

3Z Series Motors

Case drain capable, high-flow,
Low speed, high-torque motors

Catalog No. HY13-1596-02/US



ENGINEERING YOUR SUCCESS.

WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated on the separate page of this document entitled "Offer of Sale".

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WARNING

This product can expose you to chemicals including lead and DEHP, which are known to the State of California to cause cancer, and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov

Parker Hannifin Corporation
Pump & Motor Division
Greeneville, Tennessee, USA

Introduction

Wherever in the world machinery is designed, manufactured, or used, Parker is there to meet your hydraulic application requirements. Parker's 3Z product family is well suited for applications that require high flow or the use of a case drain.

This catalog contains the information you need to order hydraulic motor products. It contains complete specifications, dimensions, and ordering information on the 3Z product family, including technical data and reference material for designers, builders, and users of motion control machinery.

And when you're ready to order, call your local Parker hydraulic distributor for fast delivery and service. Or call your Parker Hydraulic Sales Office (see listing at the back of this catalog)."

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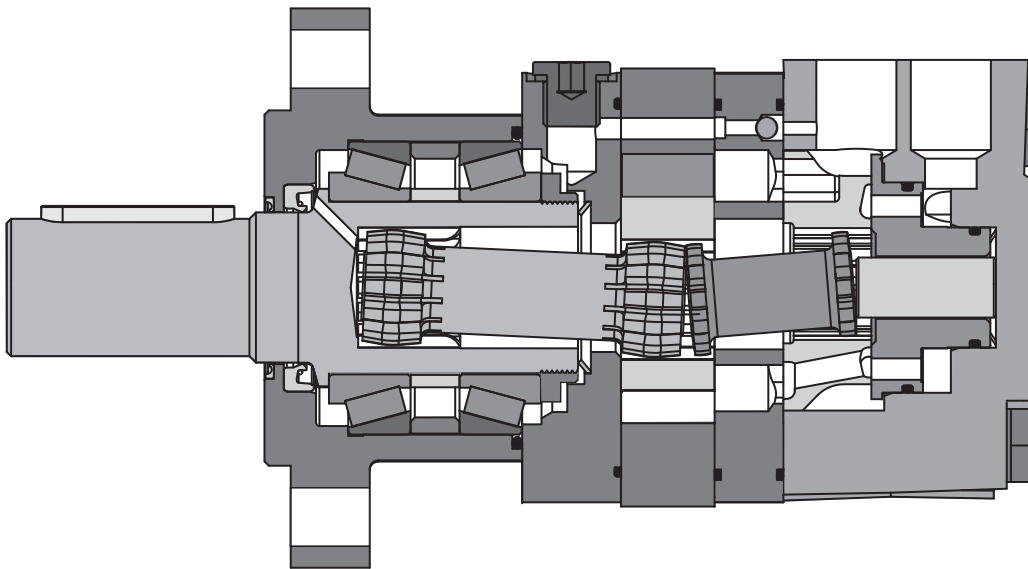
Parker Hannifin Corporation
Pump & Motor Division
Greeneville, Tennessee, USA

Technical Information

11 Displacements	(4.9 - 34.5 in ³ /rev) 80 . . . 565 cm ³ /rev	
Maximum Pressure with Case Drain Attached	Cont (3050 psid) . . .210 bar	Int (3990 psid) . . .275 bar
Maximum Oil Flow	(24 gpm) . . . 95 lpm	
Maximum Speed	(1000 rpm)	
Maximum Torque	Cont (7660 lb in) 865 Nm	Int (8850 lb in) 1000 Nm
Maximum Side Load at Key	(4000 lb) . . . 17,700 N	

High-Flow, Case-Drain-Capable, Low-Speed, High-Torque Motor

This light-duty motor is designed for high-flow applications and/or applications requiring a case drain. It is suitable for series applications and withstands high shaft side loads.



3ZE
Series






XXX
Displacement

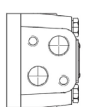
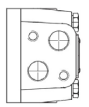
X
Mounting


X
Ports

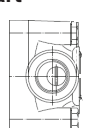
XX
Shaft






Code	cm ³ /U	in ³ /rev
080	80 / 4.9	
100	100 / 6.1	
125	126 / 7.7	
160	160 / 9.7	
200	200 / 12.2	
250	250 / 15.3	
315	315 / 19.2	
400	397 / 24.2	
475	475 / 29.0	
525	523 / 31.9	
565	565 / 34.5	

Code	Mounting
A	SAE "A" 2 Bolt 
B	SAE "B" 2 Bolt 
M	Magneto, 4 Bolt 
V	SAE "A" 4 Bolt 
W	Wheel Mount, 4.25" Pilot 

Code	Side Ports
B	7/8-14 UNF 
G	M22 X 1.5 

Code	Rear Ports
A	7/8-14 UNF 

Code	180° Apart
4	1-1/16-12 UNF 

Code	Shaft
01	1" SAE 6B Spline 
02	1" Straight Key 
03	1.25" Straight Key 
08	1.25" SAE J501 Tapered 
61	1.25" 14T Spline 

X

Shaft Seal

Code	Shaft Seal
L	Low Pressure Seal
H	High Pressure Seal

XXXX

Options

Code	Options
ZAAA	Black Paint
ZAAC	Black Paint, Reverse Rotation
ZAAE	Black Paint, 210 Bar Relief, Reverse Rotation
ZAAF	Black Paint, 210 Bar Relief
ZAAG	Black Paint, Speed Sensor
ZAAI	Black Paint, Speed Sensor, Reverse Rotation

	<i>Geometric displacement</i>		<i>Max. speed @ Max. intermittent flow</i>		<i>Max. oil flow</i>		<i>Max. Differential Pressure</i>		<i>Max. supply pressure</i>		<i>Max. torque</i>		<i>Max. performance</i>		<i>Min. starting torque</i>	
Motor Series	cm³/rev	rev/min	cont / int*	cont / int*	max	cont / int*	max	cont / int*	max	cont / int*	max	cont / int*	max	cont / int*	max	cont / int*
3ZE	in³/rev		l/min	bar	bar	Nm	KW	Nm	HP	Nm	HP	lb-in	HP	lb-in	HP	lb-in
			g/min	psid	psig	lb-in		lb-in		lb-in		lb-in		lb-in		lb-in
3ZE 080	80 4.9	1000	65 80 17 21	210 275 3050 3990	295 4280	240 310 2120 2740	15.5 20.8	180 235 1590 2080								
3ZE 100	100 6.1	900	75 90 20 24	210 275 3050 3990	295 4280	305 390 2700 3450	18 24.1	230 300 2040 2660								
3ZE 125	126 7.7	720	75 90 20 24	210 275 3050 3990	295 4280	375 490 3320 4340	18 24.1	290 380 2570 3360								
3ZE 160	160 9.7	560	75 90 20 24	210 275 3050 3990	295 4280	490 600 4340 5310	16.5 22.1	370 460 3270 4070								
3ZE 200	200 12.2	450	75 90 20 24	210 275 3050 3990	295 4280	610 720 5400 6370	16.5 22.1	470 560 4160 4960								
3ZE 250	250 15.3	360	75 90 20 24	200 250 2900 3630	295 4280	720 870 6370 7700	14.5 19.4	560 700 4960 6200								
3ZE 315	315 19.2	290	75 90 20 24	200 250 2900 3630	295 4280	825 1000 7300 8850	15 20.1	710 850 6280 7520								
3ZE 400	397 24.2	230	75 90 20 24	160 190 2320 2760	295 4280	865 990 7660 8760	11 14.8	710 840 6280 7430								
3ZE 475	475 29.0	190	75 90 20 24	130 150 1880 2180	295 4280	850 990 7520 8760	8.4 11	710 840 6280 7430								
3ZE 525	523 31.9	175	75 90 20 24	115 135 1670 1960	295 4280	850 990 7520 8760	7.6 10.2	710 840 6280 7430								
3ZE 565	565 34.5	160	75 90 20 24	105 125 1520 1810	295 4280	850 990 7520 8760	6.9 9	710 840 6280 7430								

Performance data based on testing using 10W40 oil with a viscosity of 43,1 cSt. (200 SUS) at 54° C (130° F). Performance data is typical. Actual data may vary slightly from one production motor to another. * Intermittent operation rating applies to 10% of every minute

Performance Data

3ZE 0080

4.9 cu in / rev

PRESSURE (PSID)

	435	1015	1523	2031	2538	3046	3263	3626	3989
1.3	292	575	876	1159	1487	1814	1974	2142	2354
	61	60	58	56	53	48	45	34	23
2.6	310	620	947	1257	1602	1991	2133	2310	2522
	122	120	119	118	113	104	97	86	73
5.3	319	637	991	1328	1682	2071	2213	2434	2655
	247	244	241	238	232	223	217	205	190
7.9	319	655	1018	1354	1717	2106	2257	2487	2708
	372	368	363	356	349	338	331	317	301
10.6	301	655	1009	1363	1726	2115	2266	2514	2744
	490	485	479	472	465	452	444	430	413
13.2	283	646	991	1345	1717	2098	2266		
	620	615	607	597	586	572	565		
17.2	257	593	947	1328	1699	2053	2213		
	803	796	788	778	762	744	735		
21.1	212	575	920	1266	1664				
	988	983	972	954	936				

TORQUE (LB IN) 2354
SPEED (RPM) 23

3ZE 100

6.1 cu in / rev

PRESSURE (PSID)

	508	1015	1523	2031	2538	3046	3263	3626	3989
1.3	416	850	1275	1699	2124	2549	2841	2885	3000
	50	49	47	44	41	37	25	22	19
2.6	443	885	1319	1761	2213	2646	2045	3089	3231
	100	96	94	90	85	79	69	65	60
5.3	425	876	1336	1788	2239	2682	3009	3195	3408
	199	195	193	188	181	173	170	165	158
7.9	407	850	1319	1779	2239	2691	3036	3231	3461
	298	295	292	286	253	268	263	257	249
10.6	381	841	1301	1761	2213	2673	3027	3239	3461
	398	395	389	382	372	360	355	350	340
13.2	354	805	1266	1726	2186	2638	3009	3204	
	498	494	489	481	469	458	449	441	
15.9	319	779	1230	1699	2160	2620	2974	3169	
	598	594	588	579	565	552	540	533	
19.8	266	717	1186	1646	2106	2558	2885	3098	
	748	745	738	726	712	696	680	672	
23.8	195	655	1124	1584	2036	2496			
	898	893	885	874	859	841			

TORQUE (LB IN) 3000
SPEED (RPM) 19

Intermittent operation rating applies to 10% of every minute.

Cont. Int.



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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

Performance Data

3ZE 125

7.67 cu in / rev

PRESSURE (PSID)

	508	1015	1523	2031	2538	3046	3263	3626	3989
1.3	496	965	1513	2071	2522	2983	3133	3434	3629
	38	37	36	35	32	28	24	16	8
2.6	522	1044	1611	2177	2691	3169	3310	3629	3965
	78	77	75	72	68	58	53	42	30
5.3	522	1089	1673	2248	2779	3310	3505	3859	4266
	157	155	152	149	145	138	133	124	110
7.9	513	1071	1682	2248	2797	3346	3567	3930	4328
	236	234	231	228	221	211	207	198	185
10.6	496	1062	1646	2230	2806	3363	3593	3947	4319
	315	312	308	304	298	288	283	272	257
13.2	487	1053	1620	2213	2779	3346	3585	3965	
	393	390	388	384	376	366	359	347	
15.9	443	1027	1593	2177	2753	3328	3558	3956	
	475	471	467	462	453	442	435	424	
19.8	381	974	1531	2124	2691	3266	3496	3912	
	592	588	583	574	564	551	542	528	
23.8	283	885	1460	2036	2576				
	705	700	693	685	674				

TORQUE (LB IN) 3629
SPEED (RPM) 8

3ZE 160

9.74 cu in / rev

PRESSURE (PSID)

	508	1015	1523	2031	2321	2538	3046	3263	3771
1.3	620	1266	1850	2461	2885	3133	3717	3974	4558
	31	29	28	27	26	25	24	22	18
2.6	673	1390	2036	2691	3098	3381	4036	4328	4956
	62	61	59	57	56	54	51	49	44
5.3	699	1416	2106	2841	3248	3531	4257	4532	5160
	124	122	120	117	115	114	110	107	99
7.9	699	1416	2142	2868	3301	3593	4310	4602	5257
	186	184	182	179	177	175	170	166	155
10.6	682	1390	2133	2859	3310	3620	4319	4620	5275
	249	246	243	239	236	234	230	227	214
13.2	637	1345	2098	2841	3292	3602	4310	4611	
	310	307	304	301	298	295	287	284	
15.9	593	1301	2053	2797	3248	3567	4284	4585	
	373	370	366	362	359	357	348	343	
19.8	513	1239	2000	2708	3124	3469	4204	4505	
	468	464	459	453	449	445	437	432	
23.8	416	1168	1947	2620	3018				
	562	557	552	547	544				

TORQUE (LB IN) 4558
SPEED (RPM) 18

Intermittent operation rating applies to 10% of every minute.

Cont. Int.



