422 RPM 868 ft-lb	4466 RPM 693 ft-lb	4749 RPM 917 ft-lb	4792 RPM 728 ft-lb	5163 RPM 945 ft-lb	5228 RPM 833 ft-lb	5664 RPM 840 ft-lb
3991 RPM 881 ft-lb	4059 RPM 731 ft-lb	4284 RPM 900 ft-lb	4577 RPM 930 ft-lb	4622 RPM 743 ft-lb	4916 RPM 983 ft-lb	4961 RPM 780 ft-lb	5344 RPM 1013 ft-lb	5412 RPM 893 ft-lb	5863 RPM 900 ft-lb
4122 RPM 940 ft-lb	4192 RPM 780 ft-lb	4425 RPM 960 ft-lb	4727 RPM 992 ft-lb	4774 RPM 792 ft-lb	5077 RPM 1048 ft-lb	5123 RPM 832 ft-lb	5519 RPM 1080 ft-lb	5589 RPM 952 ft-lb	6055 RPM 960 ft-lb
4249 RPM 999 ft-lb	4321 RPM 829 ft-lb	4561 RPM 1020 ft-lb	4873 RPM 1054 ft-lb	4921 RPM 842 ft-lb	5233 RPM 1114 ft-lb	5281 RPM 884 ft-lb	5689 RPM 1148 ft-lb	5761 RPM 1012 ft-lb	6241 RPM 1020 ft-lb
4372 RPM 1058 ft-lb	4446 RPM 878 ft-lb	4693 RPM 1080 ft-lb	5014 RPM 1116 ft-lb	5064 RPM 891 ft-lb	5385 RPM 1179 ft-lb	5434 RPM 936 ft-lb	5854 RPM 1215 ft-lb	5928 RPM 1071 ft-lb	6422 RPM 1080 ft-lb
4492 RPM 1116 ft-lb	4568 RPM 926 ft-lb	4822 RPM 1140 ft-lb	5152 RPM 1178 ft-lb	5202 RPM 941 ft-lb	5532 RPM 1245 ft-lb	5583 RPM 988 ft-lb	6014 RPM 1283 ft-lb	6091 RPM 1131 ft-lb	6598 RPM 1140 ft-lb
4608 RPM 1175 ft-lb	4687 RPM 975 ft-lb	4947 RPM 1200 ft-lb	5285 RPM 1240 ft-lb	5337 RPM 990 ft-lb	5676 RPM 1310 ft-lb	5728 RPM 1040 ft-lb	6171 RPM 1350 ft-lb	6249 RPM 1190 ft-lb	6769 RPM 1200 ft-lb
4722 RPM 1234 ft-lb	4802 RPM 1024 ft-lb	5069 RPM 1260 ft-lb	5416 RPM 1302 ft-lb	5469 RPM 1040 ft-lb	5816 RPM 1376 ft-lb	5869 RPM 1092 ft-lb	6323 RPM 1418 ft-lb	6403 RPM 1250 ft-lb	6937 RPM 1260 ft-lb
4833 RPM 1293 ft-lb	4915 RPM 1073 ft-lb	5188 RPM 1320 ft-lb	5543 RPM 1364 ft-lb	5598 RPM 1089 ft-lb	5953 RPM 1441 ft-lb	6008 RPM 1144 ft-lb	6472 RPM 1485 ft-lb	6554 RPM 1309 ft-lb	7100 RPM 1320 ft-lb
4942 RPM 1351 ft-lb	5026 RPM 1121 ft-lb	5305 RPM 1380 ft-lb	5668 RPM 1426 ft-lb	5724 RPM 1139 ft-lb	6087 RPM 1507 ft-lb	6143 RPM 1196 ft-lb	6617 RPM 1553 ft-lb	6701 RPM 1369 ft-lb	7259 RPM 1380 ft-lb
