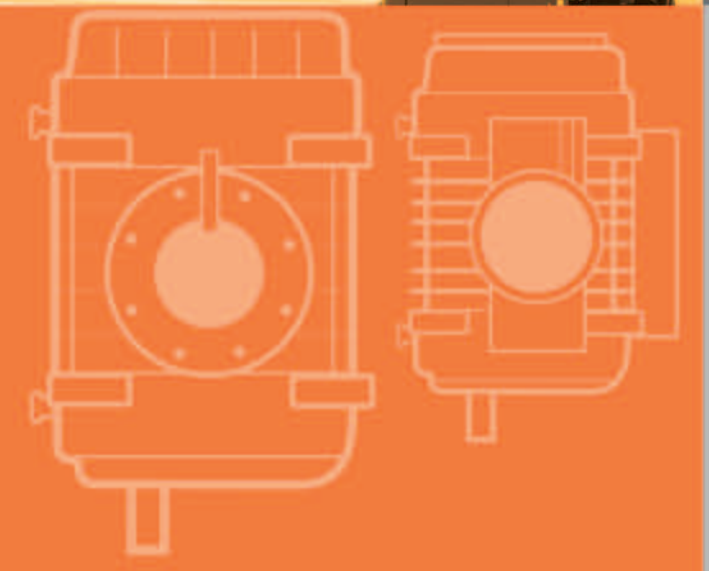
CHELSEA®
Blower Torque Guide



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Foreword

The Chelsea Products Division of Parker Hannifin is pleased to bring you our updated Blower Torque Guide. By utilizing the information contained within this guide, you will find choosing the correct PTO for your application is much simpler.

For this latest edition of the Blower Torque Guide, Chelsea teamed with the leading pneumatic blower manufacturers to compile the technical data needed to match your application with the right PTO. In addition to the blower data, we have also included relevant applications pages, data on drivelines and U-joints, as well as information about the four best PTOs used to drive blower applications.

It is our pleasure to bring this useful information to you as we continue to provide the Premier Customer Service you have come to expect.

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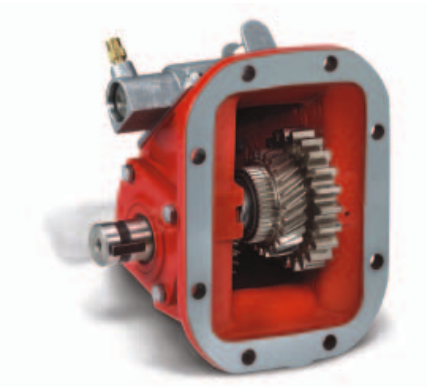
PTO Options

489 Series - 8-Bolt

- 442 Series family, but with a 8-Bolt mounting flange
- No adapter plate needed
- Less installation time, less expense and less chance of leakage
- Wide range of shifters options and pump flanges

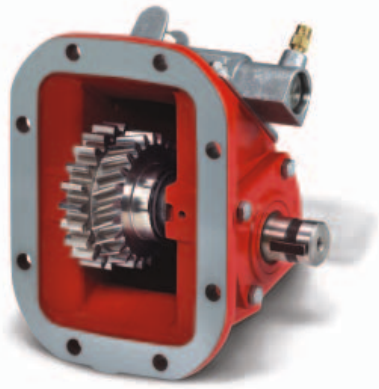


Specifications Chart – 489 Series

	489*A	489*C	489*F	489*H	489*L	489*Q	489*R	489*S	489*U	489*W	489*X
Standard Output Shaft Size	1-1/4"										
Intermittent Torque Rating (Lbs. ft.)	250	250	250	250	250	225	225	200	195	175	140
Intermittent Torque Rating (Nm)	339	339	339	339	339	305	305	271	264	237	190
Horsepower Rating for Intermittent Service											
At 500 R.P.M. of Output Shaft (HP)	24	24	24	24	24	21	21	19	19	17	13
At 1000 R.P.M. of Output Shaft (HP)	48	48	48	48	48	43	43	38	37	33	27
At 500 R.P.M. of Output Shaft (Kw)	18	18	18	18	18	16	16	14	14	12	10
At 1000 R.P.M. of Output Shaft (Kw)	36	36	36	36	36	32	32	28	28	25	20
Approximate Weight:	30 lbs. [13.6 kg]										