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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

Performance Data

3ZE 200

12.2 cu in / rev

PRESSURE (PSID)

	435	1015	1523	2031	2321	2538	3046	3263	3626
1.3	823	1611	2372	3151	3611	3930	4709	5018	5514
	24	23	22	21	19	18	16	15	12
2.6	859	1708	2540	3337	3824	4178	4965	5284	5780
	48	47	46	44	43	42	38	36	33
5.3	885	1770	2699	3549	4054	4452	5310	5647	6169
	99	97	95	92	91	89	86	83	77
7.9	876	1761	2717	3567	4098	4487	5390	5735	6346
	148	147	144	141	139	137	133	130	122
10.6	841	1744	2708	3549	4116	4487	5381	5753	6337
	197	195	193	190	189	188	182	178	171
13.2	779	1699	2682	3531	4107	4478	5372	5735	
	247	245	242	240	238	236	229	225	
15.9	726	1655	2620	3496	4071	4443	5346	5700	
	298	296	292	289	285	283	274	270	
19.8	637	1558	2522	3425	3983	4346	5275	5611	
	372	369	365	362	359	357	348	344	
23.8	549	1452	2407	3328	3859				
	448	445	441	436	433				

TORQUE (LB IN) 5514
SPEED (RPM) 12

3ZE 250

15.3 cu in / rev

PRESSURE (PSID)

	508	1015	1378	1813	2031	2248	2538	2901	3263	3626
1.3	867	2071	2903	3567	4071	4505	5001	5576	6134	6682
	19	19	18	17	15	14	12	8	6	2
2.6	991	2230	3045	3806	4337	4744	5310	5930	6514	7328
	39	39	38	37	35	34	32	27	22	16
5.3	1036	2222	3098	3983	4478	5001	5620	6355	6974	7656
	78	78	77	76	75	73	70	64	58	49
7.9	982	2186	3107	4009	4443	5018	5656	6479	7169	
	118	117	116	115	114	112	109	103	97	
10.6	938	2142	3054	3992	4443	5001	5664	6461	7213	
	158	156	155	154	153	152	149	143	135	
13.2	885	2106	2992	3939	4434	4939	5629			
	198	196	194	192	191	190	187			
15.9	841	2027	2894	3859	4425	4894	5549			
	238	236	234	232	230	228	225			
19.8	770	1903	2761	3744	4284	4788	5426			
	299	296	293	291	289	287	283			
23.8	690	1770	2602	3593	4160					
	359	356	353	348	345					

TORQUE (LB IN) 6682
SPEED (RPM) 2

Intermittent operation rating applies to 10% of every minute.

Cont. Int.



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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

Performance Data

3ZE 315

19.2 cu in / rev

PRESSURE (PSID)

	508	1015	1450	1740	2031	2321	2538	2901	3263	3481
1.3	1257	2522	3540	4213	4877	5452	6036	6886	7612	8329
	16	15	15	14	13	13	12	10	9	6
2.6	1336	2691	3788	4505	5231	5841	6434	7320	8169	8780
	32	31	30	30	29	28	27	27	22	19
5.3	1416	2832	4001	4850	5638	6319	6930	7532	8621	
	63	62	61	61	60	59	57	53	49	
7.9	1398	2841	4027	4921	5735	6470	7081	7992		
	94	93	92	92	91	89	86	82		
10.6	1363	2788	4054	4903	5726	6452	7045	7966		
	126	125	124	123	121	119	116	110		
13.2	1310	2735	4027	4841	5691	6434	7019			
	159	157	155	153	152	150	147			
15.9	1257	2682	3983	4771	5611	6390	6992			
	189	187	185	184	182	180	177			
19.8	1106	2558	3788	4673	5487	6302				
	237	234	232	230	228	225				
23.8	929	2390	3593	4514	5337					
	285	283	281	278	276					

TORQUE SPEED (LB IN) (RPM) 8329 6

Flow (GPM)

3ZE 400

24.2 cu in / rev

PRESSURE (PSID)

	435	870	1160	1523	1740	2031	2321	2538	2756
1.3	1425	2876	3788	4921	5558	6399	7258	7877	8373
	12	12	11	10	9	8	6	4	3
2.6	1443	2930	3930	5133	5859	6727	7603	8213	8718
	25	24	23	22	21	19	16	14	11
5.3	1469	2965	4027	5337	6036	7036	8036	8656	
	50	49	48	47	46	44	38	34	
7.9	1452	2974	4009	5328	6027	7081	8125		
	75	74	73	72	71	68	62		
10.6	1390	2930	3974	5310	6019	7027	8178		
	100	99	98	97	95	92	87		
13.2	1328	2859	3921	5257	6001	6992			
	125	124	122	121	119	117			
15.9	1275	2761	3841	5195	5974	6948			
	150	149	148	146	143	140			
19.8	1168	2611	3691	5063	5859				
	188	186	184	183	179				
23.8	1062	2461	3523	4930					
	226	224	222	220					

TORQUE SPEED (LB IN) (RPM) 8373 3

Flow (GPM)

Intermittent operation rating applies to 10% of every minute.

■ Cont. □ Int.



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Parker Hannifin Corporation
 Pump & Motor Division
 Greeneville, Tennessee, USA

Performance Data

3ZE 475

18.96 cu in / rev

PRESSURE (PSID)

	363	725	1015	1233	1523	1740	1885	2176
1.3	1443	2868	3806	4912	5957	6780	7081	8072
	10	10	10	9.5	9	8.5	8	6.5
2.6	1496	2921	3983	5045	6213	7081	7346	8346
	21	20.5	20	19.5	19	18	17.5	15
5.3	1443	3000	4169	5240	6505	7346	7638	8638
	41.5	41	40.5	40	39.5	39	38.5	37
7.9	1416	2947	4178	5231	6488	7364	7612	
	62.5	62	61.5	61	60.5	59.5	58.5	
10.6	1310	2832	4116	5133	6408	7284	7452	
	83.5	83	82.5	82	81	79.5	78.5	
13.2	1168	2708	3983	5027	6328			
	104.5	103.5	103	102	101.5			
15.9	1009	2443	3824	4930	6196			
	125	124	123.5	122.5	121.5			
19.8	708	2319	3567	4647	5957			
	157.5	156.5	155.5	155	154			
23.8	398	1974	3310	4363				
	189	188	187	186				



3ZE 525

31.88 cu in / rev

PRESSURE (PSID)

	363	725	1160	1305	1523	1668	1958
1.3	1567	3142	4956	5700	6612	7027	8090
	9.5	9.5	9	8.5	8	7.5	7
2.6	1637	3186	5107	5833	6842	7320	8373
	19	18.5	17.5	17	16.5	16	15
5.3	1593	3275	5310	6036	7143	7594	8762
	38	37.5	36.5	36	35.5	35	33
7.9	1567	3248	5355	6098	7187	7656	
	57	56.5	56	55.5	54.5	53	
10.6	1496	3151	5310	5992	7107	7620	
	76	75.5	74.5	74	72.5	71	
13.2	1372	3045	5213	5886	7036		
	95	94	93	92	90		
15.9	1230	2930	5080	5824	6966		
	114	113	111	110	108		
19.8	991	2753	4850	5647			
	143	141.5	140	139.5			
23.8	708	2452	4620	5364			
	172	171	169	158			



Intermittent operation rating applies to 10% of every minute.

Cont. Int.



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Pump & Motor Division
Greenville, Tennessee, USA

Performance Data

3ZE 565

34.47 cu in / rev

PRESSURE (PSID)

	218	435	653	870	1015	1233	1523	1813
1.3	982	1965	3018	3983	4673	5709	6930	8090
	9	9	8.5	8.5	8	7.5	7	6
2.6	991	2018	3062	4080	4824	5859	7151	8364
	17.5	17.5	17	16.5	16	15.5	15	13.5
5.3	1009	2089	3142	4240	5027	6063	7443	8691
	35	35	34.5	34	33.5	33	32	30
7.9	982	2098	3151	4301	5089	6151	7523	
	53	53	52.5	52	51.5	51	49.5	
10.6	938	2354	3062	4266	5054	6080	7461	
	70.5	70	69.5	69	68.5	68	66	
13.2	832	1903	2956	4204	4992	5974		
	88	87.5	87	86.5	86	85		
15.9	717	1806	2859	4089	4877	5903		
	106	105	104	103.5	102.5	102		
19.8	496	1664	2717	3877	4664	5771		
	132	131.5	131	130	129.5	128.5		
23.8	257	1407	2461	3664	4425			
	159	158.5	157.5	157	156			

Flow (GPM)



Intermittent operation rating applies to 10% of every minute.

Cont. Int.

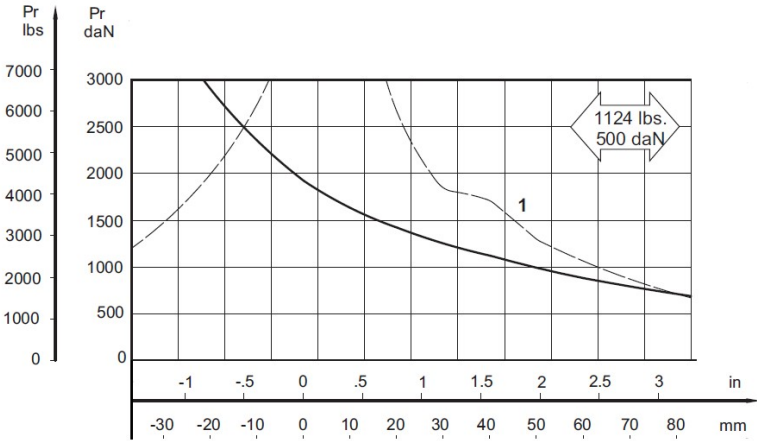


WARNING
 This product can expose you to chemicals including lead and DEHP, which are known to the State of California to cause cancer, and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov

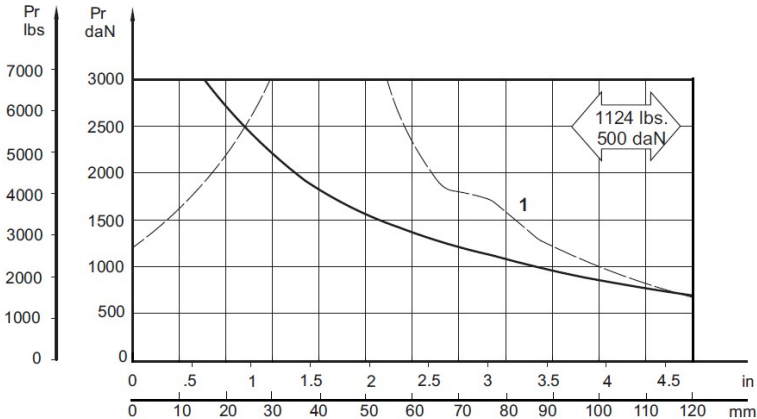
Parker Hannifin Corporation
 Pump & Motor Division
 Greeneville, Tennessee, USA

Radial Load

Flange Mount



Wheel Mount



The dynamic side load curve is based on uni-directional steady state loads for L_{10} bearing life at 3×10^6 revolutions.

The maximum load curve is defined by bearing static load capacity. This curve should not be exceeded at any time including shock loads.

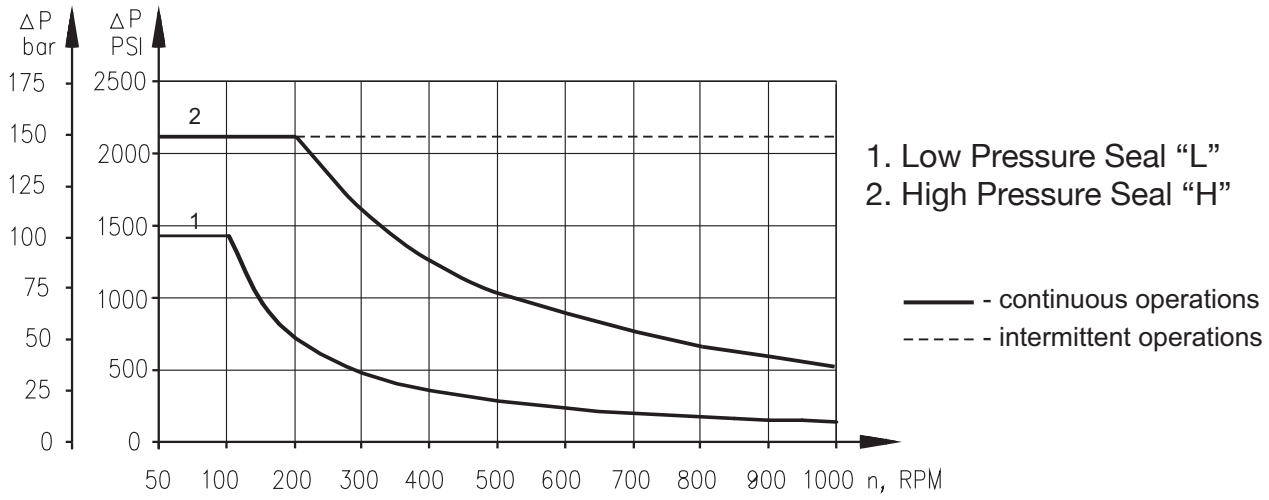


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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

Max. Permissible Shaft Seal Pressure

Max return pressure without drain line or max pressure in the drain line.