5048 RPM 1410 ft-lb	5134 RPM 1170 ft-lb	5419 RPM 1440 ft-lb	5790 RPM 1488 ft-lb	5847 RPM 1188 ft-lb	6218 RPM 1572 ft-lb	6275 RPM 1248 ft-lb	6760 RPM 1620 ft-lb	6845 RPM 1428 ft-lb	7416 RPM 1440 ft-lb
5152 RPM 1469 ft-lb	5240 RPM 1219 ft-lb	5531 RPM 1500 ft-lb	5909 RPM 1550 ft-lb	5967 RPM 1238 ft-lb	6346 RPM 1638 ft-lb	6404 RPM 1300 ft-lb	6899 RPM 1688 ft-lb	6986 RPM 1488 ft-lb	7569 RPM 1500 ft-lb
5254 RPM 1528 ft-lb	5344 RPM 1268 ft-lb	5640 RPM 1560 ft-lb	6026 RPM 1612 ft-lb	6086 RPM 1287 ft-lb	6472 RPM 1703 ft-lb	6531 RPM 1352 ft-lb	7036 RPM 1755 ft-lb	7125 RPM 1547 ft-lb	7718 RPM 1560 ft-lb
5355 RPM 1586 ft-lb	5445 RPM 1316 ft-lb	5748 RPM 1620 ft-lb	6141 RPM 1674 ft-lb	6202 RPM 1337 ft-lb	6595 RPM 1769 ft-lb	6655 RPM 1404 ft-lb	7170 RPM 1823 ft-lb	7260 RPM 1607 ft-lb	7865 RPM 1620 ft-lb
5453 RPM 1645 ft-lb	5545 RPM 1365 ft-lb	5853 RPM 1680 ft-lb	6254 RPM 1736 ft-lb	6315 RPM 1386 ft-lb	6716 RPM 1834 ft-lb	6777 RPM 1456 ft-lb	7301 RPM 1890 ft-lb	7394 RPM 1666 ft-lb	8010 RPM 1680 ft-lb
5549 RPM 1704 ft-lb	5643 RPM 1414 ft-lb	5957 RPM 1740 ft-lb	6364 RPM 1798 ft-lb	6427 RPM 1436 ft-lb	6835 RPM 1900 ft-lb	6897 RPM 1508 ft-lb	7430 RPM 1958 ft-lb	7525 RPM 1726 ft-lb	8152 RPM 1740 ft-lb
5644 RPM 1763 ft-lb	5740 RPM 1463 ft-lb	6059 RPM 1800 ft-lb	6473 RPM 1860 ft-lb	6537 RPM 1485 ft-lb	6952 RPM 1965 ft-lb	7015 RPM 1560 ft-lb	7557 RPM 2025 ft-lb	7653 RPM 1785 ft-lb	8291 RPM 1800 ft-lb
5737 RPM 1821 ft-lb	5835 RPM 1511 ft-lb	6159 RPM 1860 ft-lb	6580 RPM 1922 ft-lb	6645 RPM 1535 ft-lb	7067 RPM 2031 ft-lb	7131 RPM 1612 ft-lb	7682 RPM 2093 ft-lb	7780 RPM 1845 ft-lb	8428 RPM 1860 ft-lb
5829 RPM 1880 ft-lb	5928 RPM 1560 ft-lb	6257 RPM 1920 ft-lb	6686 RPM 1984 ft-lb	6751 RPM 1584 ft-lb	7180 RPM 2096 ft-lb	7245 RPM 1664 ft-lb	7805 RPM 2160 ft-lb	7904 RPM 1904 ft-lb	8563 RPM 1920 ft-lb