680 Series - 8-Bolt

- Excellent coverage for transmissions with 8-Bolt openings
- Deep mount housing option for Mack applications
- Several speed ratios to choose from
- Wide range of shift and output options



Specifications Chart – 680 Series

	680*F	680*Q	680*S
Standard Output Shaft Size		1-1/4" Round w/key	
*Intermittent Torque Rating At 1500 R.P.M. or less (Lbs. ft.)	375	375	229
*Intermittent Torque Rating At 1500 R.P.M. or less (Nm)	508	508	310
Horsepower Rating for Intermittent Service			
At 500 R.P.M. of Output Shaft (HP)	36	36	22
At 1000 R.P.M. of Output Shaft (HP)	71	71	44
At 1500 R.P.M. of Output Shaft (HP)	107	107	65
At 500 R.P.M. of Output Shaft (Kw)	27	27	16
At 1000 R.P.M. of Output Shaft (Kw)	53	53	33
At 1500 R.P.M. of Output Shaft (Kw)	80	80	49
Approximate Weight:		28.2 lbs. [12.8 kg]	

*Above 1500 R.P.M. of PTO Output Shaft Speed: Call for Approval

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823 Series - 8-Bolt

- Robust design for High torque applications
- Lever shift standard
- Inspection cover for adjusting backlash
- Popular pump mounts available
- Best selection with Fuller high torque capacity bearings

Specifications Chart – 823 Series

	823*B	823*D	823*G	823*J	823*M	823*R	823*T
Standard Output Shaft Size	1-1/2" 10 Spline w/1410 Flange						
Intermittent Torque Rating (Lbs. ft.)	500	500	500	500	500	400	350
Intermittent Torque Rating (Nm)	678	678	678	678	678	542	475
Horsepower Rating for Intermittent Service							
At 500 R.P.M. of Output Shaft (HP)	48	48	48	48	48	38	33
At 1000 R.P.M. of Output Shaft (HP)	95	95	95	95	95	76	67
At 500 R.P.M. of Output Shaft (Kw)	36	36	36	36	36	28	25
At 1000 R.P.M. of Output Shaft (Kw)	71	71	71	71	71	57	50
Approximate Weight:	76 lbs. [34.5 kg]						

880 Series - 8-Bolt

- Wide coverage for tough applications
- Speed ratios for high and low speed applications
- Removable shift cover for adjusting backlash
- Dual-pump output for mounting a pump on each end of the PTO

Specifications Chart – 880 Series

	880*B	880*D	880*G	880*J	880*M	880*Q	880*R	880*T
Standard Output Shaft Size	1-1/2" 10 Spline w/1410 Flange							
Intermittent Torque Rating (Lbs. ft.)	500	500	500	500	500	450	400	350
Intermittent Torque Rating (Nm)	678	678	678	678	678	610	542	475
Horsepower Rating for Intermittent Service								
At 500 R.P.M. of Output Shaft (HP)	48	48	48	48	48	43	38	33
At 1000 R.P.M. of Output Shaft (HP)	95	95	95	95	95	86	76	67
At 500 R.P.M. of Output Shaft (Kw)	36	36	36	36	36	32	28	25
At 1000 R.P.M. of Output Shaft (Kw)	71	71	71	71	71	64	57	50
Approximate Weight:	63 lbs. [28.6 kg]							