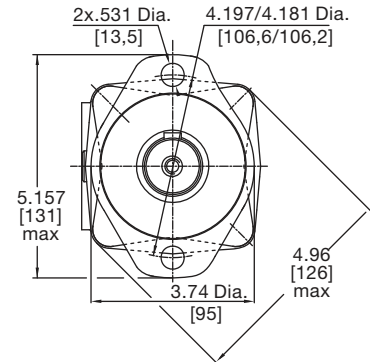
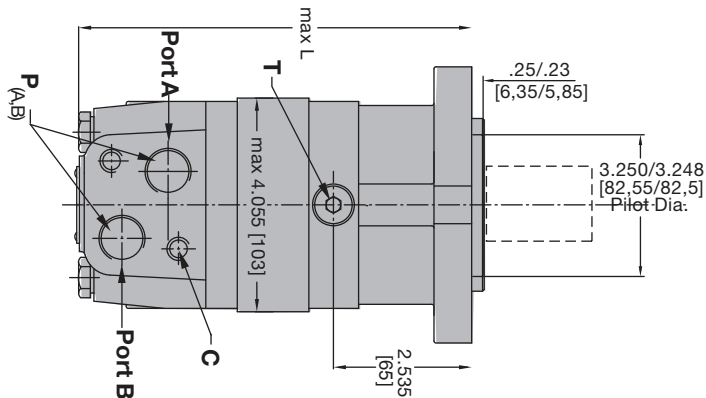
Mounting, Ports

Code AB

SAE A 2-Bolt, 7/8-14 UNF Side Ports

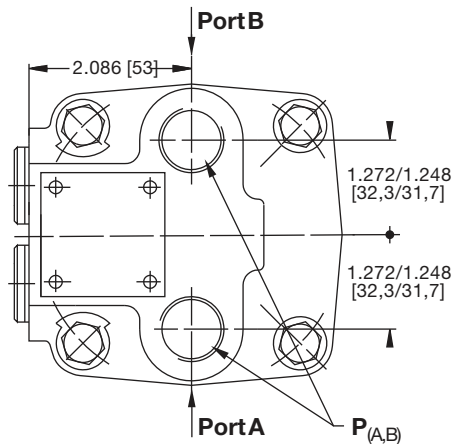
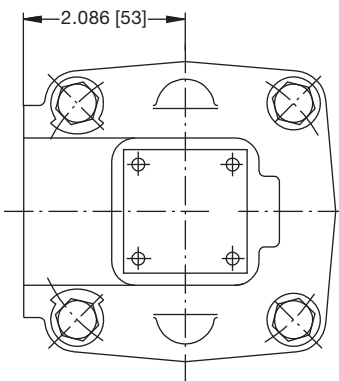
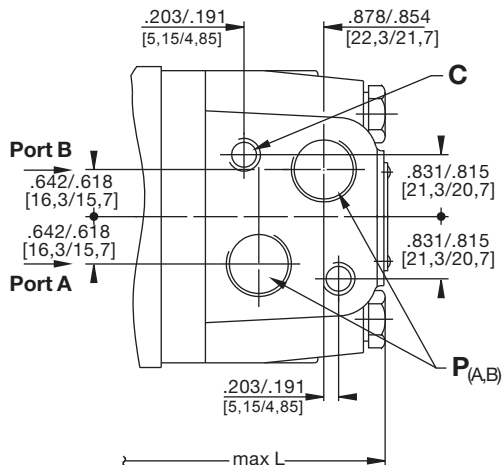
Code AA

SAE A 2-Bolt, 7/8-14 UNF Rear Ports



Side Ports

Rear Ports



Side Ports

Code AB	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	9.9	10.1	10.4	10.8	11.2	11.7	12.4	13.1	14.1	14.6	15.0
	(lb)	(21.8)	(22.2)	(22.9)	(23.8)	(24.7)	(25.8)	(27.3)	(29.3)	(31.0)	(32.2)	(33.1)
Length	"L" mm	168	171	176	182	189	197	209	223	237	229	235
	"L" (in)	(6.61)	(6.73)	(6.93)	(7.17)	(7.44)	(7.76)	(8.23)	(8.78)	(9.33)	(9.02)	(9.25)

Rear Ports

Code AA	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	10.3	10.5	10.8	11.2	11.6	12.1	12.8	13.5	14.5	15.0	15.4
	(lb)	(22.7)	(23.1)	(23.8)	(24.7)	(25.6)	(26.7)	(28.2)	(30.2)	(31.9)	(33.1)	(34.0)
Length	"L" mm	175	179	183	189	196	205	216	230	244	236	242
	"L" (in)	(6.89)	(7.05)	(7.21)	(7.44)	(7.72)	(8.07)	(8.50)	(9.05)	(9.61)	(9.29)	(9.53)

English equivalents for metric specifications are shown in ().



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Pump & Motor Division
Greenville, Tennessee, USA

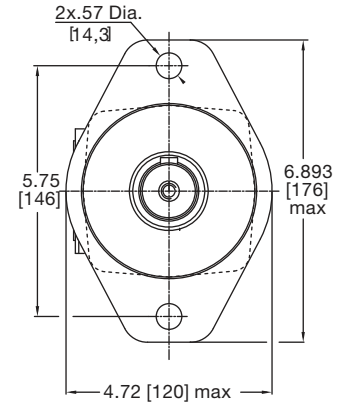
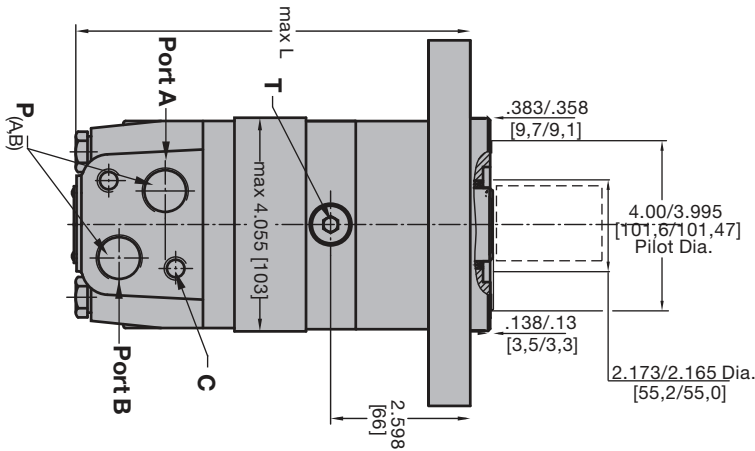
Mounting, Ports

Code BB

SAE A 2-Bolt, 7/8-14 UNF Side Ports

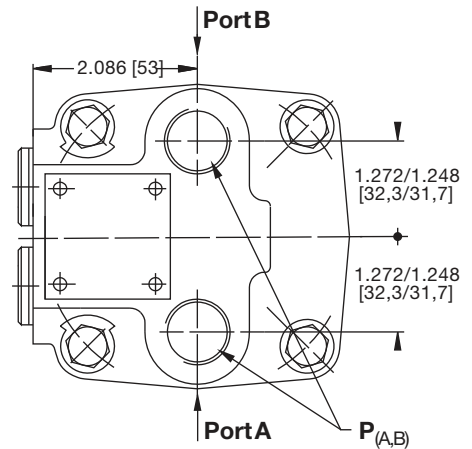
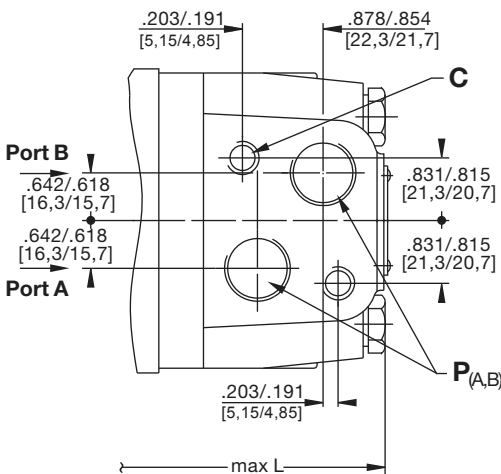
Code BA

SAE A 2-Bolt, 7/8-14 UNF Rear Ports



Side Ports

Rear Ports



Side Ports

Code BB	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	10.4	10.6	10.9	11.3	11.7	12.2	12.9	13.8	14.6	15.1	15.5
	(lb)	(22.9)	(23.3)	(24.0)	(24.6)	(25.8)	(26.9)	(28.4)	(30.4)	(32.2)	(33.3)	(34.1)
Length	"L" mm	168	171	176	182	189	197	209	223	237	229	235
	"L" (in)	(6.61)	(6.73)	(6.93)	(7.17)	(7.44)	(7.76)	(8.23)	(8.78)	(9.33)	(9.02)	(9.25)

Rear Ports

Code BA	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	10.8	11.0	11.3	11.7	12.1	12.6	13.3	14.2	15.0	15.5	15.9
	(lb)	(23.8)	(24.2)	(24.9)	(25.5)	(26.7)	(27.8)	(29.3)	(31.3)	(33.1)	(34.2)	(35.0)
Length	"L" mm	175	179	183	189	196	205	216	230	244	236	242
	"L" (in)	(6.89)	(7.05)	(7.21)	(7.44)	(7.72)	(8.07)	(8.50)	(9.05)	(9.61)	(9.29)	(9.53)

English equivalents for metric specifications are shown in ().

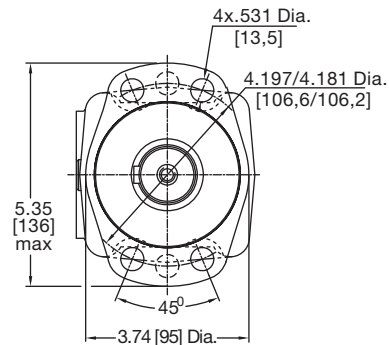
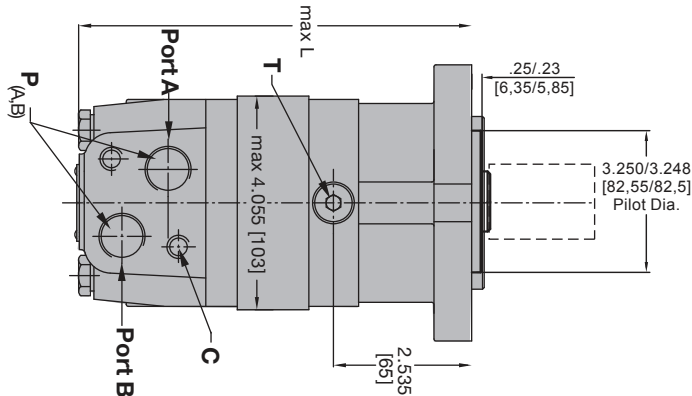
Mounting, Ports

Code MB

Magneto 4-Bolt, 7/8-14 UNF Side Ports

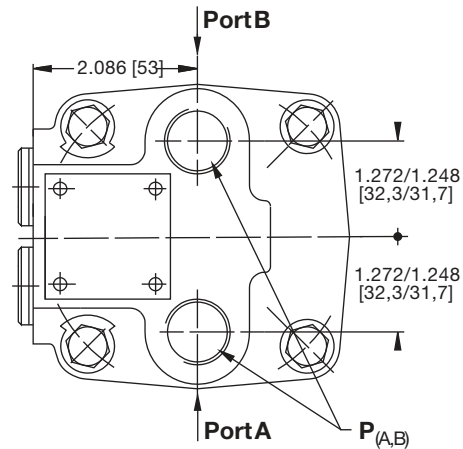
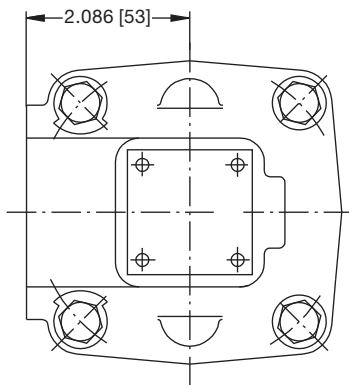
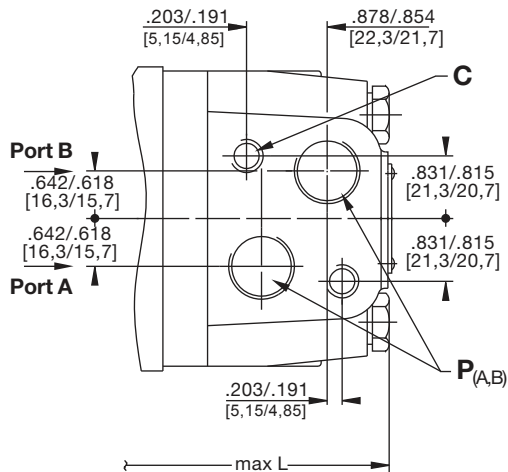
Code MA

Magneto 4-Bolt, 7/8-14 UNF Rear Ports



Side Ports

Rear Ports



Side Ports

Code MB	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	9.9	10.1	10.4	10.8	11.2	11.7	12.4	13.1	14.1	14.6	15.0
	(lb)	(21.8)	(22.2)	(22.9)	(23.8)	(24.7)	(25.8)	(27.3)	(29.3)	(31.0)	(32.2)	(33.1)
Length	"L" mm	168	171	176	182	189	197	209	223	237	229	235
	"L" (in)	(6.61)	(6.73)	(6.93)	(7.17)	(7.44)	(7.76)	(8.23)	(8.78)	(9.33)	(9.02)	(9.25)

Rear Ports

Code MA	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	10.3	10.5	10.8	11.2	11.6	12.1	12.8	13.5	14.5	15.0	15.4
	(lb)	(22.7)	(23.1)	(23.8)	(24.7)	(25.6)	(26.7)	(28.2)	(30.2)	(31.9)	(33.1)	(34.0)
Length	"L" mm	175	179	183	189	196	205	216	230	244	236	242
	"L" (in)	(6.89)	(7.05)	(7.21)	(7.44)	(7.72)	(8.07)	(8.50)	(9.05)	(9.61)	(9.29)	(9.53)

