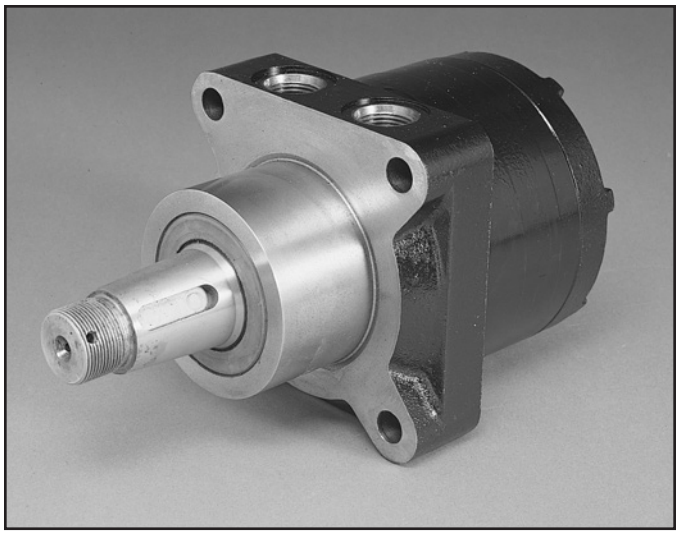
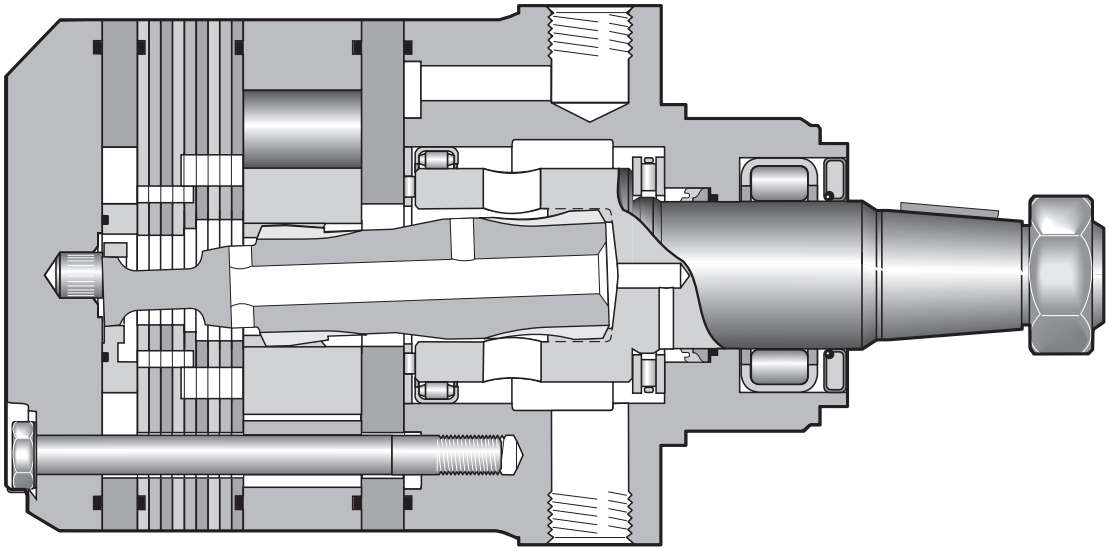
11 Displacements		(4.9 - 29.1 in³/rev) **81 . . . 477 cm³/rev**
Maximum Pressure	**Cont.** (3000 psid) **. . . 207 bar**	**Int.** (4000 psid) **. . . 276 bar**
Maximum Oil Flow		(25 gpm) **. . . 95 lpm**
Maximum Speed		(749 rpm) **749 rpm**
Maximum Torque	**Cont.** (6027 lb in) **681 Nm**	**Int.** (8106 lb in) **916 Nm**
Maximum Side Load at Key		(3597 lb) **. . . 16000 N**

A Tough Motor for Tough Applications

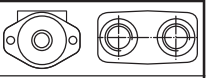
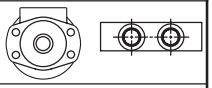
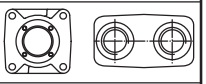
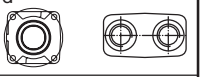
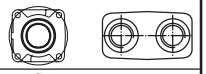
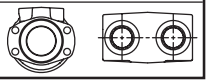
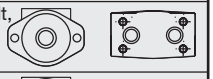
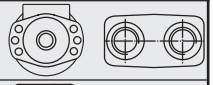
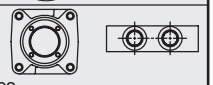
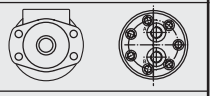
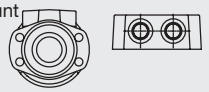
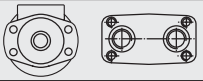
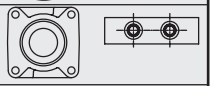
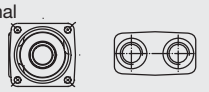
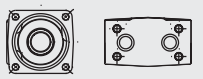
Sturdy construction throughout makes Parker's TF Series motors suitable for the most severe applications. The powertrain uses unique 60:40 spline geometry for strength. All splines are constantly flushed with cool fluid for durability. Roller vanes and sealed commutation assure high volumetric efficiency, smooth low speed operation and extended life. Shaft seals can withstand full system pressure and are washed in cool fluid for long life.





TF	XXXX	XX	XX	X
Series	Displacement	Mounting/Ports	Shaft	Rotation

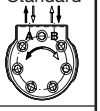
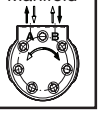
Code	cm^3/U cm^3/tr $cm^3/giro$	in^3/rev
0080	81	4.9
0100	100	6.1
0130	128	7.8
0140	141	8.6
0170	169	10.3
0195	197	11.9
0240	238	14.5
0280	280	17.1
0360	364	22.2
0405	405	24.7
0475	477	29.1

Code	Mounting/Ports	
AS	SAE "A" 2 Bolt, 7/8-14 SAE	
LS	Wheel, Front Brake Nose, 7/8-14 SAE	
MS	Magneto, 7/8-14 SAE	
UB	Wheel, Standard 7/8-14 SAE O-Ring; Rear Radial	
US	Wheel, Standard, 7/8-14 SAE	
ZS	Magneto, O Ring Pilot, 7/8-14 SAE	
Custom Order		
AB	SAE "A" 2 Bolt 7/8-14 SAE O-Ring; Rear Radial	
AE	SAE "A" 2 Bolt, Manifold; Rear Radial	
AM	SAE "A" 2 Bolt, 5/16-18 UNC Manifold	
BS	SAE "B" 2 Bolt, 7/8-14 SAE	
ES	Modified SAE A 6 Bolt, 7/8-14 SAE	
KS	Wheel Front Brake Nose, 1/2-13 UNC Mounting Holes, 7/8-14 SAE	
MA	Magneto 7/8-14 SAE O-Ring; Rear Axial	
MB	Standard Mount "A", 4-Bolt, Rear Port, 7/8 O-ring (SAE # 10) Rear Radial	
MM	Magneto, 5/16-18 UNC Manifold	
UJ	Large Wheel Mt., 9/16 O-ring	
WB	Wheel, Optional 7/8-14 SAE O-Ring; Rear Radial	
WE	Wheel, Optional, Manifold; Rear Radial	

Code	Shaft	
01*	1" 6B Spline	
02*	1" Keyed	
03	1 1/4" Keyed	
05	1 1/4" 14 Tooth Spline	
06	19 Tooth Spline	
08	1 1/4" Tapered	
Custom Order		
07	15 Tooth Spline	
26	25mm Str. w/8mm Key, 8mm Tap	
28	13 Tooth Spline (16/32 Pitch)	
58	1 1/4" Keyed plus Nitrotec C	

* Conforms to SAE recommended length

Code	Rotation	
0	Standard	
1	Reverse Timed Manifold	

Code	Rear Rotation	
0	Standard	
1	Reverse Timed Manifold	

Rotation viewed from shaft end.