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PTO Options

PTO Options Chart – 8-Bolt PTOs

PTO Series		489	680	823	880
Lubrication					
X	Standard	x	x	x	x
P	Pressure	x	x	x	x
Shifting					
A	Air	x	x	x	x
C	Heavy Duty Bracket Less Cable	x	x		
H	Less Wire Shift Cover	x	x		x
P	Electric/Air 12V	x	x		
V	Air Shift Less Installation Kit	x	x	x	x
W	Wire	x	x		
X	Less Cable & Knob	x	x		
Y	Lever			x	x
Output					
LD***	1-1/4" Round Shaft w/Lube Pump (Same as XD)	x	x		
LG***	1 1/2" 10 Spline w/1410 & Lube Pump (Same as XV)				x
XD	1-1/4" Round Shaft	x	x		
XV	1-1/2" 10 spline w/1410 Series Flange		x	x	x
XX**	1-1/4" Tapered Shaft for Companion Flange 3-1-604	x	x		

Check the current price book for available options.
**** Order companion Flange (3-1-604) separately**
***** Recommended for top mount applications**

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Torque Factors

Product blowers driven by Power Take-Off's are a subject of great concern which we all recognize. A PTO and blower combination that has not been correctly applied can spell disaster for the life of the PTO. To complicate these applications even further, several factors exist that you must address in order to determine the proper torque rating for the blower. These factors are shown below:

Start-up Torque
Start-up Torque is effected by correct or incorrect start up procedures as well as step-up gear ratios which allow you to achieve high blower R.P.M. with low engine speeds.

Cold weather can also effect your start-up torque. Applications which require operation in temperatures below 32 degrees Fahrenheit will increase start-up torque requirements by 10%.

Running Torque
Running Torque is the torque experienced during normal operation of the blower and is determined by the system pressure of the blower. Cold weather (below 32 degrees Fahrenheit) can play a role in increasing the running torque.

To help simplify the specification process for blower applications, Chelsea has worked with blower manufactures like Gardner Denver, Drum Industries, M.D. Pneumatics, Roots Dresser, Tuthill, and VMS to gather information on each of their various product lines. With this information, it is now possible for us to provide you with the steady state running torque and start-up torque for both correct and incorrect start-up procedures, based on the blower manufacturers' specifications.

Important notes to remember while using the blower torque tables:

All data supplied has already taken into account step-up gear head ratios used between the PTO and blower.

All torque values in the tables are to be compared to published PTO intermittent torque ratings. There is no need to derate the PTO torque ratings.

The continuous duty cycle of the blower has already been accounted for in the blower tables.

Cold weather applications require an increase in all blower torque ratings by 10% (i.e. 326 Lbs. ft. x 1.10 = 358.6 Lbs. ft. cold weather torque). This formula must be used when the PTO and blower are operated in weather conditions droping below 32 degrees Fahrenheit for more than 50% of the time.

Blower Start-up Procedures

There are correct start up procedures that should be used to help keep your start up torque to a minimum. They are as follows:

1. Make sure that there are no restrictions down-stream from the blower. Blowers must be started under no load conditions.

2. With engine at low idle, parking brake engaged, transmission in neutral and clutch depressed you can now engage the PTO.

3. SLOWLY release the clutch. (Warning, it is extremely important not to pop the clutch on engagement.)

4. Bring the engine up to recommended operating speed. This should also be done slowly. (Within 3-5 seconds.)

5. For start-ups during cold weather, extra care should be taken in steps 1-4.

If these start-up steps are followed, a lower torque will be seen upon start-up. A high torque would be seen by engaging the PTO at high engine R.P.M. or popping the clutch. An example of this would be a blower with a start-up torque of 171 Lbs. ft. when correctly started but requiring 488 Lbs. ft. of torque when incorrectly started. As you can see, incorrect starting procedures would demand the torque capacity of an eight-bolt PTO rather than a six-bolt PTO.

Drivelines

An auxiliary power shaft transmits torque from the power source to the driven accessory. The shaft must be capable of transmitting the maximum torque and R.P.M. required of the accessory, plus any shock loads that develop.

An auxiliary power shaft operates through constantly relative angles between the power source and the driven accessory, therefore, the length of the auxiliary power shaft must be capable of changing while transmitting torque. This length change, commonly called “slip movement”, is caused by movement of the power train due to torque reactions and chassis deflections.