5920 RPM 1939 ft-lb	6020 RPM 1609 ft-lb	6354 RPM 1980 ft-lb	6789 RPM 2046 ft-lb	6856 RPM 1634 ft-lb	7291 RPM 2162 ft-lb	7358 RPM 1716 ft-lb	7926 RPM 2228 ft-lb	8027 RPM 1964 ft-lb	8696 RPM 1980 ft-lb
6009 RPM 1998 ft-lb	6111 RPM 1658 ft-lb	6450 RPM 2040 ft-lb	6891 RPM 2108 ft-lb	6959 RPM 1683 ft-lb	7401 RPM 2227 ft-lb	7468 RPM 1768 ft-lb	8046 RPM 2295 ft-lb	8147 RPM 2023 ft-lb	8826 RPM 2040 ft-lb
6096 RPM 2056 ft-lb	6200 RPM 1706 ft-lb	6544 RPM 2100 ft-lb	6992 RPM 2170 ft-lb	7061 RPM 1733 ft-lb	7509 RPM 2293 ft-lb	7577 RPM 1820 ft-lb	8163 RPM 2363 ft-lb	8266 RPM 2083 ft-lb	8955 RPM 2100 ft-lb
6183 RPM 2115 ft-lb	6288 RPM 1755 ft-lb	6637 RPM 2160 ft-lb	7091 RPM 2232 ft-lb	7161 RPM 1782 ft-lb	7615 RPM 2358 ft-lb	7685 RPM 1872 ft-lb	8279 RPM 2430 ft-lb	8384 RPM 2142 ft-lb	9082 RPM 2160 ft-lb
6268 RPM 2174 ft-lb	6374 RPM 1804 ft-lb	6729 RPM 2220 ft-lb	7189 RPM 2294 ft-lb	7260 RPM 1832 ft-lb	7720 RPM 2424 ft-lb	7791 RPM 1924 ft-lb	8393 RPM 2498 ft-lb	8499 RPM 2202 ft-lb	9208 RPM 2220 ft-lb
6352 RPM 2233 ft-lb	6460 RPM 1853 ft-lb	6819 RPM 2280 ft-lb	7285 RPM 2356 ft-lb	7357 RPM 1881 ft-lb	7824 RPM 2489 ft-lb	7896 RPM 1976 ft-lb	8506 RPM 2565 ft-lb	8613 RPM 2261 ft-lb	9331 RPM 2280 ft-lb
6435 RPM 2291 ft-lb	6544 RPM 1901 ft-lb	6908 RPM 2340 ft-lb	7381 RPM 2418 ft-lb	7453 RPM 1931 ft-lb	7926 RPM 2555 ft-lb	7999 RPM 2028 ft-lb	8617 RPM 2633 ft-lb	8726 RPM 2321 ft-lb	9453 RPM 2340 ft-lb
6517 RPM 2350 ft-lb	6628 RPM 1950 ft-lb	6996 RPM 2400 ft-lb	7475 RPM 2480 ft-lb	7548 RPM 1980 ft-lb	8027 RPM 2620 ft-lb	8101 RPM 2080 ft-lb	8727 RPM 2700 ft-lb	8837 RPM 2380 ft-lb	9574 RPM 2400 ft-lb
6598 RPM 2409 ft-lb	6710 RPM 1999 ft-lb	7083 RPM 2460 ft-lb	7568 RPM 2542 ft-lb	7642 RPM 2030 ft-lb	8127 RPM 2686 ft-lb	8201 RPM 2132 ft-lb	8835 RPM 2768 ft-lb	8947 RPM 2440 ft-lb	9692 RPM 2460 ft-lb
6678 RPM 2468 ft-lb	6791 RPM 2048 ft-lb	7169 RPM 2520 ft-lb	7659 RPM 2604 ft-lb	7735 RPM 2079 ft-lb	8225 RPM 2751 ft-lb	8301 RPM 2184 ft-lb	8942 RPM 2835 ft-lb	9055 RPM 2499 ft-lb	9810 RPM 2520 ft-lb