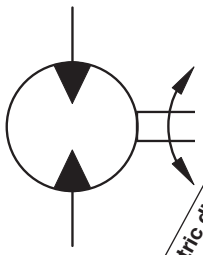
*Coupling shaft Ø 1 inch Max. torque cont./int. } 450/550 Nm

XXXX

Options
Opciones

Code	Options
AAAA[8]	“Standard”, Black Paint
AAAB	“Standard”, No Paint
AAAC[8]	“Standard”, Double Paint
AABJ[8]	Free Running Rotor Set, Black Paint
AABT[1,3,8]	No Nut, Black Paint
AAFA	Fluorocarbon Seals, High Temp Commutator Seal, No Paint
AAFW[8]	Fluorocarbon Seals, High Temp Commutator Seal, Black Paint
AAJH[1,3,8]	Fluorocarbon Seals, High Temp Commutator Seal, Black Paint
AAJL[1,3]	No Nut, No Paint
AAUP[1,3]	Fluorocarbon Seals, High Temp Commutator Seal, No Nut, No Paint
AAVE[8]	Free Running Rotor Set, Fluorocarbon (Viton) Seals, High Temp Commutator Seal, High Temp Section Seals, Black Paint
ABCW[1,3,7,8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, High Temp Section Seals, Bidirectional shuttle (.062 Orifice) (11:00*), Black Paint
ABCZ[8]	Fluorocarbon Seals, High Temp Commutator Seal , High Temp Section Seals, Double paint
BBGV[1,4,7,8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, 1015 PSI Int Bidirectional Relief, Black Paint
BBGW[1,4,7,8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, 1450 PSI Int Bidirectional Relief, Black Paint
BBGX[1,4,7,8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, 2031 PSI Int Bidirectional Relief, Black Paint
BBGY[1,4,5,7,8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, 3046 PSI Int Bidirectional Relief, Black Paint
BBGZ[1,4,6,7,8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, 4061 PSI Int Bidirectional Relief, Black Paint
BBHC[8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, 725 PSI Int Bidirectional Relief, Black Paint
BBHD[8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, 2538 PSI Int Bidirectional Relief, Black Paint
FSEK[1,2,3,8]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, High Temp Section Seals, Parker ECD Speed Sensor, Black Paint
FSEN[1,2,3]	No Shaft Hardware, Fluorocarbon Seals, High Temperature Commutator Seal, High Temp Section Seals, Parker ECD Speed Sensor, No Paint

[1] No Nut with shaft code 08
[2] Not applicable with shaft code 58
[3] No bolt, washer or lock washer with shaft code 03, 05 and 58
[4] No bolt, washer or lock washer with shaft code 03, 58 or 62
[5] Not applicable with displacement 0360, 0405 or 0475
[6] Only available with displacement 0080
[7] Only available with front porting option
[8] Paint area all over except front and rear pilot and mounting flanges and shaft



Motor Series TF	Geometric displacement: **cm³/rev** in³/rev	Max. speed @ Max. intermittent flow: rev/min	Max. oil flow: *cont* / *int** **l/min** g/min		Max. differential pressure: *cont* / *int** **bar** psid		Max. supply pressure: *max* **bar** psig	Max. torque: *cont* / *int** **Nm** lb-in		Max. performance: *max* **KW** HP	Min. starting torque: *cont* / *int** **Nm** lb-in	
TF 0080	**81** 4.9	693	**46** 12	**57** 15	**207** 3000	**276** 4000	**300** 4350	**220** 1948	**296** 2621	**21.5** 28.8	**158** 1401	**205** 1811
TF 0100	**100** 6.1	749	**57** 15	**76** 20	**155** 2250	**241** 3500	**300** 4350	**197** 1746	**318** 2813	**24.9** 33.4	**148** 1309	**243** 2155
TF 0130	**128** 7.8	583	**57** 15	**76** 20	**138** 2000	**207** 3000	**300** 4350	**229** 2031	**356** 3148	**21.7** 29.1	**180** 1596	**278** 2460
TF 0140	**141** 8.6	530	**57** 15	**76** 20	**138** 2000	**207** 3000	**300** 4350	**254** 2248	**393** 3477	**21.8** 29.2	**196** 1739	**308** 2728
TF 0170	**169** 10.3	444	**57** 15	**76** 20	**138** 2000	**207** 3000	**300** 4350	**317** 2808	**489** 4324	**22.7** 30.5	**243** 2152	**385** 3404
TF 0195	**197** 12.0	381	**57** 15	**76** 20	**138** 2000	**207** 3000	**300** 4350	**364** 3222	**562** 4971	**22.4** 30.1	**302** 2671	**468** 4142
TF 0240	**238** 14.5	394	**76** 20	**95** 25	**138** 2000	**207** 3000	**300** 4350	**427** 3782	**670** 5928	**27.7** 37.1	**366** 3242	**572** 5058
TF 0280	**280** 17.1	334	**76** 20	**95** 25	**138** 2000	**207** 3000	**300** 4350	**509** 4502	**794** 7029	**27.8** 37.3	**438** 3876	**672** 5946
TF 0360	**364** 22.2	258	**76** 20	**95** 25	**130** 1880	**190** 2750	**300** 4350	**594** 5257	**880** 7788	**20.0** 26.8	**517** 4575	**779** 6898
TF 0365 Clutch	**364** 22.2	258	**76** 20	**95** 25	**97** 1400	**152** 2200	**300** 4350	**437** 3871	**740** 6456	**20.0** 26.8	**398** 3521	**650** 5749
TF 0405	**405** 24.7	231	**76** 20	**95** 25	**128** 1850	**172** 2750	**300** 4350	**655** 5800	**916** 8106	**22.1** 29.7	**575** 5091	**789** 6978
TF 0475	**477** 29.1	195	**76** 20	**95** 25	**113** 1645	**138** 2000	**300** 4350	**681** 6027	**851** 7528	**17.4** 23.3	**603** 5334	**740** 6548

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.