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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

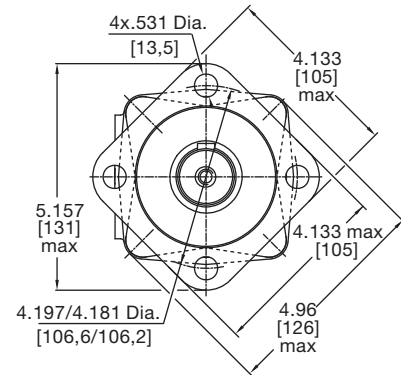
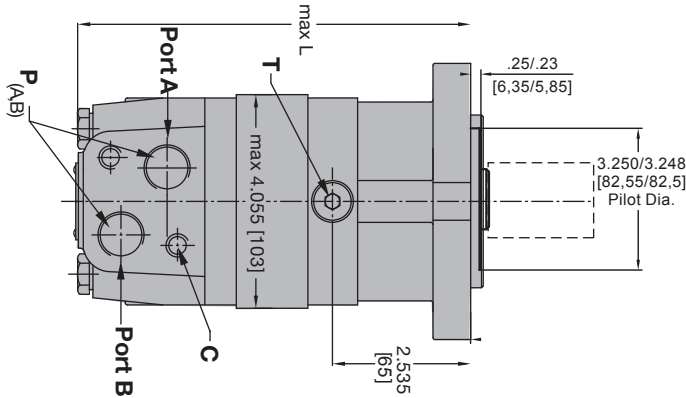
Mounting, Ports

Code VB

SAE A 4-Bolt, 7/8-14 UNF Side Ports

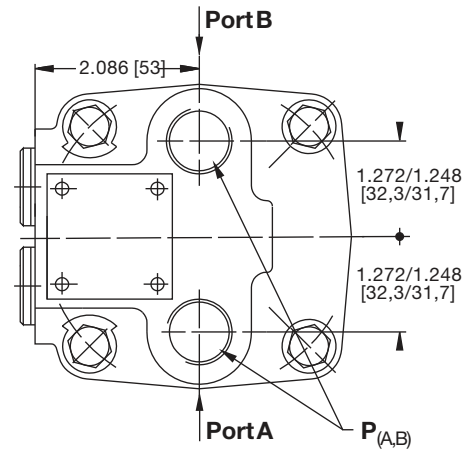
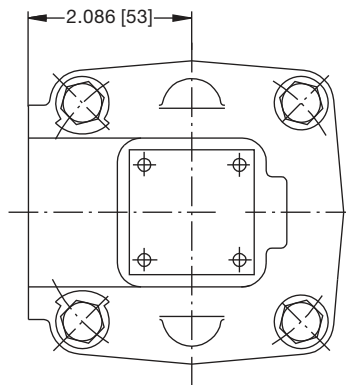
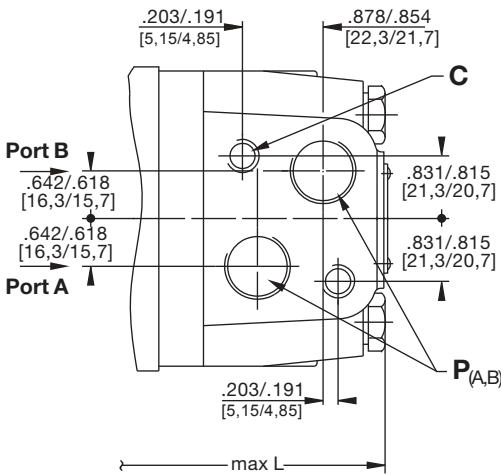
Code VA

SAE A 4-Bolt, 7/8-14 UNF Rear Ports



Side Ports

Rear Ports



Side Ports

Code VB	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	9.9	10.1	10.4	10.8	11.2	11.7	12.4	13.1	14.1	14.6	15.0
	(lb)	(21.8)	(22.2)	(22.0)	(23.8)	(24.7)	(25.8)	(27.3)	(29.3)	(31.0)	(32.2)	(33.1)
Length	"L" mm	168	171	176	182	189	197	209	223	237	229	235
	"L" (in)	(6.61)	(6.73)	(6.93)	(7.17)	(7.44)	(7.76)	(8.23)	(8.78)	(9.33)	(9.02)	(9.25)

Rear Ports

Code VA	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	10.3	10.5	10.8	11.2	11.6	12.1	12.8	13.5	14.5	15.0	15.4
	(lb)	(22.7)	(23.1)	(23.8)	(24.7)	(25.6)	(26.7)	(28.2)	(30.2)	(31.9)	(33.1)	(34.0)
Length	"L" mm	175	179	183	189	196	205	216	230	244	236	242
	"L" (in)	(6.89)	(7.05)	(7.21)	(7.44)	(7.72)	(8.07)	(8.50)	(9.05)	(9.61)	(9.29)	(9.53)

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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

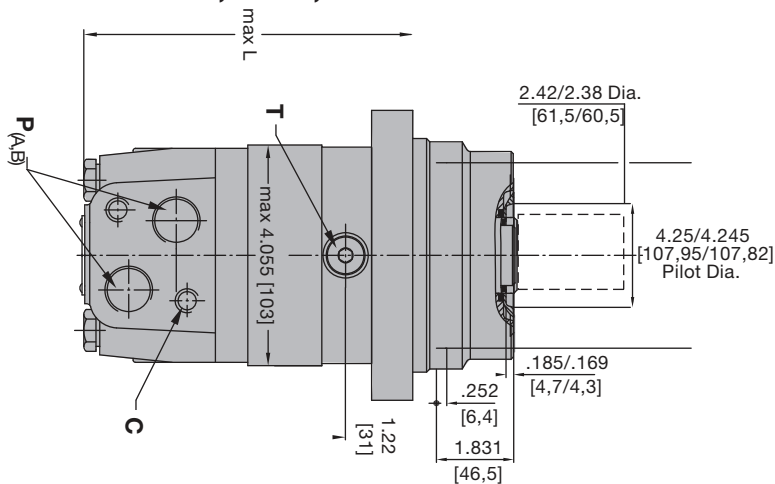
Mounting, Ports

Code WB

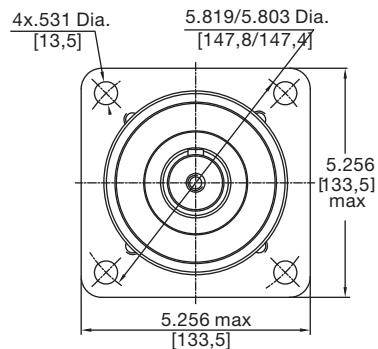
Wheel Mount, 4.25", 7/8-14 UNF Side Port

Code WA

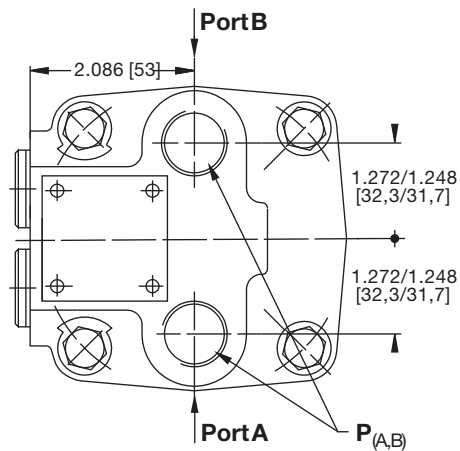
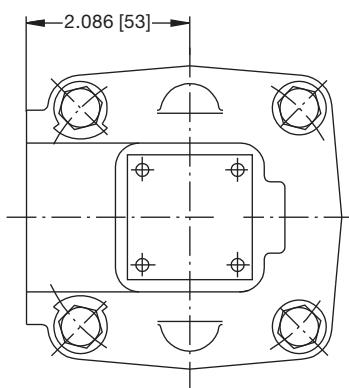
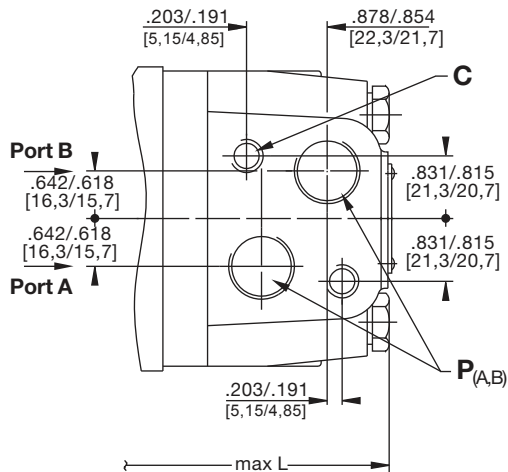
Wheel Mount, 4.25", 7/8-14 UNF Rear Ports



Side Ports



Rear Ports



Side Ports

Code WB	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	10.3	10.5	10.8	11.2	11.6	12.1	12.8	13.7	14.5	15.0	15.4
	(lb)	(22.7)	(23.2)	(23.8)	(24.7)	(25.6)	(26.7)	(28.2)	(30.2)	(32.0)	(33.1)	(33.9)
Length	"L" mm	133	137	141	147	154	163	174	189	202	194	200
	"L" (in)	(5.24)	(5.39)	(5.55)	(5.79)	(6.06)	(6.42)	(6.85)	(7.44)	(7.95)	(7.64)	(7.87)

Rear Ports

Code MA	disp.	080	100	125	160	200	250	315	400	475	525	565
Weight	kg	10.7	10.9	11.2	11.6	12.0	12.5	13.2	14.1	14.9	15.4	15.8
	(lb)	(23.6)	(24.1)	(24.7)	(25.6)	(26.5)	(27.6)	(29.1)	(31.1)	(32.9)	(34.0)	(34.8)
Length	"L" mm	140	144	148	154	161	170	181	196	209	201	207
	"L" (in)	(5.51)	(5.67)	(5.83)	(6.06)	(6.34)	(6.69)	(7.13)	(7.72)	(8.23)	(7.91)	(8.15)

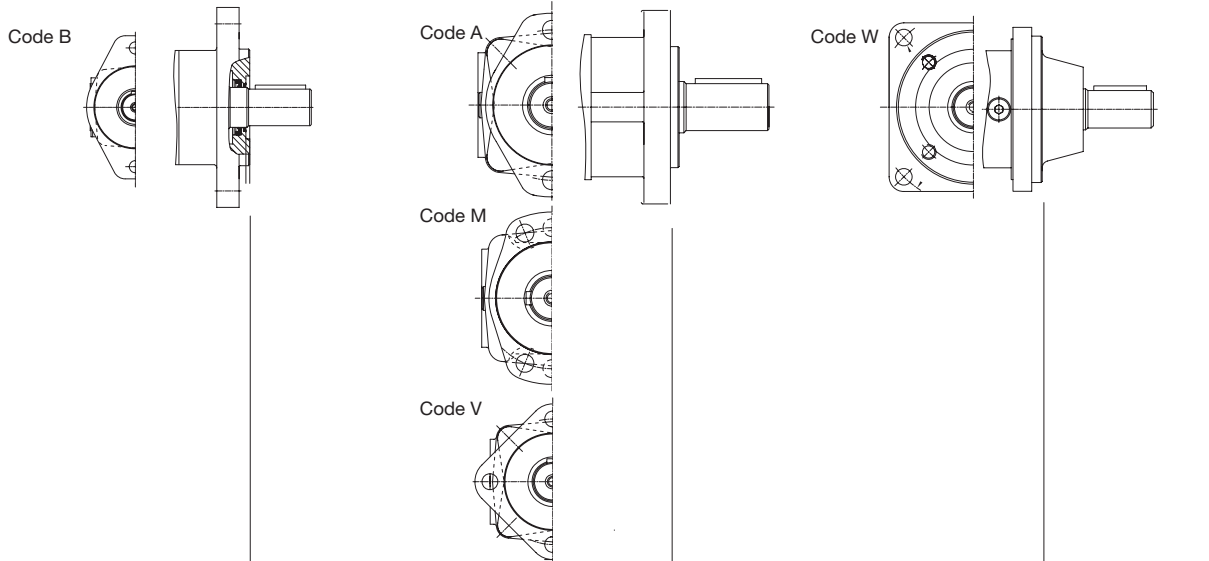
English equivalents for metric specifications are shown in ().