Joint operating angles are very important in an auxiliary power joint application. In many cases, the longevity of a joint is dependent on the operating angles. (See chart below)

This information is limited to 1000 through 1310 series applications. For applications requiring a series larger than 1310, contact your local Chelsea distributor.

Spicer® Universal Joint Operating Angles			
Prop. Shaft R.P.M.	**Max. Normal Operating Angle**	**Prop. Shaft R.P.M.**	**Max. Normal Operating Angle**
3000	5° 50'	1500	11° 30'
2500	7° 00'	1000	11° 30'
2000	8° 40'	500	11° 30'

Above based on angular acceleration of 100 RAD/SEC^2

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Drivelines

Every U-Joint That Operates at an Angle Creates a Vibration.
U-joint operating angles are probably the most common causes of driveline vibration in vehicles that have had auxiliary equipment installed. When you install a driveshaft in a vehicle with auxiliary equipment, make sure that you follow the basic rules that apply to u-joint operating angles:

Rule No. 1: U-joint operating angles at each end of a shaft should always be at least 1 degree.

Rule No. 2: U-Joint operating angles on each end of a driveshaft should always be equal within one degree of each other.

Rule No. 3: U-joint operating angles should not be larger than 3 degrees. If they are, make sure that they do not exceed the maximum recommended angles.

A u-joint operating angle is the angle that occurs at each end of a driveshaft when the output shaft of the Power Take-Off and the input shaft of the auxiliary equipment are not in line.

The connecting driveshaft operates with an angle at each u-joint. It is that angle that creates a vibration.

Reducing and canceling vibration
A key point to remember about u-joint operating angles: To reduce the amount of vibration, the angles on each end of a driveshaft should always be **small**.

To cancel an angle vibration, the u-joint operating angles need to be equal within on degree at each end of the driveshaft.

Single Plane and Compound U-Joint Operating Angles

There are two types of u-joint operating angles: Single Plane and Compound.

Single Plane
Single Plane angles occur when the Power Take-off and driven components are in-line when viewed from either the top or side, but not both.

There are two things that you can do to always make sure Single Plane angles are SMALL and EQUAL: Make sure that the Power Take-Off and auxiliary equipment is mounted so that their centerlines are parallel when viewed from both he side and the top. Make sure the offset between them is small in both views.

Compound Angles
Compound u-joint operating angles occur when the Power Take-Off and auxiliary equipment are not in-line when viewed from BOTH the top and the side. Their centerlines, however, are parallel in both views.

Compound u-joint operating angle is one of the most common causes of driveline vibration. To avoid these problems, remember the following important points:

- When setting up an application that requires Compound u-joint operating angles, always keep the centerlines of the Power Take-Off and auxiliary equipment parallel in both views.
- Always keep the offset between their horizontal and vertical centerlines small.

Angle Size
The magnitude of a vibration created by a u-joint operating angle is proportional to the size of the u-joint operating angle. It is recommended that true u-joint operating angles be 3 degrees or less.

BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State	Pressure (PSI)
T5CDL9 with 1:1 (direct)				
	410	192	229	20
			188	16
			143	12
T5CDL12 with 1:1 (direct)				
	474	265	304	20
			248	16
			188	12
T5CDL13 with 1:1 (direct)				
	512	286	304	15
			255	12
			203	8
T5CDL12L92 with 1:1 (direct)				
	661	370	322	20
			290	18
			258	16
			193	12

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

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BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs.-ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
450, HPD450 with 1:1 (direct)				
	476	262	183	25
			167	20
			150	15
			142	10
			133	5
D807 with 1:1 (direct)				
	634	349	244	20
			221	18
			195	16
			173	14
			150	12
			128	10
D907 with 1:1 (direct)				
	653	359	251	16
			221	14
			191	12
			161	10

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BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
4504 with 1:1 (direct)				
	122	43	59	15
			48	12
			38	10
			31	8
			21	5
			9	2
4504 with 2:1 (step-up)				
	392	183	118	15
			96	12
			76	10
			62	8
			42	5
			18	2
4506 with 1:1 (direct)				
	178	63	90	15
			72	12
			60	10
			49	8
			31	5
			13	2
4506 with 2:1 (step-up)				
	560	260	180	15
			142	12
			120	10
			98	8
			62	5
			26	2