TF 0080

4.9 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	2000	2500	3000	3500	4000
.5	256 **19**	546 **14**	835 **8**	1118 **1**				
1	270 **42**	575 **37**	867 **31**	1151 **24**	1434 **17**	1713 **13**	2002 **12**	2289 **13**
2	281 **89**	598 **83**	917 **76**	1233 **68**	1537 **60**	1821 **53**	2090 **46**	2352 **40**
3	282 **135**	601 **128**	922 **121**	1238 **113**	1547 **104**	1845 **96**	2138 **86**	2428 **78**
4	284 **182**	610 **174**	938 **166**	1264 **158**	1586 **149**	1899 **139**	2202 **129**	2491 **120**
5	282 **228**	612 **219**	944 **211**	1278 **202**	1607 **193**	1932 **183**	2250 **172**	2560 **163**
7	274 **321**	607 **311**	945 **301**	1285 **291**	1622 **281**	1957 **270**	2288 **258**	2612 **247**
9	262 **414**	597 **402**	937 **391**	1279 **380**	1622 **369**	1960 **357**	2295 **344**	2628 **331**
12	239 **553**	574 **540**	916 **526**	1260 **514**	1605 **501**	1948 **488**	2287 **472**	2621 **456**
15	215 **693**	546 **677**	886 **661**	1231 **646**	1579 **633**	1927 **619**	2269 **601**	2605 **582**

TORQUE (LB IN) 2605
SPEED (RPM) 582

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0100
6.1 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	2000	2250	2500	3000	3500
.5	318 **14**	679 **9**	1041 **4**					
1	335 **33**	703 **28**	1066 **22**	1430 **17**	1611 **14**	1791 **12**	2162 **9**	2543 **6**
2	351 **71**	743 **65**	1132 **58**	1514 **52**	1700 **48**	1882 **45**	2241 **39**	2602 **34**
3	350 **109**	746 **102**	1138 **95**	1525 **88**	1717 **84**	1907 **80**	2288 **72**	2671 **64**
4	353 **147**	754 **139**	1156 **132**	1554 **124**	1752 **120**	1948 **116**	2334 **107**	2716 **98**
5	352 **184**	759 **177**	1167 **169**	1572 **161**	1774 **156**	1974 **152**	2370 **143**	2762 **133**
7	343 **260**	753 **252**	1166 **243**	1581 **233**	1788 **229**	1994 **224**	2401 **213**	2810 **202**
9	329 **336**	741 **327**	1159 **316**	1579 **306**	1788 **301**	1997 **296**	2411 **284**	2824 **272**
12	299 **449**	715 **438**	1137 **426**	1561 **415**	1773 **409**	1985 **403**	2406 **391**	2825 **377**
15	259 **562**	679 **549**	1106 **536**	1532 **523**	1746 **517**	1959 **510**	2387 **496**	2813 **480**
20	186 **749**	607 **734**	1034 **718**	1463 **703**	1679 **696**	1896 **689**	2331 **671**	2763 **653**

TORQUE (LB IN) 2763
SPEED (RPM) 653

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0130
7.8 cu in / rev

Flow (GPM)	PRESSURE (PSID) 500	1000	1500	2000	2500	3000
.5	441 **10**	927 **7**	1413 **3**			
1	456 **24**	948 **21**	1440 **17**	1935 **13**	2422 **9**	2909 **5**
2	478 **52**	991 **47**	1495 **42**	2004 **36**	2508 **32**	3009 **29**
3	475 **82**	993 **76**	1510 **70**	2023 **63**	2533 **57**	3042 **52**
4	479 **112**	1006 **105**	1529 **98**	2048 **91**	2568 **85**	3084 **79**
5	478 **141**	1014 **134**	1548 **127**	2076 **119**	2600 **113**	3115 **106**
7	467 **200**	1010 **192**	1553 **184**	2094 **176**	2632 **169**	3166 **161**
9	447 **259**	996 **251**	1546 **242**	2094 **233**	2640 **225**	3184 **216**
12	410 **348**	961 **338**	1518 **328**	2073 **318**	2626 **309**	3177 **299**
15	365 **436**	914 **426**	1474 **415**	2031 **404**	2589 **394**	3148 **382**
20	263 **583**	812 **572**	1371 **559**	1933 **547**	2498 **535**	3059 **522**

TORQUE (LB IN) 3059
SPEED (RPM) 522

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0140

8.6 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	2000	2500	3000
.5	485 **11**	1025 **8**	1560 **4**			
1	507 **24**	1056 **20**	1594 **16**	2137 **12**	2682 **8**	3224 **5**
2	526 **50**	1101 **46**	1670 **42**	2237 **37**	2796 **33**	3336 **28**
3	525 **77**	1103 **72**	1676 **68**	2246 **63**	2814 **57**	3370 **52**
4	528 **103**	1114 **98**	1696 **93**	2277 **88**	2857 **82**	3423 **77**
5	528 **130**	1120 **125**	1712 **119**	2301 **113**	2885 **107**	3456 **101**
7	516 **184**	1115 **177**	1716 **170**	2314 **164**	2908 **158**	3497 **151**
9	496 **237**	1100 **230**	1707 **222**	2311 **215**	2912 **208**	3510 **200**
12	454 **317**	1063 **309**	1677 **300**	2290 **292**	2901 **284**	3506 **275**
15	403 **397**	1011 **388**	1629 **378**	2248 **368**	2866 **359**	3477 **349**
20	298 **530**	908 **520**	1525 **508**	2149 **497**	2775 **485**	3401 **473**

TORQUE (LB IN) 3401
SPEED (RPM) 473

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0170

10.3 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	2000	2500	3000
.5	627 **8**	1304 **6**	1980 **2**			
1	657 **19**	1341 **16**	2021 **12**	2714 **9**	3404 **4**	4101 **1**
2	687 **42**	1409 **38**	2123 **34**	2829 **29**	3520 **25**	4197 **21**
3	681 **64**	1407 **60**	2127 **56**	2841 **51**	3552 **45**	4263 **40**
4	681 **86**	1419 **82**	2153 **77**	2879 **72**	3604 **67**	4321 **61**
5	675 **109**	1423 **104**	2165 **99**	2897 **94**	3628 **88**	4355 **82**
7	654 **153**	1406 **148**	2161 **143**	2911 **137**	3652 **130**	4385 **123**
9	624 **198**	1380 **193**	2143 **186**	2900 **180**	3645 **173**	4384 **165**
12	572 **265**	1331 **259**	2101 **252**	2863 **244**	3618 **236**	4364 **228**
15	514 **332**	1267 **325**	2040 **317**	2808 **309**	3570 **300**	4324 **291**
20	387 **444**	1138 **436**	1903 **427**	2667 **417**	3435 **407**	4201 **396**