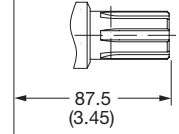
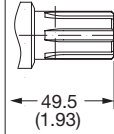
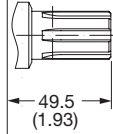
WARNING

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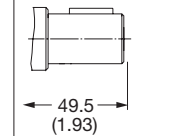
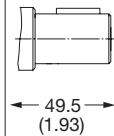
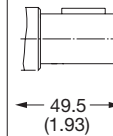
Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA



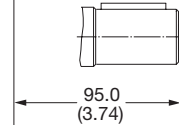
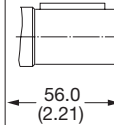
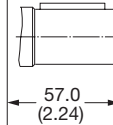
Code: 01
1" SAE 6B Spline



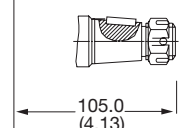
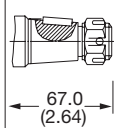
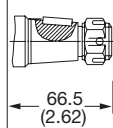
Code: 02
1" Straight Key



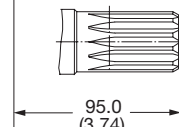
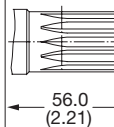
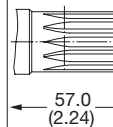
Code: 03
1.25" Straight Key



Code: 08
1.25" J501 Tapered

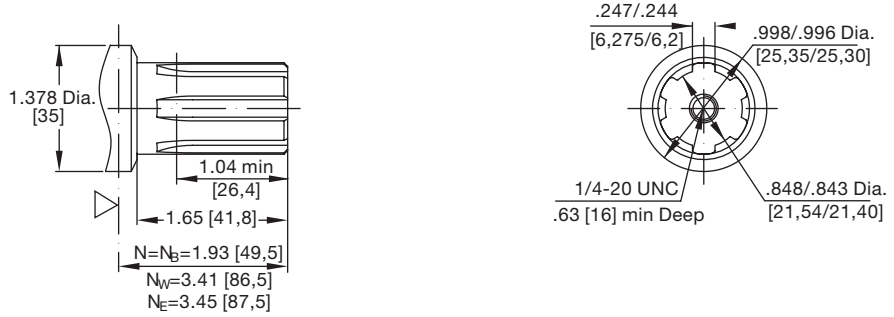


Code: 61
1.25" 14T Spline

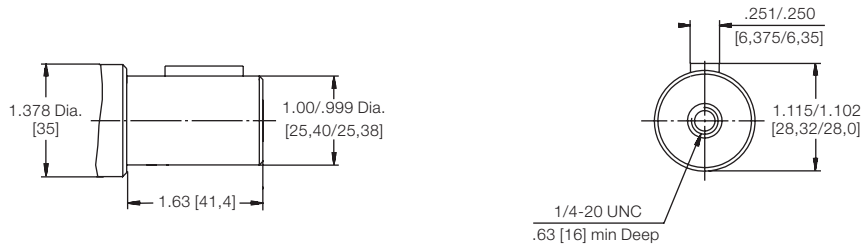


English equivalents for metric specifications are shown in ().

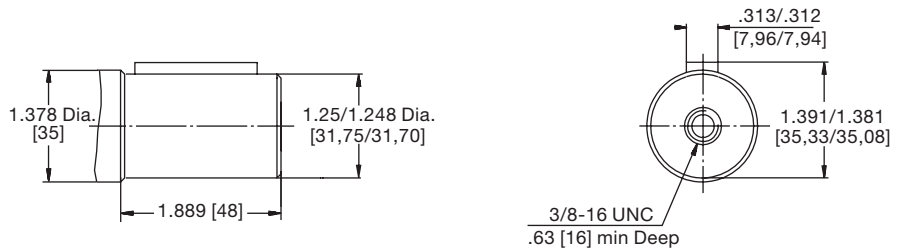
Code: 01
1" SAE 6B Spline



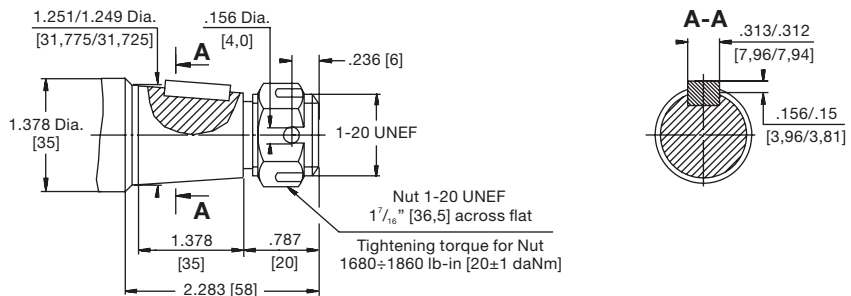
Code: 02
1" Straight Key



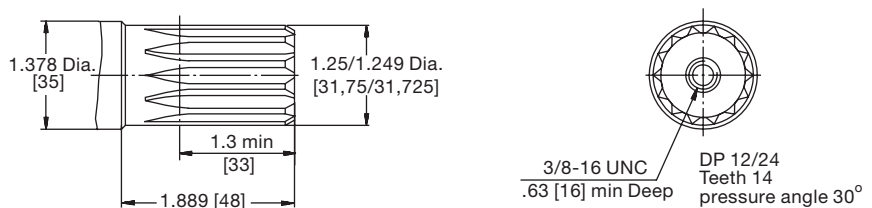
Code: 03
1.25" Straight Key



Code: 08
1.25" J501 Tapered



Code: 61
1.25", 14T Spline



English equivalents for metric specifications are shown in ().



WARNING
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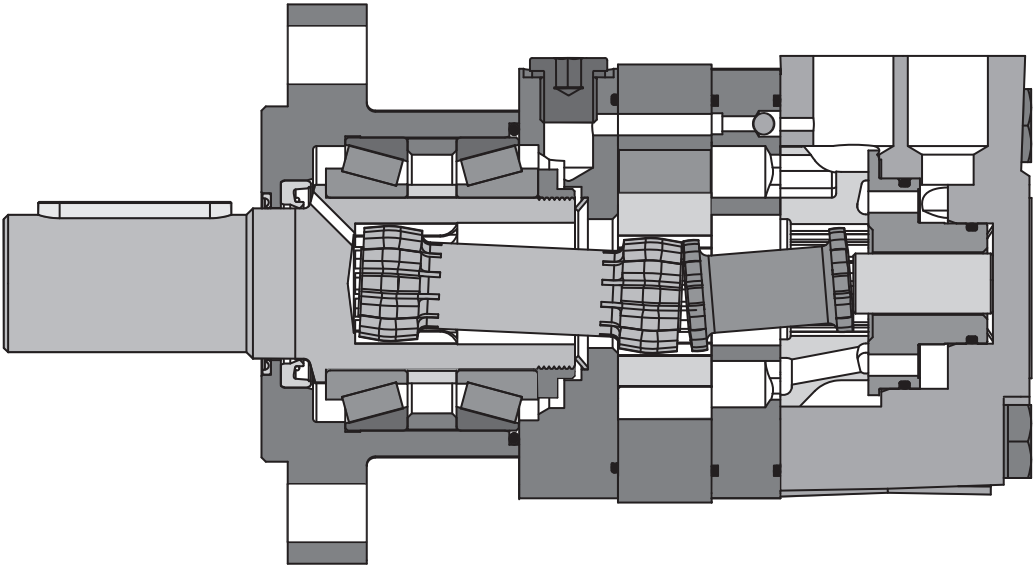
Parker Hannifin Corporation
Pump & Motor Division
Greeneville, Tennessee, USA

Technical Information

8 Displacements	(9.8 - 44.2 in ³ /rev) 161 ... 724 cm ³ /rev	
Maximum Pressure	Cont (2900 psid) ... 200 bar	Int (3450 psid) ... 240 bar
Maximum Oil Flow	(40 gpm) ... 125 lpm	
Maximum Speed	(775 rpm)	
Maximum Torque	Cont (11,500 lb in) 1300 Nm	Int (13,100 lb in) 1480 Nm
Maximum Side Load at Key	(4000 lb) ... 17,700 N	

High-Flow, Case-Drain-Capable, Low-Speed, High-Torque Motor

This heavy-duty motor is designed for high-flow applications and/or applications requiring a case drain. It is suitable for series applications and withstands high shaft side loads.



3ZG
Series



XXX
Displacement

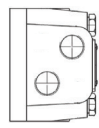
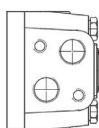
X
Mounting


X
Ports

XX
Shaft

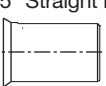
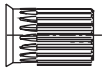

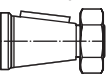
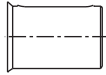
Code	cm ³ /U	in ³ /rev
160	161 / 9.8	
200	201 / 12.3	
250	252 / 15.4	
315	326 / 19.9	
400	411 / 25.1	
500	524 / 32.0	
630	631 / 38.5	
725	724 / 44.2	

Code	Mounting
K	SAE "C" 4 Bolt 
T	Wheel Mount 

Code	Side Ports
4	1 1/16-12 UN 
X*	G 3/4 BSPP 

Code	Rear Ports
7	1 1/16-12 UN 

*porting required for optional codes using a relief valve

Code	Shaft
32	1.5" Straight Key 
36	1.5" 17T Spline 
61	1.25" 14T Spline 
63	1.75" SAE J501 Tapered 
64	40mm Straight Key 

X

Shaft Seal

Code	Shaft Seal
L	Low Pressure Seal
H	High Pressure Seal

XXXX

Options

Code	Options
ZAAA	Black Paint
ZAAC	Black Paint, Reverse Rotation
ZAAE	Black Paint, 210 Bar Relief, Reverse Rotation
ZAAF	Black Paint, 210 Bar Relief
ZAAG	Black Paint, Speed Sensor
ZAAI	Black Paint, Speed Sensor, Reverse Rotation

Note: Options with relief valves require Code "X" porting (G 3/4 BSPP) to assemble to the motor, relief valve porting is 1 1/16-12 UN.

	<i>Geometric displacement</i>		<i>Max. speed @ Max. intermittent flow</i>		<i>Max. oil flow</i>		<i>Max. Differential Pressure</i>		<i>Max. supply pressure</i>		<i>Max. torque</i>		<i>Max. performance</i>		<i>Min. starting torque</i>	
Motor Series 3ZG	cm³/rev in³/rev	rev/min	cont / int* l/min g/min	cont / int* bar psid	max bar psig	cont / int* Nm lb-in	max KW HP			cont / int* Nm lb-in						
3ZG 160	161 9.8	775	100 125 26 33	200 240 2900 3450	250 3600	470 560 4160 4960	26.5 36			340 410 3010 3630						
3ZG 200	201 12.3	752	125 150 33 40	200 240 2900 3450	250 3600	590 710 5220 6285	33.5 45			430 520 3800 4600						
3ZG 250	252 15.4	601	125 150 33 40	200 240 2900 3450	250 3600	730 880 6460 7790	33.5 45			530 630 4690 5580						
3ZG 315	326 19.9	461	125 150 33 40	200 240 2900 3450	250 3600	950 1140 8410 10090	33.5 45			740 890 6550 7880						
3ZG 400	411 25.1	368	125 150 33 40	180 210 2600 3050	250 3600	1080 1260 9560 11150	30 40			840 970 7435 8585						
3ZG 500	524 32	289	125 150 33 40	160 180 2300 2600	250 3600	1220 1370 10800 12125	26.5 36			950 1060 8410 9380						
3ZG 630	631 38.5	234	125 150 33 40	140 160 2010 2310	250 3600	1300 1480 11500 13100	24.3 33			950 1100 8410 9740						
3ZG 725	725 44.2	209	125 150 33 40	120 140 1740 2010	250 3600	1270 1470 11240 13010	20.2 27			950 1150 8410 10180						

Performance data based on testing using 10W40 oil with a viscosity of 43,1 cSt. (200 SUS) at 54° C (130° F). Performance data is typical. Actual data may vary slightly from one production motor to another.

* Intermittent operation rating applies to 10% of every minute

Performance Data

3ZG 160

9.83 cu in / rev

PRESSURE (PSID)

	580	1160	1740	2320	2900	3480
2.6	690	1486	2345	3097	3919	4556
	59	56	53	50	48	46
5.3	734	1513	2406	3229	4070	4866
	121	117	114	111	109	105
10.6	725	1548	2415	3273	4140	5043
	244	235	231	225	220	215
15.9	699	1522	2398	3256	4123	5025
	367	363	358	350	340	326
21	637	1469	2345	3203	4070	4954
	603	602	600	597	594	585
26	602	1416	2309	3167	3990	4910
	603	602	600	597	594	585
33	531	1371	2256	3097	3910	4884
	764	754	739	731	722	710

TORQUE (LB IN) 4556
SPEED (RPM) 46

3ZG 200

12.29 cu in / rev

PRESSURE (PSID)

	580	1160	1740	2320	2900	3480
2.6	1020	2007	3028	3984	4958	5855
	49	48	45	41	37	31
5.3	1041	2071	3096	4139	5130	6133
	98	97	95	90	86	78
10.6	1042	2116	3129	4216	5261	6314
	197	194	191	187	181	170
15.9	984	2105	3104	4232	5290	6329
	296	294	290	284	276	265
21	918	2087	3047	4203	5257	6297
	495	492	488	482	473	461
26	861	2009	2995	4145	5174	6264
	495	492	488	482	473	461
33	807	1899	2937	4047	5075	6171
	616	612	607	601	591	577
39.6	679	1738	2836	3916	4957	6079
	744	741	733	723	708	685

TORQUE (LB IN) 5855
SPEED (RPM) 31

Intermittent operation rating applies to 10% of every minute.

Cont. Int.