6757 RPM 2526 ft-lb	6872 RPM 2096 ft-lb	7254 RPM 2580 ft-lb	7750 RPM 2666 ft-lb	7826 RPM 2129 ft-lb	8323 RPM 2817 ft-lb	8399 RPM 2236 ft-lb	9048 RPM 2903 ft-lb	9162 RPM 2559 ft-lb	9926 RPM 2580 ft-lb
6835 RPM 2585 ft-lb	6951 RPM 2145 ft-lb	7337 RPM 2640 ft-lb	7840 RPM 2728 ft-lb	7917 RPM 2178 ft-lb	8419 RPM 2882 ft-lb	8496 RPM 2288 ft-lb	9153 RPM 2970 ft-lb	9268 RPM 2618 ft-lb	10041 RPM 2640 ft-lb
6913 RPM 2644 ft-lb	7030 RPM 2194 ft-lb	7420 RPM 2700 ft-lb	7928 RPM 2790 ft-lb	8006 RPM 2228 ft-lb	8514 RPM 2948 ft-lb	8592 RPM 2340 ft-lb	9256 RPM 3038 ft-lb	9373 RPM 2678 ft-lb	10154 RPM 2700 ft-lb
6989 RPM 2703 ft-lb	7108 RPM 2243 ft-lb	7502 RPM 2760 ft-lb	8016 RPM 2852 ft-lb	8095 RPM 2277 ft-lb	8608 RPM 3013 ft-lb	8687 RPM 2392 ft-lb	9358 RPM 3105 ft-lb	9477 RPM 2737 ft-lb	10266 RPM 2760 ft-lb
7065 RPM 2761 ft-lb	7184 RPM 2291 ft-lb	7584 RPM 2820 ft-lb	8102 RPM 2914 ft-lb	8182 RPM 2327 ft-lb	8701 RPM 3079 ft-lb	8781 RPM 2444 ft-lb	9459 RPM 3173 ft-lb	9579 RPM 2797 ft-lb	10377 RPM 2820 ft-lb
7139 RPM 2820 ft-lb	7260 RPM 2340 ft-lb	7664 RPM 2880 ft-lb	8188 RPM 2976 ft-lb	8269 RPM 2376 ft-lb	8793 RPM 3144 ft-lb	8874 RPM 2496 ft-lb	9560 RPM 3240 ft-lb	9681 RPM 2856 ft-lb	10487 RPM 2880 ft-lb
7213 RPM 2879 ft-lb	7336 RPM 2389 ft-lb	7743 RPM 2940 ft-lb	8273 RPM 3038 ft-lb	8354 RPM 2426 ft-lb	8884 RPM 3210 ft-lb	8966 RPM 2548 ft-lb	9659 RPM 3308 ft-lb	9781 RPM 2916 ft-lb	10596 RPM 2940 ft-lb
7287 RPM 2938 ft-lb	7410 RPM 2438 ft-lb	7822 RPM 3000 ft-lb	8357 RPM 3100 ft-lb	8439 RPM 2475 ft-lb	8974 RPM 3275 ft-lb	9057 RPM 2600 ft-lb	9757 RPM 3375 ft-lb	9880 RPM 2975 ft-lb	10704 RPM 3000 ft-lb
7359 RPM 2996 ft-lb	7484 RPM 2486 ft-lb	7900 RPM 3060 ft-lb	8440 RPM 3162 ft-lb	8523 RPM 2525 ft-lb	9064 RPM 3341 ft-lb	9147 RPM 2652 ft-lb	9854 RPM 3443 ft-lb	9978 RPM 3035 ft-lb	10810 RPM 3060 ft-lb