TORQUE (LB IN) 4201
SPEED (RPM) 396

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0195

12.0 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	2000	2500	3000
.5	710 **8**	1494 **7**	2286 **5**	3085 **3**		
1	737 **18**	1537 **16**	2334 **14**	3133 **12**	3946 **9**	4767 **7**
2	757 **37**	1587 **35**	2417 **32**	3242 **29**	4067 **26**	4887 **23**
3	758 **56**	1591 **53**	2424 **51**	3254 **47**	4086 **44**	4914 **40**
4	759 **75**	1604 **72**	2450 **69**	3292 **66**	4131 **62**	4965 **58**
5	755 **94**	1610 **91**	2469 **88**	3321 **84**	4163 **80**	5000 **75**
7	737 **132**	1599 **129**	2467 **125**	3329 **120**	4185 **116**	5034 **110**
9	709 **170**	1577 **166**	2451 **162**	3319 **157**	4181 **152**	5034 **146**
12	652 **228**	1523 **223**	2405 **218**	3283 **212**	4154 **206**	5018 **199**
15	586 **285**	1451 **280**	2338 **273**	3222 **267**	4100 **260**	4971 **252**
20	445 **381**	1303 **375**	2174 **367**	3056 **359**	3939 **350**	4822 **341**

TORQUE (LB IN) 4822
SPEED (RPM) 341

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0240
14.5 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	2000	2500	3000
.5	856 **7**	1796 **5**	2758 **3**	3739 **1**		
1	883 **15**	1838 **13**	2801 **11**	3780 **8**	4756 **5**	5741 **3**
2	920 **30**	1912 **28**	2910 **26**	3895 **23**	4880 **20**	5864 **17**
3	919 **46**	1920 **44**	2927 **41**	3931 **38**	4924 **35**	5919 **31**
4	924 **62**	1941 **60**	2958 **57**	3967 **54**	4978 **50**	5985 **45**
5	919 **78**	1948 **75**	2975 **72**	3998 **69**	5017 **64**	6025 **60**
7	904 **109**	1947 **106**	2995 **103**	4036 **99**	5066 **94**	6090 **89**
9	868 **141**	1922 **137**	2982 **134**	4033 **130**	5072 **124**	6101 **119**
12	815 **188**	1866 **184**	2930 **180**	3998 **175**	5053 **169**	6090 **162**
15	726 **235**	1791 **231**	2865 **227**	3934 **221**	5002 **214**	6054 **206**
20	539 **315**	1616 **310**	2699 **304**	3782 **297**	4863 **289**	5928 **280**
25	335 **394**	1404 **389**	2464 **382**	3542 **374**	4634 **365**	5718 **354**

TORQUE (LB IN) 5718
SPEED (RPM) 354

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0280

17.1 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	2000	2500	3000
.5	1048 **6**	2180 **5**	3333 **4**	4508 **3**	5704 **2**	
1	1080 **13**	2237 **12**	3399 **11**	4577 **9**	5762 **7**	6925 **5**
2	1120 **26**	2316 **25**	3516 **23**	4726 **22**	5915 **19**	7092 **17**
3	1117 **39**	2320 **38**	3528 **36**	4742 **34**	5949 **32**	7134 **29**
4	1120 **53**	2337 **51**	3559 **49**	4778 **47**	5988 **44**	7187 **41**
5	1109 **66**	2342 **64**	3575 **62**	4802 **60**	6020 **56**	7218 **53**
7	1086 **93**	2331 **91**	3582 **88**	4827 **85**	6058 **81**	7266 **77**
9	1040 **120**	2299 **117**	3562 **114**	4811 **111**	6048 **106**	7264 **102**
12	978 **160**	2226 **157**	3494 **154**	4758 **149**	6001 **144**	7217 **138**
15	888 **200**	2146 **197**	3419 **193**	4688 **188**	5945 **182**	7176 **175**
20	678 **267**	1945 **263**	3223 **258**	4502 **252**	5777 **245**	7029 **236**
25	442 **334**	1686 **330**	2938 **324**	4206 **316**	5487 **308**	6754 **297**

TORQUE (LB IN) 6754
SPEED (RPM) 297

☐ Cont. ☐ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0360

22.2 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	1850	2000	2500	2750
.5	1436 **5**	2955 **4**	4497 **4**	5582 **4**	6047 **3**	7608 **3**	8393 **3**
1	1492 **10**	3042 **9**	4591 **9**	5672 **8**	6136 **8**	7673 **8**	8445 **7**
2	1532 **20**	3114 **19**	4691 **19**	5784 **18**	6249 **18**	7799 **17**	8575 **16**
3	1527 **30**	3114 **29**	4699 **29**	5796 **28**	6263 **27**	7814 **26**	8590 **25**
4	1526 **40**	3125 **40**	4718 **38**	5821 **37**	6290 **37**	7847 **35**	8624 **34**
5	1504 **51**	3114 **50**	4719 **48**	5831 **47**	6304 **46**	7866 **44**	8641 **43**
7	1469 **71**	3090 **70**	4697 **68**	5809 **66**	6282 **66**	7850 **63**	8630 **61**
9	1392 **92**	3017 **90**	4640 **88**	5766 **86**	6243 **85**	7817 **81**	8595 **79**
12	1279 **122**	2902 **120**	4526 **117**	5653 **115**	6133 **113**	7712 **109**	8493 **106**
15	1106 **153**	2739 **151**	4385 **147**	5518 **144**	5999 **142**	7578 **139**	8355 **134**
20	840 **204**	2465 **202**	4115 **197**	5256 **193**	5735 **191**	7329 **184**	8121 **180**
25	516 **255**	2138 **253**	3756 **248**	4876 **243**	5356 **240**	6976 **232**	7785 **226**

TORQUE (LB IN) 7785
SPEED (RPM) 226

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0405

24.7 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	1850	2000	2500
.5	1567 **4**	3212 **4**	4883 **3**	6075 **2**	6587 **2**	8325 **2**
1	1623 **9**	3298 **8**	4972 **7**	6151 **6**	6660 **6**	8371 **5**
2	1662 **18**	3377 **17**	5103 **16**	6306 **14**	6815 **14**	8507 **12**
3	1665 **27**	3392 **26**	5118 **24**	6325 **23**	6839 **22**	8554 **20**
4	1667 **37**	3414 **35**	5155 **33**	6367 **32**	6880 **31**	8591 **28**
5	1652 **46**	3417 **44**	5171 **42**	6393 **40**	6909 **39**	8625 **36**
7	1623 **64**	3399 **62**	5163 **60**	6392 **58**	6912 **56**	8638 **53**
9	1549 **83**	3337 **81**	5125 **78**	6361 **75**	6883 **73**	8605 **69**
12	1432 **111**	3216 **108**	5006 **104**	6252 **101**	6779 **99**	8523 **94**
15	1259 **138**	3059 **136**	4866 **131**	6113 **128**	6644 **126**	8394 **120**
20	936 **185**	2735 **182**	4542 **177**	5800 **172**	6335 **170**	8106 **162**
25	657 **231**	2435 **229**	4187 **222**	5418 **217**	5945 **214**	7709 **205**