WARNING

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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

Performance Data

3ZG 250

15.36 cu in / rev PRESSURE (PSID)

	580	1160	1740	2320	2900	3480
2.6	1201	2532	3767	4938	6108	7249
	40	39	38	36	32	27
5.3	1232	2625	3920	5155	6330	7590
	77	76	74	72	68	63
10.6	1249	2635	3968	5262	6491	7848
	157	155	152	148	144	136
15.9	1209	2602	3955	5254	6504	7880
	238	236	232	228	222	210
21	1126	2534	3897	5209	6460	7872
	315	314	311	306	300	286
26	1067	2459	3830	5148	6397	7804
	397	394	390	384	375	361
33	873	2364	3720	5029	6329	7700
	494	490	485	479	470	454
39.6	762	2202	3551	4873	6191	7556
	590	585	579	573	562	544

TORQUE (LB IN) 7249
 SPEED (RPM) 27

3ZG 315

19.9 cu in / rev PRESSURE (PSID)

	580	1160	1740	2320	2900	3480
2.6	1592	3141	4795	6264	7927	9245
	29	27	25	24	23	22
5.3	1663	3344	4954	6671	8210	8891
	60	57	56	55	54	52
10.6	1672	3362	4972	6688	8414	10086
	121	118	117	115	111	108
15.9	1584	3353	4963	6680	8378	9997
	181	176	173	170	165	160
21	1575	3327	4937	6653	8334	9891
	240	239	234	226	220	215
26	1362	3141	4875	6618	8290	9820
	298	297	295	292	285	271
33	1017	3026	4804	6538	8228	9776
	378	373	367	360	355	350
39.6	885	2743	4556	6264	7998	9732
	453	452	443	436	430	422

TORQUE (LB IN) 9245
 SPEED (RPM) 22

Intermittent operation rating applies to 10% of every minute.

Cont. Int.



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Parker Hannifin Corporation
 Pump & Motor Division
 Greeneville, Tennessee, USA

3ZG 400

25.06 cu in / rev

PRESSURE (PSID)

	435	870	1160	1740	2175	2610	3050
2.6	1470	3230	4763	6426	7916	9298	10634
	24	23	22	21	20	18	15
5.3	1519	3283	4858	6481	8046	9542	11000
	48	47	45	44	42	40	37
10.6	1576	3261	4927	6507	8142	9712	11254
	97	95	93	91	87	83	78
15.9	1572	3164	4906	6472	8099	9736	11305
	146	145	142	139	135	129	123
21	1498	3060	4802	6372	8009	9664	11261
	195	194	192	189	184	179	172
26	1404	2968	4685	6285	7909	9569	11155
	243	242	240	237	233	227	220
33	1237	2827	4499	6168	7777	9399	10973
	304	303	301	298	294	288	280
39.6	996	2671	4307	5981	7612	9161	10745
	365	363	361	357	352	346	338

TORQUE (LB IN) 10634
SPEED (RPM) 15

3ZG 500

31.95 cu in / rev

PRESSURE (PSID)

	435	870	1160	1740	2030	2320	2610
2.6	1950	4030	6122	7883	9252	10558	11795
	21	20	20	19	18	18	17
5.3	1996	4156	6306	8129	9577	10868	12216
	39	38	38	37	36	35	34
10.6	2019	4195	6423	8312	9705	11039	12508
	76	75	73	72	71	69	67
15.9	1984	4123	6375	8343	9709	11062	12524
	114	113	111	109	107	106	103
21	1881	3993	6237	8207	9596	11030	12452
	153	152	150	147	145	143	139
26	1754	3872	6092	8063	9453	10933	12307
	190	189	187	185	183	180	176
33	1620	3745	5881	7903	9246	10768	12098
	237	236	234	232	231	228	225
39.6	1463	3615	5675	7733	9046	10509	11877
	284	283	282	280	278	275	271

TORQUE (LB IN) 11795
SPEED (RPM) 17

Intermittent operation rating applies to 10% of every minute.

Cont. Int.



WARNING

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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

3ZG 630

38.52 cu in / rev

PRESSURE (PSID)

	435	870	1160	1740	2030	2320
2.6	1911	3990	6220	7998	10174	11590
	15	14	12	12	10	9
5.3	2061	4079	6423	8369	10528	11900
	31	30	28	27	26	25
10.6	2070	4087	6441	8396	10652	12015
	62	60	58	56	54	52
15.9	2035	4034	6388	8343	10546	12032
	93	90	88	86	84	82
21	1929	3990	6335	8303	10475	11988
	124	121	119	117	115	116
26	1876	3910	6282	8237	10395	11944
	154	152	150	148	145	142
33	1743	3610	6282	8237	10395	11944
	195	191	188	186	183	180
39.6	1416	3539	5441	7626	9626	11369
	234	233	231	230	227	228

TORQUE (LB IN) 11590
SPEED (RPM) 9

3ZG 725

44.2 cu in / rev

PRESSURE (PSID)

	435	870	1160	1740	2030
2.6	2700	5093	7833	10028	11860
	14	13	13	12	12
5.3	2811	5223	8020	10299	12158
	26	26	25	24	24
10.6	2801	5259	8164	10581	12438
	54	53	52	52	51
15.9	2733	5131	8090	10556	12374
	81	80	80	78	77
21	2643	4942	7876	10414	12256
	109	108	107	106	105
26	2524	4748	7575	10163	12035
	136	135	135	133	132
33	2266	4456	7206	9848	11615
	173	172	171	170	169
39.6	1897	4162	6756	9523	11102
	208	207	206	205	203

TORQUE (LB IN) 9245
SPEED (RPM) 22

Intermittent operation rating applies to 10% of every minute.

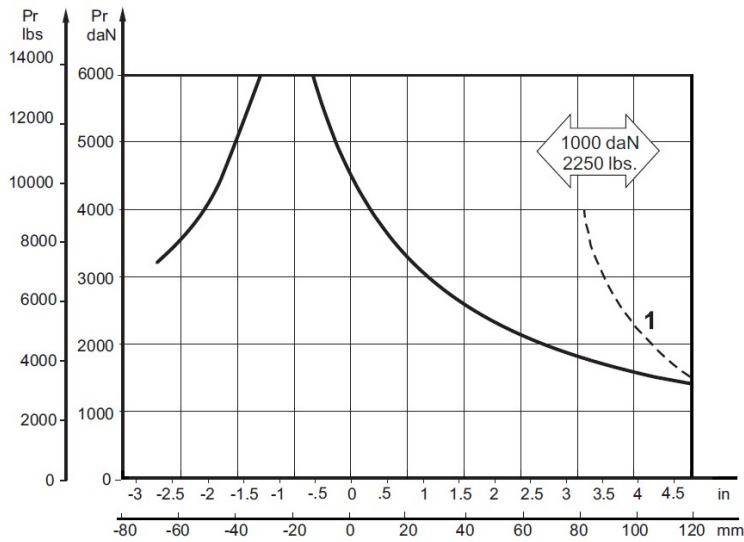
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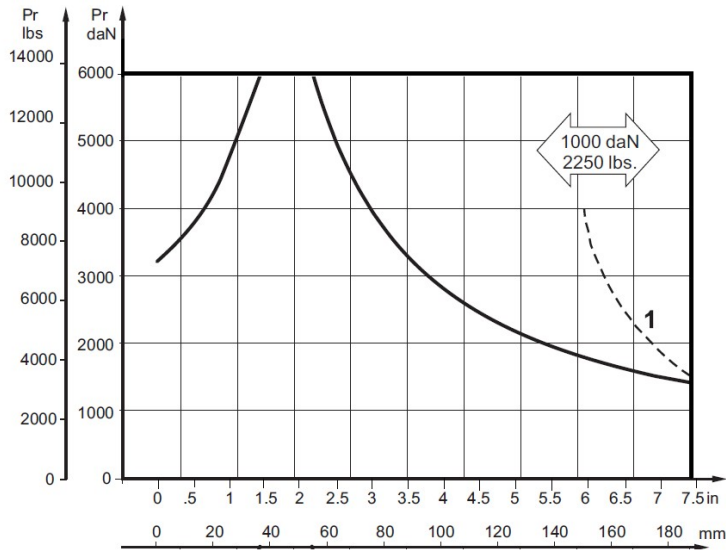
WARNING
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Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

Flange Mount



Wheel Mount

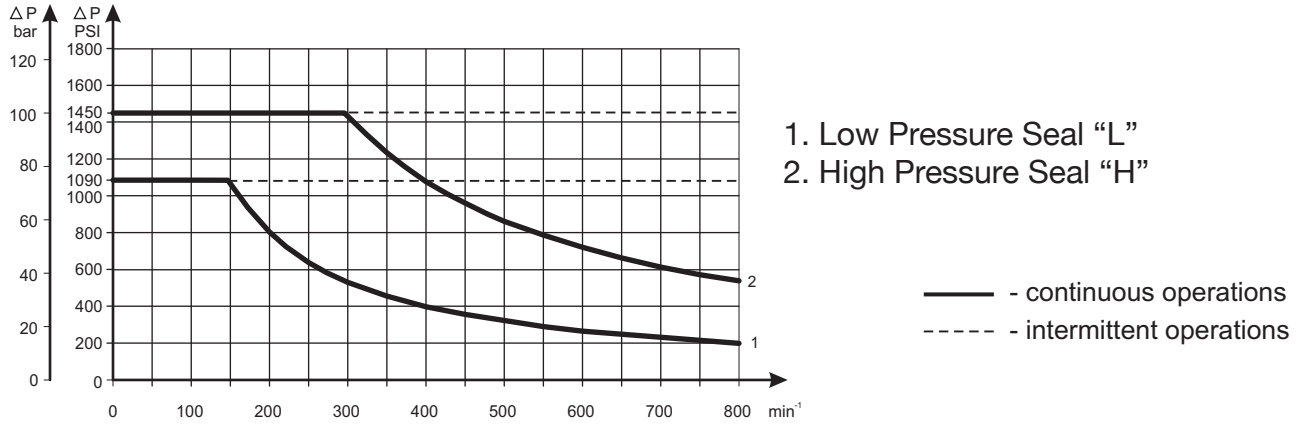


The dynamic side load curve is based on uni-directional steady state loads for L_{10} bearing life at 3×10^6 revolutions.

The maximum load curve is defined by bearing static load capacity. This curve should not be exceeded at any time including shock loads.

Max. Permissible Shaft Seal Pressure

Max Return Pressure without Drain Line or Max Pressure in the Drain Line.



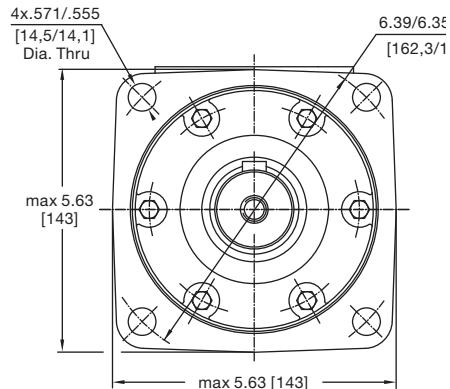
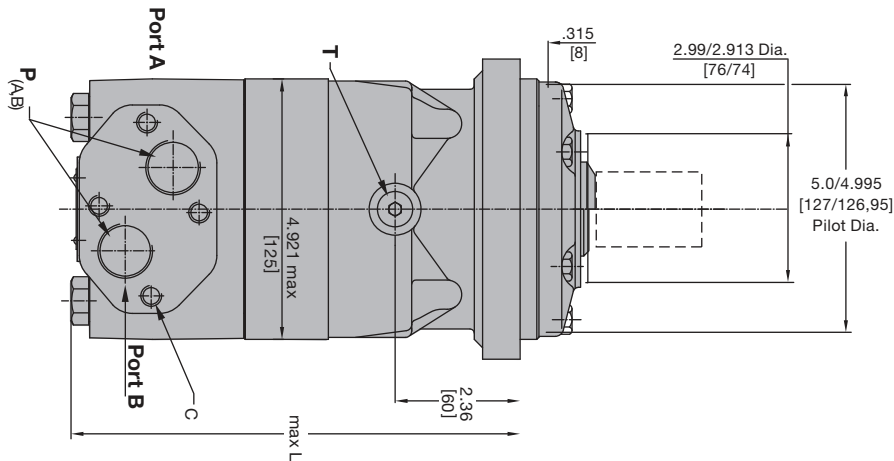
Mounting, Ports

Code K4

SAE C 4-Bolt, 1 1/16-12 UN Side Ports

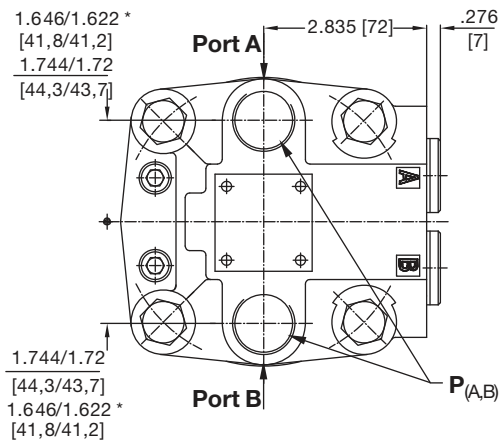
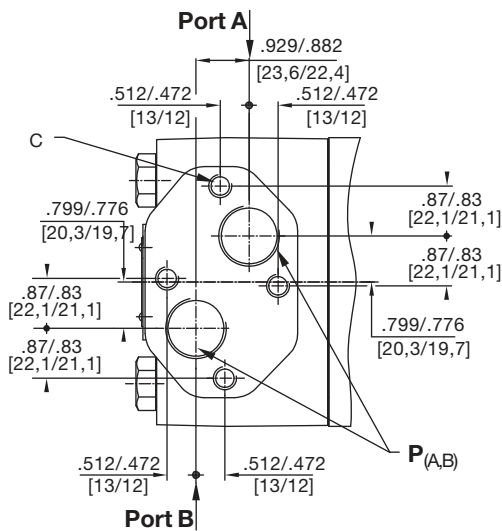
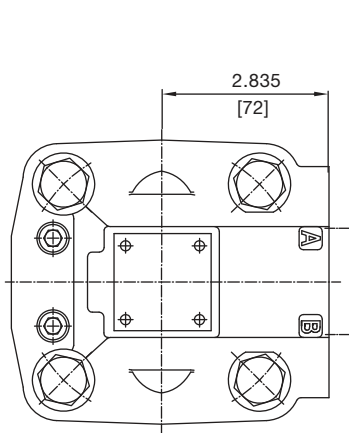
Code K7