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

Continued on Next Page

BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
4509 with 1:1 (direct)				
	262	91	131	15
			107	12
			90	10
			73	8
			48	5
			23	2
4509 with 2:1 (step-up)				
	540	378	262	15
			214	12
			180	10
			146	8
			96	5
			46	2
4512 with 1:1 (direct)				
	342	120	167	15
			138	12
			115	10
			91	8
			63	5
			28	2
4512 with 2:1 (step-up)				
	702	491	334	15
			276	12
			230	10
			182	8
			126	5
			56	2

* Only to be used with correct start-up procedures.
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BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
4006 with 1:1 (direct)				
	214	75	39	10
			33	8
			23	5
			13	2
4009 with 2.5:1 (step-up)				
	326	114	204	15
			161	12
			154	10
4009 with 2:1 (step-up)				
	214	75	163	15
			129	12
			107	10
4009 with 1.6:1 (step-up)				
	142	50	131	15
			103	12
			86	10
4009 with 1.4:1 (step-up)				
	112	39	114	15
			90	12
			75	10
4009 with 1:1 (direct)				
	63	22	82	15
			64	12
			54	10

Continued on Next Page

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
4012 with 2.5:1 (step-up)				
	399	140	284	15
			214	12
			178	10
4012 with 2:1 (step-up)				
	261	91	227	15
			171	12
			142	10
4012 with 1.6:1 (step-up)				
	172	60	182	15
			137	12
			114	10
4012 with 1.4:1 (step-up)				
	135	47	159	15
			120	12
			99	10
4012 with 1:1 (direct)				
	76	27	114	15
			86	12
			71	10
71-4009, 06 GH9 with 2.5:1 (step-up)				
	488	171	285	25
			230	20
			173	15
			128	10

Continued on Next Page

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
71-4009, 06 GH9 with 2:1 (step-up)				
	318	111	228	25
			184	20
			138	15
			102	10
71-4009, 06 GH9 with 1.6:1 (step-up)				
	209	73	182	25
			147	20
			110	15
			82	10
71-4009, 06 GH9 with 1.4:1 (step-up)				
	163	57	159	25
			129	20
			97	15
			71	10
71-4009, 06 GH9 with 1:1 (direct)				
	91	32	114	25
			92	20
			69	15
			51	10

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

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BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
68RBTM with 1:1 (direct)				
	346	121	153	16
			144	15
			127	13
			101	10
			72	7
610RBT with 1:1 (direct)				
	289	101	177	15
			155	13
			122	10
			99	8
			77	6
613RBT with 1:1 (direct)				
	503	176	186	12
			155	10
			127	8
			98	6
			83	5
404J with 1:1 (direct)				
	104	37	47	12
			39	10
			30	8
			21	6
			17	4

Continued on Next Page

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

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BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
406J with 1:1 (direct)				
	145	51	69	12
			56	10
			47	8
			34	6
			21	4
409J with 1:1 (direct)				
	210	74	103	12
			86	10
			69	8
			51	6
			39	4
412J with 1:1 (direct)				
	275	96	137	12
			111	10
			90	8
			69	6
			47	4
418J with 1:1 (direct)				
	265	93	167	10
			137	8
			103	6
			73	4

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BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
5507-76X2G with 2.5:1 (step-up)				
	715	500	408	20
			358	18
			303	15
			250	12
5507-76X2G with 2:1 (step-up)				
	466	326	326	20
			286	18
			242	15
			200	12
5507-76X2G with 1.6:1 (step-up)				
	460	215	261	20
			229	18
			194	15
			160	12
5507-76X2G with 1.4:1 (step-up)				
	480	167	228	20
			200	18
			169	15
			140	12