TORQUE (LB IN) 7709
SPEED (RPM) 205

■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

TF 0475

29.1 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1500	1645	1850	2000
.5	1870 **4**	3857 **3**	5875 **3**	6460 **3**	7292 **2**	7902 **2**
1	1941 **8**	3967 **7**	5992 **7**	6582 **6**	7410 **6**	8016 **6**
2	2003 **15**	4071 **15**	6124 **14**	6717 **14**	7554 **13**	8166 **13**
3	1994 **23**	4072 **23**	6145 **22**	6738 **21**	7578 **20**	8192 **20**
4	1993 **31**	4091 **30**	6177 **29**	6776 **28**	7620 **27**	8235 **27**
5	1964 **39**	4081 **38**	6186 **37**	6790 **36**	7639 **35**	8258 **34**
7	1918 **55**	4048 **54**	6159 **52**	6765 **51**	7620 **50**	8242 **48**
9	1829 **70**	3965 **59**	6098 **67**	6709 **66**	7565 **64**	8189 **63**
12	1694 **94**	3822 **92**	5954 **89**	6575 **89**	7440 **87**	8063 **85**
15	1462 **117**	3617 **116**	5766 **112**	6385 **111**	7254 **109**	7875 **107**
20	1070 **156**	3231 **154**	5394 **151**	6027 **149**	6900 **147**	7530 **145**
25	711 **195**	2820 **194**	4927 **190**	5531 **188**	6391 **185**	7028 **183**

TORQUE (LB IN) 7028
SPEED (RPM) 183

TF 0365 Clutch Motor

22.2 cu in / rev

PRESSURE (PSID)

Flow (GPM)	500	1000	1400	1500	2000	2200
.5	1392 **5**	2902 **4**	4131 **3**	4441 **3**	6013 **2**	6653 **2**
1	1439 **10**	2972 **9**	4208 **8**	4518 **8**	6090 **7**	6725 **7**
2	1478 **20**	3061 **19**	4332 **18**	4651 **18**	6248 **17**	6884 **16**
3	1478 **30**	3071 **29**	4349 **29**	4670 **28**	6268 **27**	6906 **26**
4	1480 **41**	3089 **40**	4379 **39**	4703 **38**	6311 **37**	6950 **36**
5	1467 **51**	3096 **50**	4396 **49**	4720 **49**	6332 **47**	6971 **46**
7	1434 **72**	3072 **70**	4384 **69**	4712 **69**	6344 **66**	6990 **65**
9	1378 **92**	3031 **91**	4355 **89**	4686 **89**	6322 **86**	6970 **85**
12	1278 **123**	2922 **122**	4252 **120**	4585 **119**	6242 **116**	6897 **115**
15	1158 **154**	2810 **152**	4139 **150**	4470 **150**	6127 **146**	6787 **144**
20	873 **206**	2531 **204**	3871 **202**	4206 **201**	5878 **197**	6546 **194**
25	557 **258**	2197 **255**	3509 **253**	3839 **252**	5498 **247**	6175 **244**

Flow (GPM)

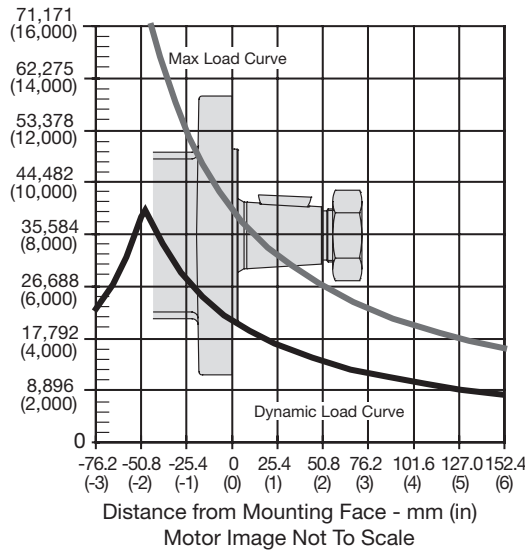
■ Cont. □ Int.

Intermittent operation rating applies to 10% of every minute.

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

Flange Mount

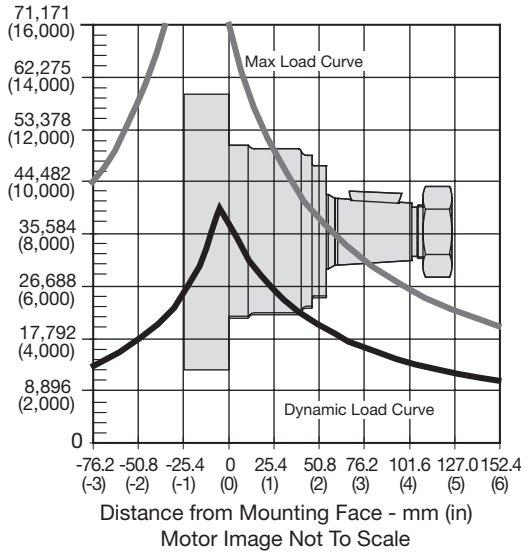
Side Load - N (lbs)



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

Wheel Mount

Side Load - N (lbs)



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

Equation to Calculate the Expected Radial Bearing Life

Equation to calculate the dynamic bearing life for a given load:

Use F_a, F_b and S in equation to determine hours of L_{10} bearing life.

$$L = \frac{3 \times 10^6}{60 \times S} \left\{ \frac{F_a}{F_b} \right\}^{3.33}$$

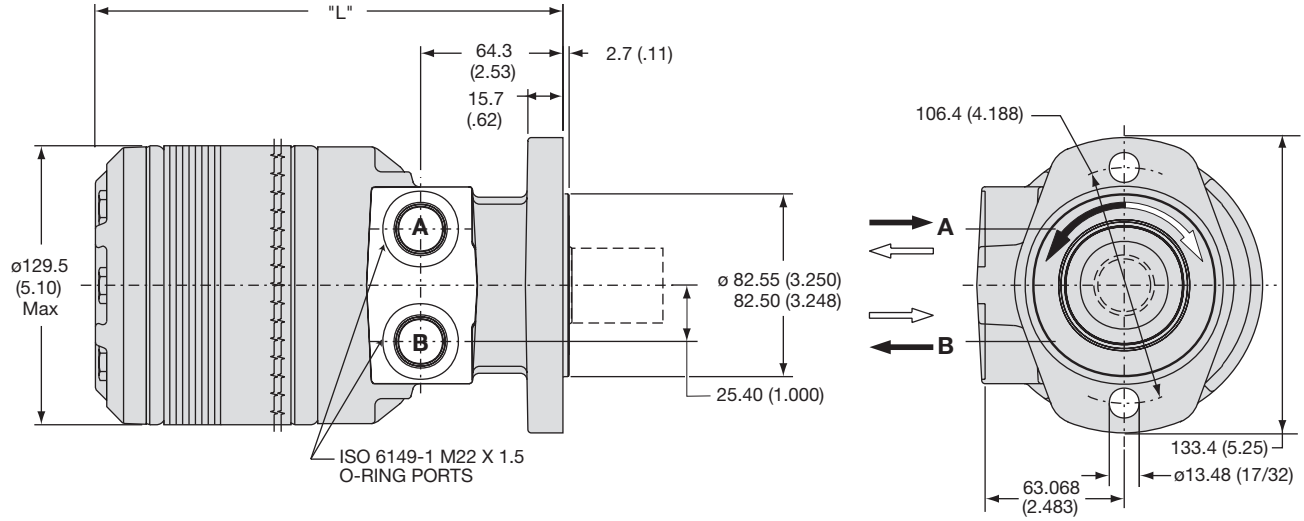
Where / Mit:

S = Shaft Speed RPM
L = Life In Hours
F_a = Dynamic side load defined by above curve at a distance from mounting flange.
F_b = Application side load.