SAE C 4-Bolt, 1 1/16-12 UNF Rear Ports



Side Ports

Rear Ports



Side Ports

Code K4	disp.	160	200	250	315	400	500	630	725
Weight	kg	20.0	21.5	21.0	22.0	23.0	24.0	23.5	24.5
	(lb)	(44.1)	(47.4)	(46.3)	(48.5)	(50.7)	(52.9)	(51.8)	(54.0)
Length	"L" mm	190	195	201	211	221	235	231	240
	"L" (in)	(7.48)	(7.68)	(7.91)	(8.31)	(8.70)	(8.70)	(9.25)	(9.09)

Rear Ports

Code K7	disp.	160	200	250	315	400	500	630	725
Weight	kg	20.5	22.0	21.5	22.5	23.5	24.5	24.0	25.0
	(lb)	(45.1)	(48.4)	(47.3)	(49.5)	(51.7)	(53.9)	(52.8)	(55.0)
Length	"L" mm	200	205	211	221	231	245	241	250
	"L" (in)	(7.87)	(8.07)	(8.31)	(8.70)	(9.09)	(9.64)	(9.49)	(9.84)

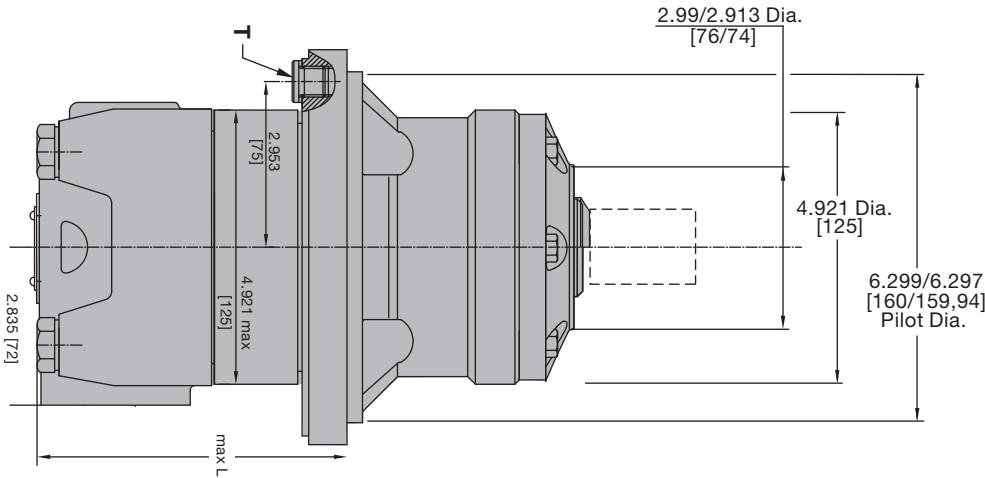


WARNING

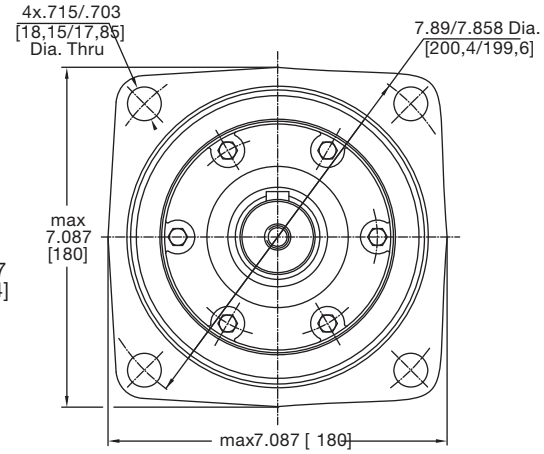
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Code T4
Wheel Mount, 1 1/16-12 UN Side Ports

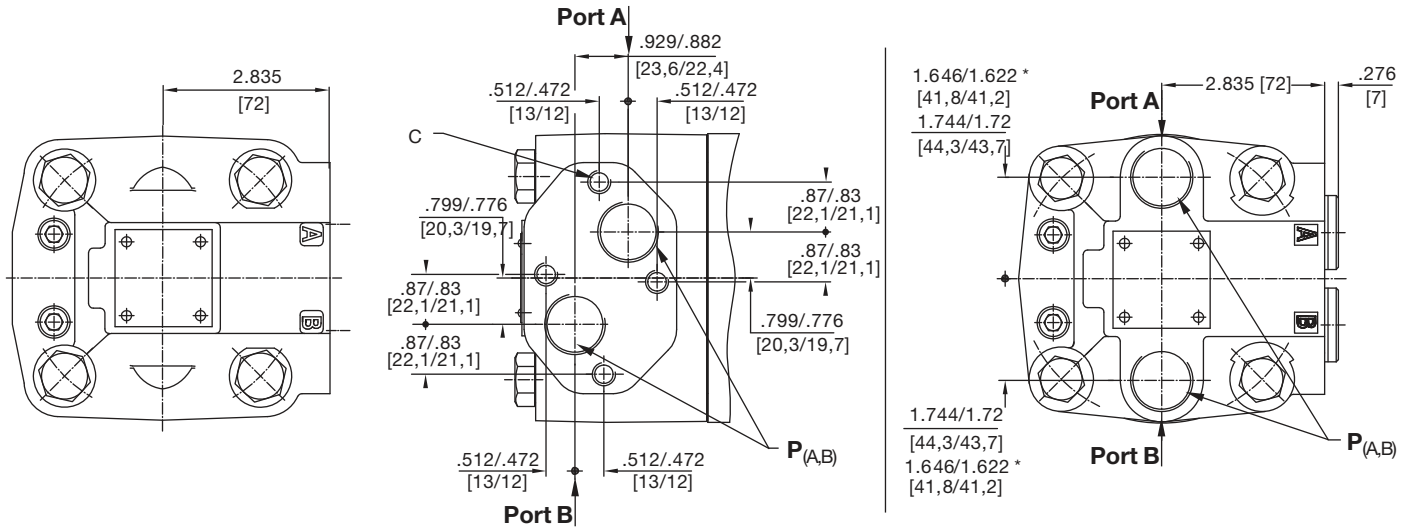
Code T7
Wheel Mount, 1 1/16-12 UNF Rear Ports



Side Ports



Rear Ports

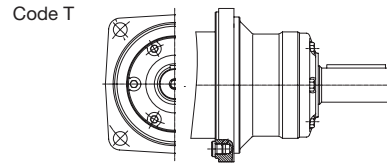
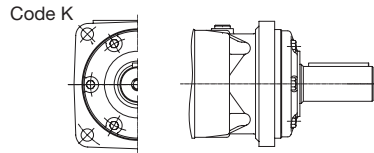


Side Ports

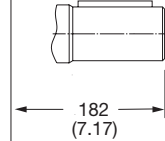
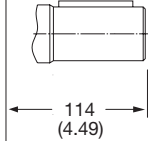
Code T4	disp.	160	200	250	315	400	500	630	725
Weight	kg	22.0	22.5	23.0	24.0	25.0	26.0	25.5	26.5
	(lb)	(48.5)	(49.6)	(50.7)	(52.9)	(55.1)	(57.3)	(56.2)	(58.4)
Length	"L" mm	190	195	201	211	221	235	231	240
	"L" (in)	(7.48)	(7.68)	(7.91)	(8.31)	(8.70)	(8.70)	(9.25)	(9.09)

Rear Ports

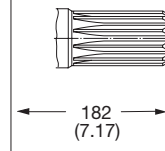
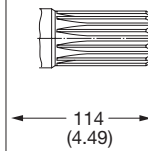
Code K7	disp.	160	200	250	315	400	500	630	725
Weight	kg	22.5	23.0	23.5	24.5	25.5	26.5	26.0	27.0
	(lb)	(49.5)	(50.6)	(51.7)	(53.9)	(56.1)	(58.3)	(57.2)	(59.4)
Length	"L" mm	133	138	144	154	164	178	174	183
	"L" (in)	(5.23)	(5.43)	(5.67)	(6.02)	(6.45)	(6.61)	(6.85)	(7.21)



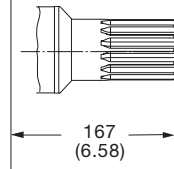
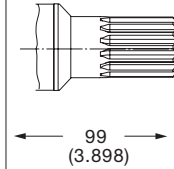
Code: 32
1.5" Straight Key



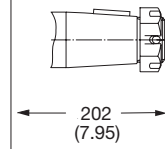
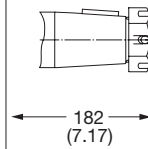
Code: 36
1.5" 17T Spline



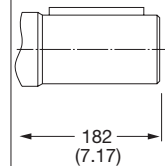
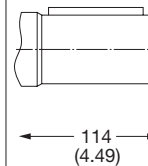
Code: 61
1.25" 14T Spline



Code: 63
1.75" J501 Tapered



Code: 64
**40 mm straight,
Parallel key**



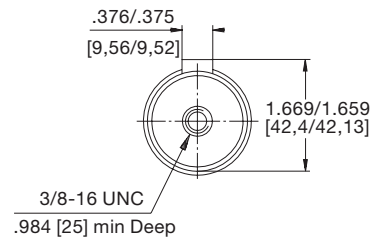
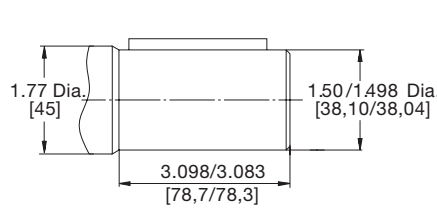
English equivalents for metric specifications are shown in ().



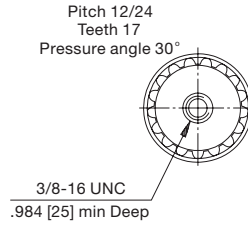
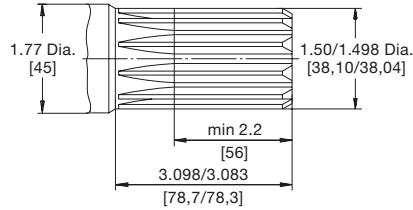
WARNING
This product can expose you to chemicals including lead and DEHP, which are known to the State of California to cause cancer, and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov

Parker Hannifin Corporation
Pump & Motor Division
Greenville, Tennessee, USA

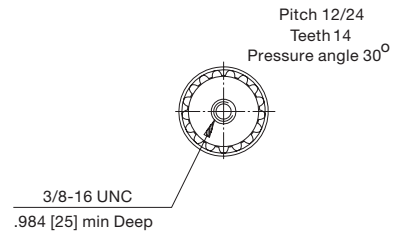
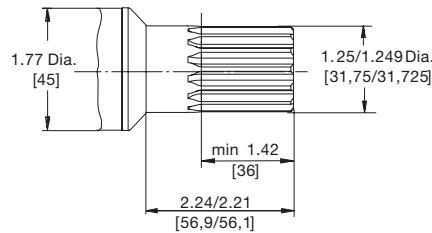
Code: 32
1.5" Straight Key



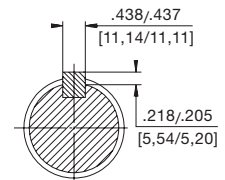
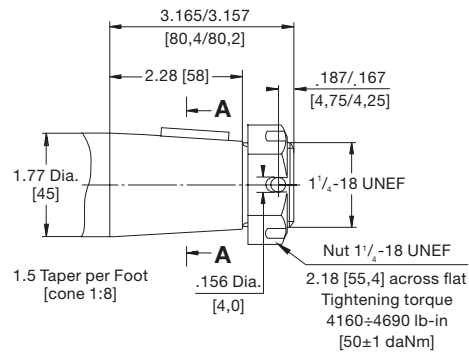
Code: 36
1.5" 17T Spline



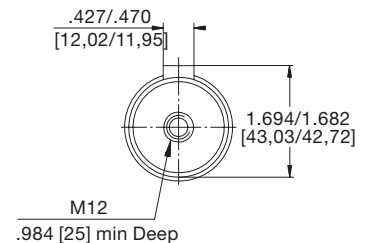
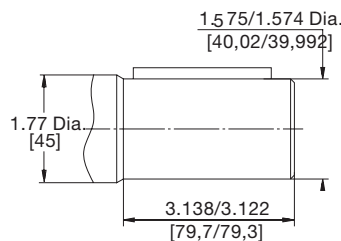
Code: 61
1.25" 14T Spline



Code: 63
1.75" J501 Tapered



Code: 64
40 mm straight, Parallel key



English equivalents for metric specifications are shown in ().

Installation/Operation Information

Fluid

To insure maximum motor performance and life, use a premium grade hydraulic or engine oil. Fluids with a minimum of .125% zinc (or equivalent) anti-wear package should be used. A mineral or synthetic based 10W40 engine oil or hydraulic (200 SUS) is recommended. Torqmotor™ seals come standard in nitrile rubber. If a fluid that is not compatible with nitrile is to be used, a fluoroelastomer seal material can be specified.

- Minimum fluid viscosity is 50 SUS
- Recommended fluid operating temperature is -28° C to 93° C (-20°F to 200° F)
- Filtration level is 20-50 micron nominal

Pressure

Operating the motor in its intermittent pressure range will shorten the life of the motor and should generally be restricted to 10% or less per minute. The reduced life resulting from continuous operation in the intermittent range may be acceptable in some applications. Consult the factory for details.