Continued on Next Page

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

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BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
5507-76X2G with 1:1 (direct)				
	268	93	163	20
			143	18
			121	15
			100	12
5509-76X2G with 2.5:1 (step-up)				
	853	598	360	15
			278	12
			253	10
5509-76X2G with 2:1 (step-up)				
	555	389	288	15
			222	12
			202	10
5509-76X2G with 1.6:1 (step-up)				
	545	254	230	15
			178	12
			162	10
5509-76X2G with 1.4:1 (step-up)				
	425	198	202	15
			155	12
			141	10

Continued on Next Page

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
5509-76X2G with 1:1 (direct)				
	312	109	144	15
			111	12
			101	10
T850 with 1:1 (direct)				
	416	229	160	20
			145	18
			118	15
			95	12
			63	8
T1050 with 1:1 (direct)				
	487	268	188	18
			163	16
			125	12
			108	10
			90	8

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

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Chelsea Products Division
Olive Branch, MS 38654 USA

BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
VMS 9.25 with 1:1 (direct)				
	429	236	165	18
			146	16
			135	14
VMS 13.0 with 1:1 (direct)				
	536	295	206	15
			188	12
			161	10

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

BLOWER TORQUE RATINGS

Blower Model	Torque (Lbs. ft.) Incorrect Start-Up	Torque (Lbs. ft.) Correct Start-Up*	Torque (Lbs. ft.) Steady-State Running	Pressure (PSI)
RTL 60 with 1:1 (direct)				
	155	108	156	29
			140	22
			101	15
			86	7
			76	0
RTL 80 with 1:1 (direct)				
	222	155	190	29
			160	22
			136	15
			116	7
			109	0
RTL 100 with 1:1 (direct)				
	277	194	251	29
			217	22
			184	15
			150	7
			136	0

* Only to be used with correct start-up procedures.
NOTE: Blower torque ratings are to be compared to Chelsea intermittent PTO torque ratings.

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The following PTO application information is provided for ***reference only*** and represents some of the more popular transmission applications for blower applications. Please refer to the Chelsea Applications Catalog (HY25-3000/US) or the PTO e-selection at www.parker.com/chelsea for complete transmission application information.

CAUTION: Eaton Transmission Division has established a Maximum Torque Limit for the Transmission PTO Driver Gear. For all RT/RTO/RTLO transmissions the torque limit is 350 Ft-lbs [475 N.m] unless the transmission has been upgraded to a roller type input shaft bearing, Eaton part number 4301417, then 500 Ft-lbs [678 N.m] torque becomes the Maximum limit. All torque limits on this application page reflect the 350 Ft-lbs [475 N.m] limit at the Transmission PTO Drive Gear.

FLR-34 Bottom Opening 8-Bolt (RT/RTA/RTF/RTLO Series Transmissions)

PTO Model Number	Intermittent Torque*	Engine %
489XRAHX-*3**	178	137
489XUAHX-*3**	126	194
489XWAHX-*3**	107	229
680XQAHX-*3**	206	118
680XSAHX-*3**	150	163
823XRAHX-*3**	172	142
823XTKTX-*3**	142	172
880XQAHX-*3**	203	120
880XRAHX-*3**	172	142
880XTAHX-*3**	134	183

*Published Torque on the Eaton pages listed is calculated as not to exceed the Eaton® Transmission Torque Limit.

FLR-58 Bottom Opening 8-Bolt (RTAO/RTLO Series Transmissions)

PTO Model Number	Intermittent Torque*	Engine %
489XLAHX-*3**	222	124
489XRAHX-*3**	178	155
680XQAHX-*3**	206	134
680XSAHX-*3**	150	184
823XRAHX-*3**	172	160
823XTKTX-*3**	142	194
880XQAHX-*3**	203	136
880XRAHX-*3**	172	160

*Published Torque on the Eaton pages listed is calculated as not to exceed the Eaton® Transmission Torque Limit.

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PTO Applications

CAUTION: Eaton Transmission Division has established a Maximum Torque Limit for the Transmission PTO Driver Gear. For all RT/RTO/RTLO transmissions the torque limit is 350 Ft-lbs [475 N.m] unless the transmission has been upgraded to a roller type input shaft bearing, Eaton part number 4301417, then 500 Ft-lbs [678 N.m] torque becomes the Maximum limit. All torque limits on this application page reflect the 350 Ft-lbs [475 N.m] limit at the Transmission PTO Drive Gear.