7431 RPM 3055 ft-lb	7557 RPM 2535 ft-lb	7977 RPM 3120 ft-lb	8522 RPM 3224 ft-lb	8606 RPM 2574 ft-lb	9152 RPM 3406 ft-lb	9236 RPM 2704 ft-lb	9950 RPM 3510 ft-lb	10076 RPM 3094 ft-lb	10915 RPM 3120 ft-lb
7502 RPM 3114 ft-lb	7629 RPM 2584 ft-lb	8053 RPM 3180 ft-lb	8604 RPM 3286 ft-lb	8689 RPM 2624 ft-lb	9240 RPM 3472 ft-lb	9325 RPM 2756 ft-lb	10045 RPM 3578 ft-lb	10172 RPM 3154 ft-lb	11020 RPM 3180 ft-lb
7572 RPM 3173 ft-lb	7701 RPM 2633 ft-lb	8129 RPM 3240 ft-lb	8685 RPM 3348 ft-lb	8770 RPM 2673 ft-lb	9327 RPM 3537 ft-lb	9412 RPM 2808 ft-lb	10139 RPM 3645 ft-lb	10268 RPM 3213 ft-lb	11123 RPM 3240 ft-lb
7642 RPM 3231 ft-lb	7772 RPM 2681 ft-lb	8204 RPM 3300 ft-lb	8765 RPM 3410 ft-lb	8851 RPM 2723 ft-lb	9413 RPM 3603 ft-lb	9499 RPM 2860 ft-lb	10233 RPM 3713 ft-lb	10362 RPM 3273 ft-lb	11226 RPM 3300 ft-lb
7711 RPM 3290 ft-lb	7842 RPM 2730 ft-lb	8278 RPM 3360 ft-lb	8844 RPM 3472 ft-lb	8931 RPM 2772 ft-lb	9498 RPM 3668 ft-lb	9585 RPM 2912 ft-lb	10325 RPM 3780 ft-lb	10456 RPM 3332 ft-lb	11328 RPM 3360 ft-lb
7780 RPM 3349 ft-lb	7912 RPM 2779 ft-lb	8351 RPM 3420 ft-lb	8923 RPM 3534 ft-lb	9011 RPM 2822 ft-lb	9582 RPM 3734 ft-lb	9670 RPM 2964 ft-lb	10417 RPM 3848 ft-lb	10549 RPM 3392 ft-lb	11428 RPM 3420 ft-lb
7848 RPM 3408 ft-lb	7981 RPM 2828 ft-lb	8424 RPM 3480 ft-lb	9001 RPM 3596 ft-lb	9089 RPM 2871 ft-lb	9666 RPM 3799 ft-lb	9754 RPM 3016 ft-lb	10508 RPM 3915 ft-lb	10641 RPM 3451 ft-lb	11528 RPM 3480 ft-lb
7915 RPM 3466 ft-lb	8049 RPM 2876 ft-lb	8497 RPM 3540 ft-lb	9078 RPM 3658 ft-lb	9167 RPM 2921 ft-lb	9749 RPM 3865 ft-lb	9838 RPM 3068 ft-lb	10598 RPM 3983 ft-lb	10733 RPM 3511 ft-lb	11627 RPM 3540 ft-lb
7982 RPM 3525 ft-lb	8117 RPM 2925 ft-lb	8568 RPM 3600 ft-lb	9155 RPM 3720 ft-lb	9245 RPM 2970 ft-lb	9831 RPM 3930 ft-lb	9921 RPM 3120 ft-lb	10688 RPM 4050 ft-lb	10823 RPM 3570 ft-lb	11725 RPM 3600 ft-lb

Do I Need To Be Concerned With The Stator's One-Way Clutch?