Performance Data

Performance data shown in this catalog is the result of testing performed using 10W40 oil at 54°C (130°F), 200 SUS. Actual performance will vary with fluid conditions. Lower viscosity will produce lower performance.

Inlet Conditions

Positive pressure must be available at the motor inlet while it is rotating. If an overrunning load causes the motor to rotate faster than the pump can fill it, cavitation will occur. Consult the factory for inlet pressure requirements and speed limitations.

Other Operating Conditions

Consult factory before operating at conditions exceeding any ratings or recommendations in this catalog.

Installation Recommendations

- To avoid contamination do not remove plastic port plugs until fittings are to be installed.
- Motor mounting flange must make full contact with equipment mount; do not use the mounting bolts to force the motor pilot into the pilot hole to align the motor.
- Pulleys, sprockets, wheels, or couplings should be properly aligned on the shaft to avoid excessive radial or thrust loads.
- To avoid damaging the thrust system, do not hammer on the motor or shaft to install or remove couplings, pulleys, sprockets, etc.

Tapered Shaft

The tightening torque listed for a taper shaft nut is based on strength of the shaft and nut. Hub design and hub material determine the application tightening torque. Refer to hub manufacturers specifications to determine actual assembly torque. Factory suggested assembly torques are: 200-400 lb-ft (1.25, 1.5 & 1.75 Dia. Shafts), 175-225 lb-ft (1.0 dia. shafts).

To insure a sound hub to shaft coupling, the hub must conform to the full length of the shaft taper. This will prevent bending stresses at the keyway that could cause a fatigue failure.

Castle Nut

All motors ordered with Tapered shafts are equipped with patch locking nuts. If desired, a castle nut may be specified.

Paint

Motors are shipped with single coat of black paint.



WARNING

This product can expose you to chemicals including lead and DEHP, which are known to the State of California to cause cancer, and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov

Engineering Data

Hydraulic Formulas

$$HP_{in} = \frac{Q \Delta P}{1714}$$

$$HP_{out} = \frac{NT}{63025}$$

$$T = \frac{D \Delta P e_m}{2 \pi}$$

$$Q = \frac{DN}{231 e_v}$$

Where

- HP = Horsepower
- Q = Flow, GPM
- P = Pressure, PSI
- Δ = Pressure differential across the motor
- π = 3.1416
- T = Torque, lb in
- D = Motor displacement, cubic inches per revolution
- N = Shaft Speed, RPM
- e_m = Mechanical efficiency
- e_v = Volumetric efficiency

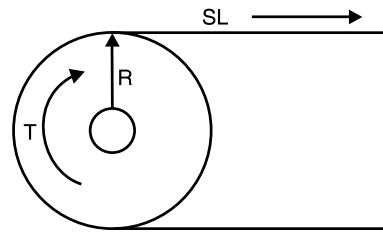
To Convert	Into	Multiply By
Into	To Convert	Divide By
bars	pounds/sq.in.	14.5
BTU/min	horsepower	.02356
BTU/min	kilowatts	.01757
centigrade	fahrenheit	(C°x9/5)+32
centimeters	inches	.3937
cu. cms.	cu. inches	.06102
cu. cms.	liters	.001
cu. inches	cu.cms.	16.39
cu. inches	liters	.01639
feet	meters	.3048
gallons	cu. inches	231
gallons	liters	3.785
horsepower	kilowatts	.7457
inches	millimeters	25.4
kilograms	pounds	2.205
pounds	newtons	4.448
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pound-inches	daNM	.0113
radians	degrees	57.3
square inches	sq. cms.	6.452

Side Load

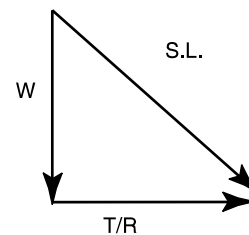
Side loads are imposed upon the shaft of a motor by:

- Driving the load through a pulley or gear
- Supporting the weight of a vehicle or other load on the shaft

Or both



If the load above requires torque T pound-inches and is driven with a pulley on the motor shaft with a radius of R inches, the side load imposed on the motor shaft is T/R pounds. If the motor shaft is connected to a sprocket for a chain drive, R is one half the pitch diameter of the sprocket. If an external load with a weight of W pounds is also being supported by the motor shaft above, the total side load on the shaft is:



$$(SL)^2 = W^2 + (T/R)^2$$

$$\text{Side Load(lb)} = \sqrt{W^2 + (T/R)^2}$$

Warning

This Catalog is not a Controlled Document. All Dimensions listed herein are for reference only. Consult a Sales engineer for detailed information.

Vehicle Propulsion Systems

Hydraulic motors are often used to drive off-highway vehicles, either directly or through gear reducers. The power required to propel the vehicle, called "Tractive Effort," is supplied by the hydraulic motor(s). It is normally expressed in pounds and is the sum of the forces below:

$$TE = (RR+GR+F+DP) \times 1.1$$

Where:

RR	=	Rolling Resistance
GR	=	Grade Resistance
F	=	Acceleration Force
DP	=	Drawbar Pull

Definitions

• Tractive Effort (TE)

Tractive effort is the total linear force that a vehicle can exert on the ground. Sometimes called "rim pull," it is the axle torque divided by the distance from the axle to the surface it is traversing.

• Rolling Resistance (RR)

Rolling resistance is the force in pounds required to propel a vehicle at constant speed over level terrain. It varies with the weight of the vehicle and the type of surface it is traversing. Soft sand, for example, offers more resistance to movement than concrete.

$RR = GVW \times R$ where:

RR = Rolling Resistance (lbs.)

GVW= Gross Vehicle Weight (lbs.)

R = Rolling Resistance Factor dependent upon type and condition of surface. Typical "R" values are shown in the accompanying table.

Surface Type	Surface Condition	R Value
Concrete	Excellent	0.010 lb.
Concrete	Good	0.015 lb.
Concrete	Poor	0.020 lb.
Asphalt	Good	0.012 lb.
Asphalt	Fair	0.017 lb.
Asphalt	Poor	0.022 lb.
Macadam	Good	0.015 lb.
Macadam	Fair	0.022 lb.
Macadam	Poor	0.037 lb.
Cobbles	Ordinary	0.055 lb.
Cobbles	Poor	0.085 lb.
Grass		0.025 lb.
Snow	2 In.	0.025 lb.
Snow	4 In.	0.037 lb.
Dirt	Smooth	0.025 lb.
Dirt	Sandy	0.037 lb.
Mud		0.037 to 0.150 lb.
Sand	Level/Soft	0.060 to 0.150 lb.
Sand	Dune	0.150 to 0.300 lb.

Engineering Data

- **Grade Resistance (GR)**

Grade resistance is the additional force required to move a vehicle up an incline. The grade of a slope is normally expressed as a percentage, and represents the number of feet of rise in 100 feet of length. A slope that rises 10 feet in 100 feet has a grade of 10%. The gradeability of a vehicle is defined as the maximum grade the vehicle can climb.

$GR = 0.01 \times GVW \times G$ where:

GR = Grade Resistance (lbs.)
 GVW = Gross Vehicle Weight (lbs.)
 G = Grade (%)

The following table gives the approximate relationship between grade in percent and slope in degrees.

Grade (Percent)	Slope (Degrees)
1%	0° 35'
2%	1° 9'
5%	2° 51'
6%	3° 26'
8%	4° 35'
10%	5° 43'
12%	6° 54'
15%	8° 31'
20%	11° 19'
25%	14° 3'
32%	18°
60%	31°

- **Acceleration Force (F)**

The force required to accelerate a vehicle from an initial speed V_1 (in feet/second) to speed V_2 in T seconds is the accelerating force in pounds. If the acceleration is from rest, V_1 is zero.

$$F = \frac{V \times GVW}{T \times 32.16} \text{ where}$$

V = Change in Velocity
 (ft. per Second)
 (Final Velocity - Initial Velocity)

GVW = Gross Vehicle Weight (lbs.)

T = Time for Velocity Change
 (Seconds)

Note - To obtain velocity in feet per second when MPH is known, Multiply MPH by 1.467.

- **Drawbar Pull (DP)**

Drawbar Pull is the force a vehicle can exert on a load in addition to the force required to propel itself.

Actual force to tow or push a load can be calculated based upon Rolling Resistance, Accelerating Force and Grade Resistance of towed or pushed load.

- **Motor Torque**

The total Tractive effort required to propel a vehicle is the sum of the forces due to Rolling Resistance, Grade Resistance, Acceleration and Drawbar Pull plus 10% for friction and other variables:

$$TE = (RR + GR + F + DP) \times 1.1$$

When Tractive Effort has been calculated, hydraulic motor torque can be estimated by:

$$T = \frac{TE \times r}{G \times N} \text{ where:}$$

T = Hydraulic Motor Torque (lbs. in.)

TE = Tractive Effort

r = Rolling Radius of Driven Tires
 (inches)

G = Gear Reduction Ratio Between Hydraulic Motors and Driven Wheels (if none, use a value of 1)

N = Number of Driving Motors

Engineering Data

• **Slip Torque**

Slip torque is the torque at the motor shaft that will cause the wheels or tracks to break traction and skid. It is affected by the weight of the vehicle and the coefficient of friction between the wheels or tracks and the surface.

$$ST = \frac{VW \times u \times r}{G \times N} \text{ where:}$$

- ST = Hydraulic Motor Slip Torque (lb in)
- VW = Maximum Weight on Driven Wheel (lb) Including: Allowable Vehicle Overload Dynamic Weight Shift.
- u = Coefficient of Friction Between Tire and Ground. (A value of 0.6 is used for "normal" tires and an average road surface)
- r = Rolling Radius of Driven Tires (inches)
- G = Gear Reduction Ratio Between Hydraulic Motors and Driven Wheel.
- N = Number of Driving Motors

• **Rolling Radius**

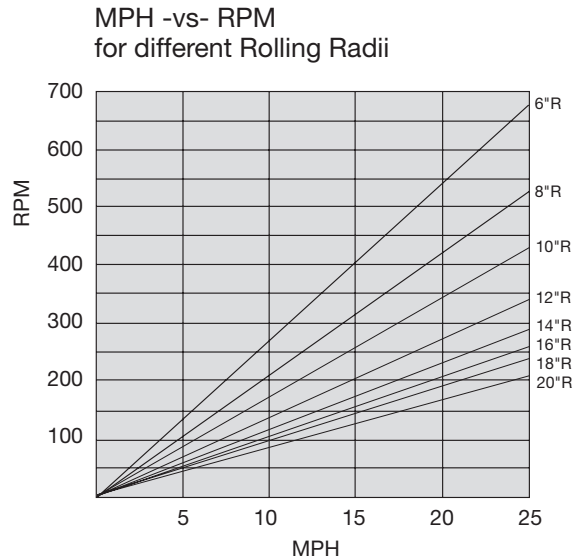
The rolling radius should be based on actual application factors such as Plyrating, Rated Load and inflation pressure can result in different values.

• **Hydraulic Motor Speed**

$$S = \frac{168 \times V \times G}{r} \text{ where:}$$

- S = Required Hydraulic Motor Speed (RPM)
- V = Desired Vehicle Velocity (MPH)
- G = Gear Reduction Ratio Between Hydraulic Motors and Driven Wheels (if none, use a value of 1)
- r = Rolling Radius of driven Tires (inches)

The chart below will estimate the wheel RPM -vs- vehicle velocity for various rolling radii.



Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods, services or work described will be referred to as "Products".

1. Terms and Conditions. Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is subject to these Terms and Conditions or any newer version of the terms and conditions found on-line at www.parker.com/saleterms/. Seller objects to any contrary or additional terms or conditions of Buyer's order or any other document issued by Buyer.

2. Price Adjustments; Payments. Prices stated on Seller's quote or other documentation offered by Seller are valid for 30 days, and do not include any sales, use, or other taxes unless specifically stated. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). Payment is subject to credit approval and is due 30 days from the date of invoice or such other term as required by Seller's Credit Department, after which Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. Delivery Dates; Title and Risk; Shipment. All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon placement of the products with the shipment carrier at Seller's facility. Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

4. Warranty. Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of eighteen months from the date of delivery to Buyer or 2,000 hours of normal use, whichever occurs first. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY:** THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

5. Claims; Commencement of Actions. Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 30 days after delivery. Buyer shall notify Seller of any alleged breach of warranty within 30 days after the date the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for an amount due on any invoice) must be commenced within 12 months from the date of the breach without regard to the date breach is discovered.

6. LIMITATION OF LIABILITY. UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.

7. User Responsibility. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

8. Loss to 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, will be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items 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. Special Tooling. A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. 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 Products, 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.

10. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. Improper use and Indemnity. Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement

or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

12. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

13. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

14. Force Majeure. Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

15. Waiver and Severability. Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

16. Termination. Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appointments a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) dissolves or liquidates all or a majority of its assets.

17. Governing Law. This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.

18. 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 Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("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 a Product sold pursuant to this Agreement 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 a Product 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 the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product 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 Products 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 Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

19. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

20. Compliance with Law, U.K. Bribery Act and U.S. Foreign Corrupt Practices Act. Buyer agrees to comply with all applicable laws and regulations, including those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.



WARNING

This product can expose you to chemicals including lead and DEHP, which are known to the State of California to cause cancer, and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov

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HY13-1596-02/US 05/2021



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