Note: Calculations are based on L_{10} bearing life per ISO 281.

Code: AH

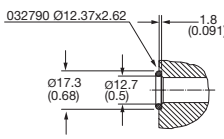
SAE A 2-Bolt, ISO 6149-1 M22 x 1.5



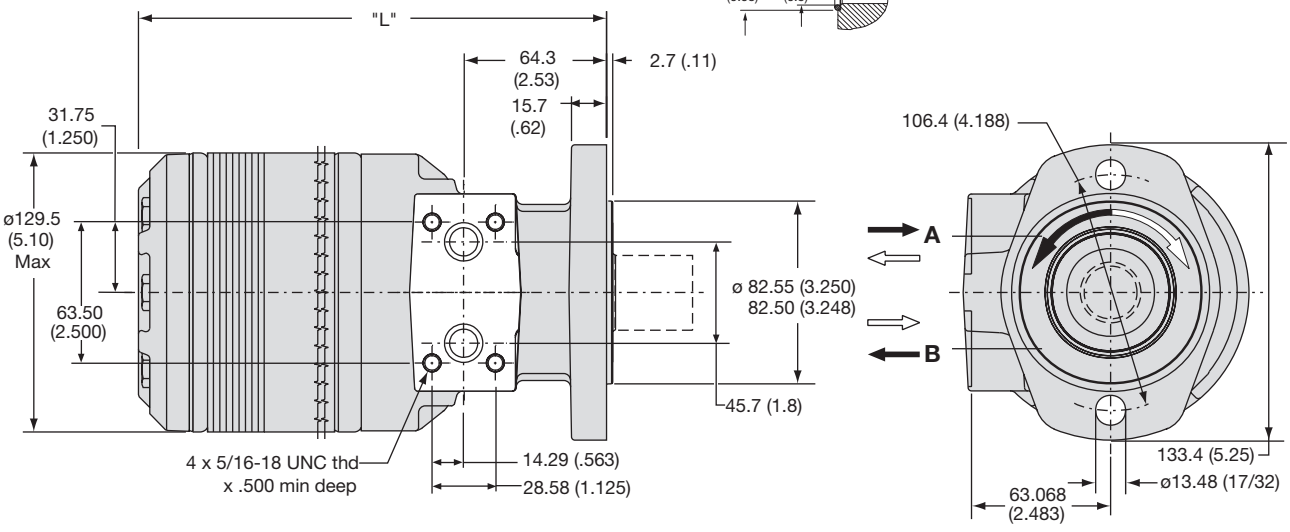
Code AH	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**13.6**	**13.6**	**13.8**	**13.9**	**14.2**	**14.5**	**14.9**	**15.2**	**16.0**	**16.5**	**17.2**
Poids/Peso	(lb)	(29.9)	(30.0)	(30.5)	(30.7)	(31.3)	(31.9)	(32.9)	(33.5)	(35.2)	(36.4)	(37.9)
Length	**"L" mm**	**190.8**	**190.8**	**193.8**	**195.6**	**198.6**	**201.9**	**207**	**211.3**	**221.0**	**225.3**	**233.7**
	"L" (in)	(7.51)	(7.51)	(7.63)	(7.70)	(7.82)	(7.95)	(8.13)	(8.32)	(8.70)	(8.87)	(9.20)

Code: AM

SAE A 2-Bolt, Manifold



Motor with manifold mount is supplied with 2 o-rings.

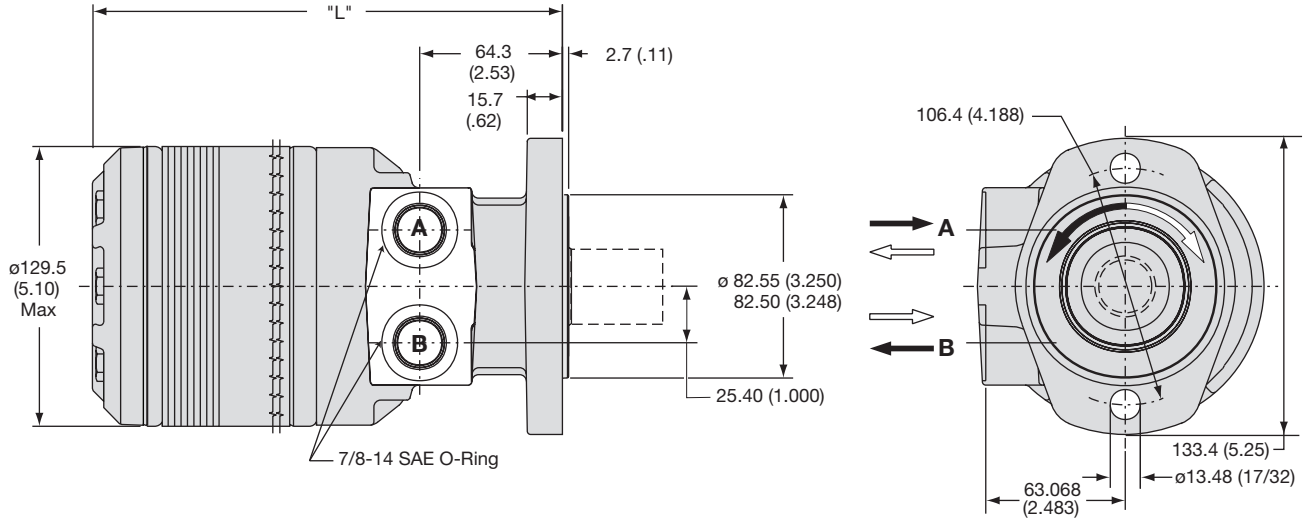


Code AM	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**13.6**	**13.6**	**13.8**	**13.9**	**14.2**	**14.5**	**14.9**	**15.2**	**16.0**	**16.5**	**17.2**
Poids/Peso	(lb)	(29.9)	(30.0)	(30.5)	(30.7)	(31.3)	(31.9)	(32.9)	(33.5)	(35.2)	(36.4)	(37.9)
Length	**"L" mm**	**190.8**	**190.8**	**193.8**	**195.6**	**198.6**	**201.9**	**207**	**211.3**	**221.0**	**225.3**	**233.7**
	"L" (in)	(7.51)	(7.51)	(7.63)	(7.70)	(7.82)	(7.95)	(8.13)	(8.32)	(8.70)	(8.87)	(9.20)

English equivalents for metric specifications are shown in ( ).