FLR-88 Bottom Opening 8-Bolt (FRO Series Transmissions)

PTO Model Number	Intermittent Torque*	Engine %
489GHAHX-*3**	250	118
489GLAHX-*3**	250	132
489GRAHX-*3**	225	164
489GUAHX-*3**	180	233
489GWAHX-*3**	153	274
680GQAHX-*3**	295	142
680GSAHX-*3**	214	195
823GMAHX-*3**	340	123
823GRAHX-*3**	246	170
823GTKTX-*3**	191	206
880GMAHX-*3**	340	123
880GQAHX-*3**	290	144
880GRAHX-*3**	246	170
880GTAHX-*3**	191	219

*Published Torque on the Eaton pages listed is calculated as not to exceed the Eaton® Transmission Torque Limit.

RKW-1 Bottom Opening 8-Bolt (M Series Transmissions)

PTO Model Number	Intermittent Torque	Engine %
489XQAHX-*3**	225	123
489XRAHX-*3**	225	142
489XSAHX-*3**	200	169
489XUAHX-*3**	195	202
489XWAHX-*3**	175	237
489XXAHX-*3**	140	281
680XQAHX-*3**	375	123
680XSAHX-*3**	325	169
823XRAHX-*3**	400	147
823XTKTX-*3**	350	177
880XQAHX-*3**	450	125
880XRAHX-*3**	400	147
880XTAHX-*3**	350	189

RKW-2 Bottom Opening 8-Bolt (MO Series Transmissions)

PTO Model Number	Intermittent Torque	Engine %
489XHAHX-*3**	250	137
489XLAHX-*3**	250	153
489XQAHX-*3**	225	165
489XRAHX-*3**	225	191
489XSAHX-*3**	200	227
489XUAHX-*3**	195	270
489XWAHX-*3**	175	318
489XXAHX-*3**	140	376
680XFAHX-*3**	375	118
680XQAHX-*3**	375	165
680XSAHX-*3**	325	227
823XRAHX-*3**	400	197
823XTKTX-*3**	350	239
880XJAHX-*3**	500	122
880XMAHX-*3**	500	143
880XQAHX-*3**	450	167
880XRAHX-*3**	400	197
880XTAHX-*3**	350	254

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PTO Applications

SPR-137 Left Opening 8-Bolt (Pro Shift 9 Speed Series Transmissions)

PTO Model Number	Intermittent Torque*	Engine %
489XLAHX-*5**	250	124
489XQAHX-*5**	225	134
489XRAHX-*5**	225	155
489XSAHX-*5**	200	184
489XUAHX-*5**	195	220
489XWAHX-*5**	175	258
489XXAHX-*5**	140	306
680XQAHX-*5**	375	134
680XSAHX-*5**	325	184
823XRAHX-*5**	400	60
823XTKTX-*5**	350	194
880XQAHX-*5**	450	136
880XRAHX-*5**	400	160
880XTAHX-*5**	350	206

SPR-140 Left Opening 8-Bolt (Pro Shift 10 Speed Series Transmissions)

PTO Model Number	Intermittent Torque*	Engine %
489XLAHX-*5**	250	127
489XQAHX-*5**	225	137
489XRAHX-*5**	225	159
489XSAHX-*5**	200	189
489XUAHX-*5**	195	225
489XWAHX-*5**	175	265
489XXAHX-*5**	140	313
680XQAHX-*5**	375	137
680XSAHX-*5**	325	189
823XRAHX-*5**	400	164
823XTKTX-*5**	350	199
880XQAHX-*5**	450	139
880XRAHX-*5**	400	164
880XTAHX-*5**	350	212

Notes

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2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of:

(A) All Power Take-Off units one (1) year from date of installation.

(B) Except 267, 277, 278, 242, 244, 246, 250, 251 and 859 series two (2) years from date of installation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

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6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

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1/06-P

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