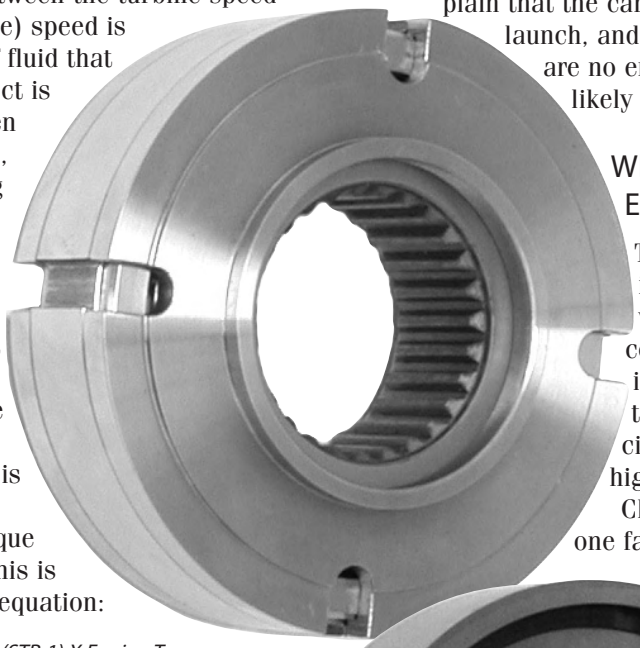
When the difference between the turbine speed and the impeller (engine) speed is greatest, the amount of fluid that the stator blades redirect is also at its highest. When the converter is at stall, the stator is redirecting the most flow and the converter has achieved the Stall Torque Ratio (STR) or the maximum ratio between the input and output torque.

The amount of torque developed by the stator due to fluid redirection is equal to the difference between the output torque and the input torque. This is shown in the following equation:

Output Torque–Input Torque=(STR-1) X Engine Torque

This is the amount of torque that is applied to the one-way clutch. If the clutch fails to hold, there will be no torque multiplication.

Typically, the OEM GM 245mm clutch can hold up to 400 lb-ft of torque. If the torque is increased beyond that, the OEM one-way clutch could fail. If the one-way clutch fails, the converter will lose its torque multiplication. The customer will probably complain that the car went from working well to bogging after launch, and has trouble reaching stall speed. If there are no engine issues, the one-way clutch is a likely culprit.



What Can I Do To Improve Efficiency?

The peak efficiency of a torque converter is the maximum ratio of output speed versus input speed. This occurs when the converter no longer multiplies torque (this is known as the coupling speed). Stock torque converters are typically 85% efficient, while racing units can achieve as high as 95% efficiency.

Clearance between the bladed elements is one factor that affects the efficiency of a torque converter. Minimizing the clearance between the impeller and turbine can increase efficiency. In order to reduce this clearance, it is necessary to improve the runout of the faces of the impeller and turbine blades. Start by welding and brazing the impeller and turbine to improve rigidity. Then install the impeller and turbine hubs. Next, machine the blade faces to run within .015" of the turbine hub and impeller hub journals. This should allow clearances to be run as low as .050". The K factor will be reduced slightly, lowering the stall speed approximately 100 to 300 RPM. Conversely, increasing the clearance will decrease the efficiency and increase the stall speed. Raising the stall speed by increasing the clearance is not recommended.

RACEKITS	APPLICATIONS
GM-RK-1	Race Kit for GM Powerglide, THM350, THM400. Utilizes GM 245mm core, with 30-tooth turbine hub. 10.75" & 11.50" bolt patterns, forged front cover.
GM-RK-1S	Race Kit for GM Powerglide, THM350, THM400. Utilizes GM 245mm core, with 30-tooth turbine hub. 10.75" bolt pattern, forged front cover.
GM-RK-2	Race Kit for GM Powerglide, THM350, THM400. Utilizes 8" Opel core, with 30-tooth turbine hub, 10.75" & 11.50" bolt patterns, forged front cover.
GM-RK-2S	Race Kit for GM Powerglide, THM350, THM400. Utilizes 8" Opel core, with 30-tooth turbine hub, 10.75" bolt pattern, forged front cover.
GM-RK-7	Race Kit for GM Powerglide. Utilizes GM 245mm core, with 17-tooth turbine hub. 10.75" & 11.50" bolt patterns, forged front cover.
GM-RK-7S	Race Kit for GM Powerglide. Utilizes GM 245mm core, with 17-tooth turbine hub. 10.75" bolt pattern, forged front cover.
GM-RK-8	Race Kit for GM Powerglide. Utilizes 8" Opel core, with 17-tooth turbine hub, 10.75" & 11.50" bolt patterns, forged front cover.