Code: AS

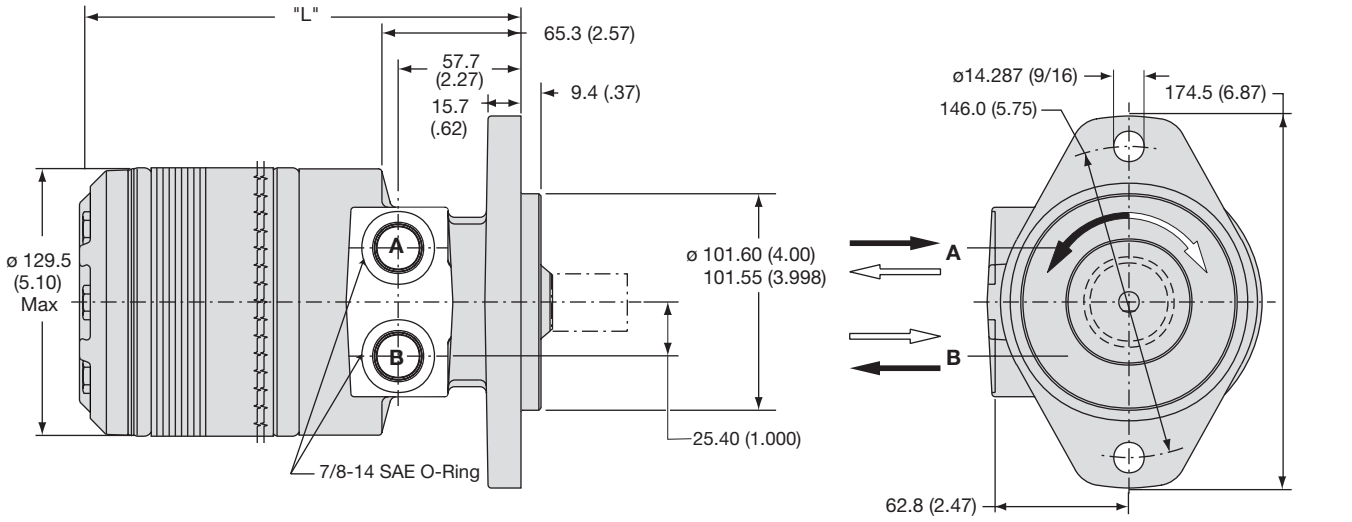
SAE A 2-Bolt, 7/8-14 SAE O-Ring



Code AS	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**13.6**	**13.6**	**13.8**	**13.9**	**14.2**	**14.5**	**14.9**	**15.2**	**16.0**	**16.5**	**17.2**
Poids/Peso	(lb)	(29.9)	(30.0)	(30.5)	(30.7)	(31.3)	(31.9)	(32.9)	(33.5)	(35.2)	(36.4)	(37.9)
Length	**"L" mm**	**190.8**	**190.8**	**193.8**	**195.6**	**198.6**	**201.9**	**206.5**	**211.3**	**221.0**	**225.3**	**233.7**
	"L" (in)	(7.51)	(7.51)	(7.63)	(7.70)	(7.82)	(7.95)	(8.13)	(8.32)	(8.70)	(8.87)	(9.20)

Code: BS

SAE B 2-Bolt, 7/8-14 SAE O-Ring

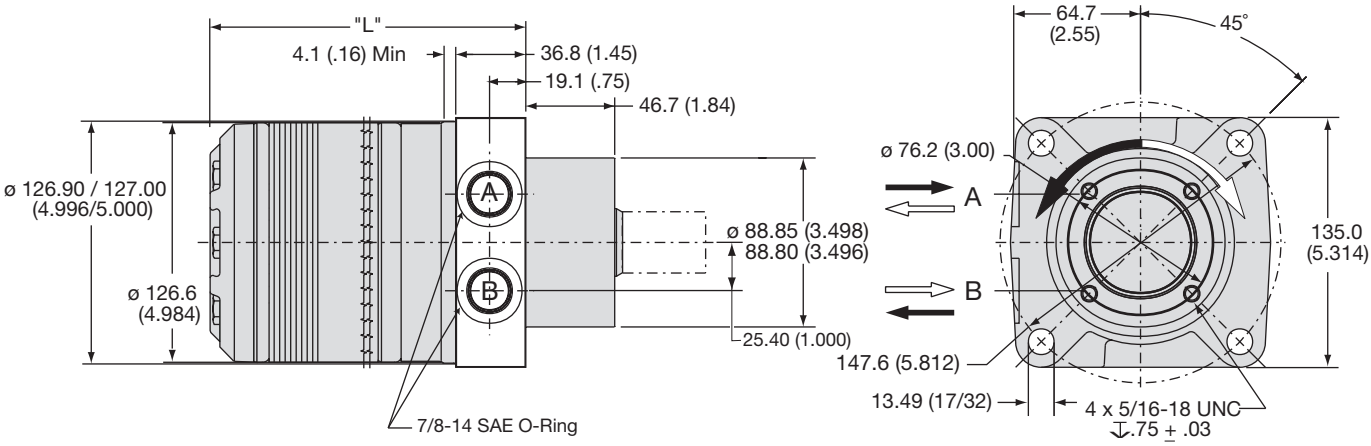


Code BS	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**14.2**	**14.2**	**14.5**	**14.6**	**14.8**	**15.1**	**15.5**	**15.8**	**16.6**	**17.1**	**17.8**
Poids/Peso	(lb)	(31.3)	(31.4)	(31.9)	(32.1)	(32.7)	(33.3)	(34.3)	(34.9)	(36.6)	(37.8)	(39.3)
Length	**"L" mm**	**184.2**	**184.2**	**187.2**	**189.0**	**198.6**	**195.3**	**200.0**	**204.8**	**214.3**	**218.4**	**227.1**
	"L" (in)	(7.25)	(7.25)	(7.37)	(7.44)	(7.56)	(7.69)	(7.87)	(8.06)	(8.44)	(8.60)	(8.94)

English equivalents for metric specifications are shown in ( ).