GM-RK-8S	Race Kit for GM Powerglide. Utilizes 8" Opel core, with 17-tooth turbine hub, 10.75" bolt pattern, forged front cover.
GM-RK-9	Race Kit for GM THM200-4R / THM700-R4. Utilizes GM 245mm core. Non-Lockup, with 27-tooth turbine hub, 10.75" & 11.50" bolt patterns, forged front cover.
GM-RK-10	Race Kit for GM THM200-4R / THM700-R4. Utilizes GM 245mm core. Non-Lockup, with 30-tooth turbine hub, 10.75" & 11.50" bolt patterns, forged front cover.
GM-RK-11	Race Kit for GM 4L60 / 4L60E - 298mm. Utilizes GM 245mm core. Lockup, with 30-tooth turbine hub, 10.75" & 11.08" bolt patterns, uses stock GM 245mm front cover and clutch.
GM-RK-12	**New** - Race Kit for GM THM200-4R / THM700-R4. Utilizes GM 245mm core. Lockup, with 27-tooth turbine hub, 10.75" & 11.08" bolt patterns, uses stock GM 245mm front cover and clutch.
GM-RK-13	**New** - Race Kit for GM 4L60E - 300mm. Utilizes GM 245mm core. Lockup, with 30-tooth turbine hub, uses stock GM 245mm front cover and clutch. Available Spring 2005.
FD-RK-1	Race Kit for Ford AOD. Utilizes GM 245mm core. Lockup or Non-Lockup, with 35-tooth turbine hub, 11.40" bolt pattern, forged front cover. Lockup utilizes Ford O.E. damper assembly.
FD-RK-3	Race Kit for Ford C-4. Utilizes GM 245mm core. Replaces O.E. 10" & 12" converters, 5 15/16" stack-up height, with 26-tooth turbine hub, 10.50" & 11.40" bolt patterns, forged front cover.
FD-RK-3S	Race Kit for Ford C-4. Utilizes GM 245mm core. Replaces O.E. 10" & 12" converters, with 26-tooth turbine hub, 10.50" bolt pattern, forged front cover.
FD-RK-4	Race Kit for Ford C-6. Utilizes GM 245mm core, with 31-tooth turbine hub, 10.50" & 11.40" bolt patterns, forged front cover. Includes 1.375" diameter pilot. Optional 1.848"" diameter pilot, FD-PI-8, must be ordered separately, not included in kit.
FD-RK-9	Race Kit for Ford C-4. Utilizes GM 245mm core. Replaces O.E. 11" converter, 5⅝"" stack-up height, with 26-tooth turbine hub, 10.50" bolt pattern, forged front cover. This converter is for the C-4 with a small bell housing, small bolt pattern. Also available for this kit is the 24-tooth turbine hub for the early model applications.
FD-RK-10	**New** - Race Kit for Ford AODE. Utilizes GM 245mm core. Lockup, with 31-tooth turbine hub, uses stock GM 245mm front cover and clutch. Available January 2005.
CH-RK-1-CP	Race Kit for Chrysler 727. Utilizes GM 245mm core, with 24-tooth turbine hub, uses Chrysler O.E. thick mounting pad and ring gear. This kit will be replaced by CH-RK-4 when it becomes available.
CH-RK-2-CP	Race Kit for Chrysler 904. Utilizes GM 245mm core, with 27-tooth turbine hub, uses Chrysler O.E. thick mounting pad and ring gear. This kit will be replaced by CH-RK-3 when it becomes available.
CH-RK-3	**New** - Race Kit for Chrysler 904. Utilizes GM 245mm core, with 27-tooth turbine hub, forged front cover and bolt-on ring gear. Available Spring 2005. Will replace CH-RK-2-CP.
CH-RK-4	**New** - Race Kit for Chrysler 727. Utilizes GM 245mm core, with 24-tooth turbine hub, forged front cover and bolt-on ring gear. Available Spring 2005. Will replace CH-RK-1-CP.