Code: LS

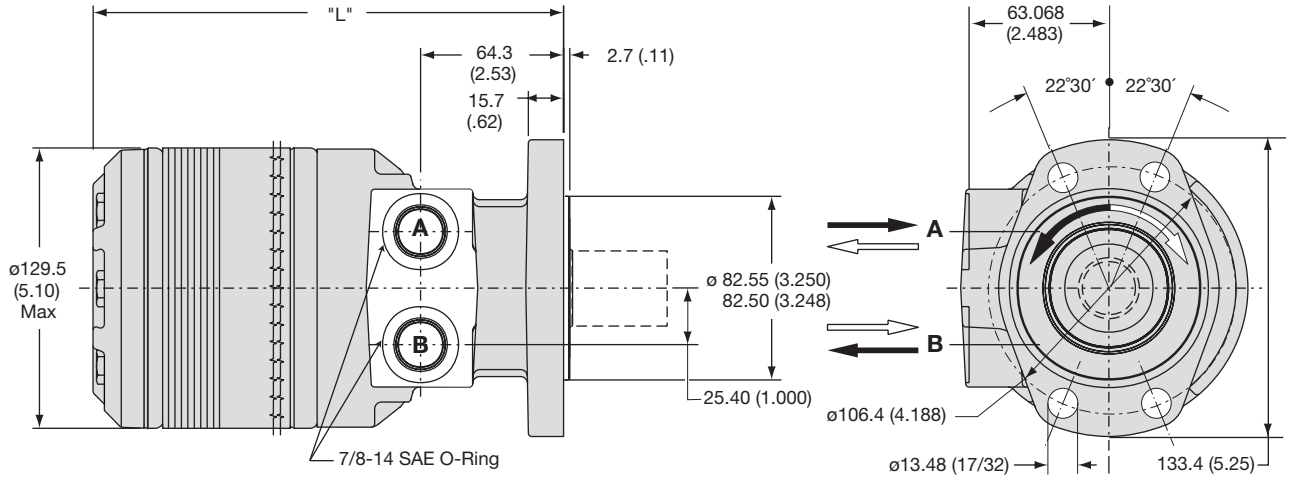
Wheel, Front Brake Nose



Code LS	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**14.0**	**14.0**	**14.2**	**14.3**	**14.6**	**14.9**	**15.3**	**15.6**	**16.3**	**17.0**	**17.5**
Poids/Peso	(lb)	(30.9)	(30.9)	(31.2)	(31.5)	(32.1)	(32.9)	(33.7)	(34.4)	(35.9)	(37.5)	(38.6)
Length	**"L" mm**	**145.5**	**145.5**	**148.6**	**150.4**	**153.4**	**156.7**	**161.3**	**166.1**	**175.8**	**180.0**	**188.5**
	"L" (in)	(5.73)	(5.73)	(5.85)	(5.92)	(6.04)	(6.17)	(6.35)	(6.54)	(6.92)	(7.08)	(7.42)

Code: MS

Magneto, 7/8-14 SAE O-Ring

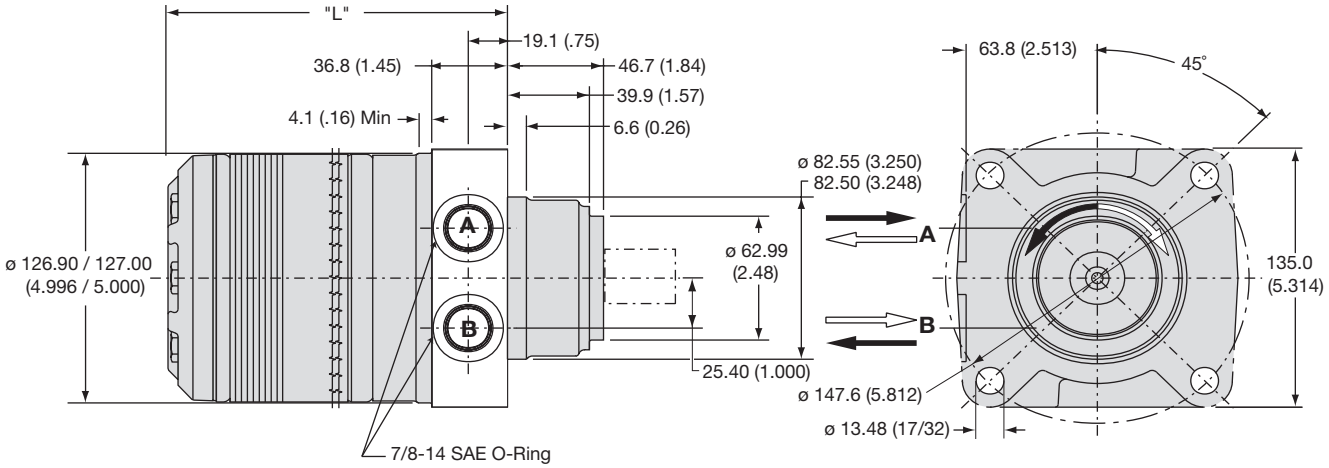


Code MS	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**13.6**	**13.6**	**13.8**	**13.9**	**14.2**	**14.5**	**14.9**	**15.2**	**16.0**	**16.5**	**17.2**
Poids/Peso	(lb)	(29.9)	(30.0)	(30.5)	(30.7)	(31.3)	(31.9)	(32.9)	(33.5)	(35.2)	(36.4)	(37.9)
Length	**"L" mm**	**190.8**	**190.8**	**193.8**	**195.6**	**198.6**	**201.9**	**206.5**	**211.3**	**221.0**	**225.3**	**233.7**
	"L" (in)	(7.51)	(7.51)	(7.63)	(7.70)	(7.82)	(7.95)	(8.13)	(8.32)	(8.70)	(8.87)	(9.20)

English equivalents for metric specifications are shown in ( ).

Code: US

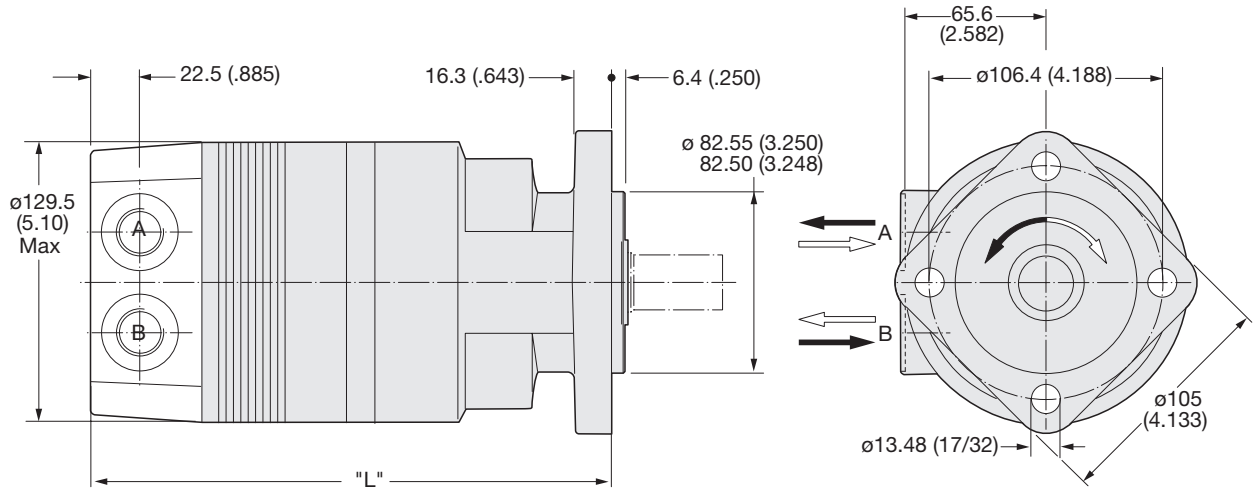
Wheel, Standard, 7/8-14 SAE O-Ring



Code US	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**13.9**	**13.9**	**14.2**	**14.3**	**14.5**	**14.8**	**15.2**	**15.5**	**16.3**	**16.9**	**17.5**
Poids/Peso	(lb)	(30.6)	(30.7)	(31.2)	(31.5)	(32.0)	(32.7)	(33.6)	(34.2)	(35.9)	(37.2)	(38.6)
Length	**"L" mm**	**145.5**	**145.5**	**148.6**	**150.4**	**153.4**	**156.7**	**161.3**	**166.1**	**175.8**	**179.8**	**188.5**
	"L" (in)	(5.73)	(5.73)	(5.85)	(5.92)	(6.04)	(6.17)	(6.35)	(6.54)	(6.92)	(7.08)	(7.42)

Code: VB

SAE A 4-Bolt, 7/8-14 SAE Rear Port

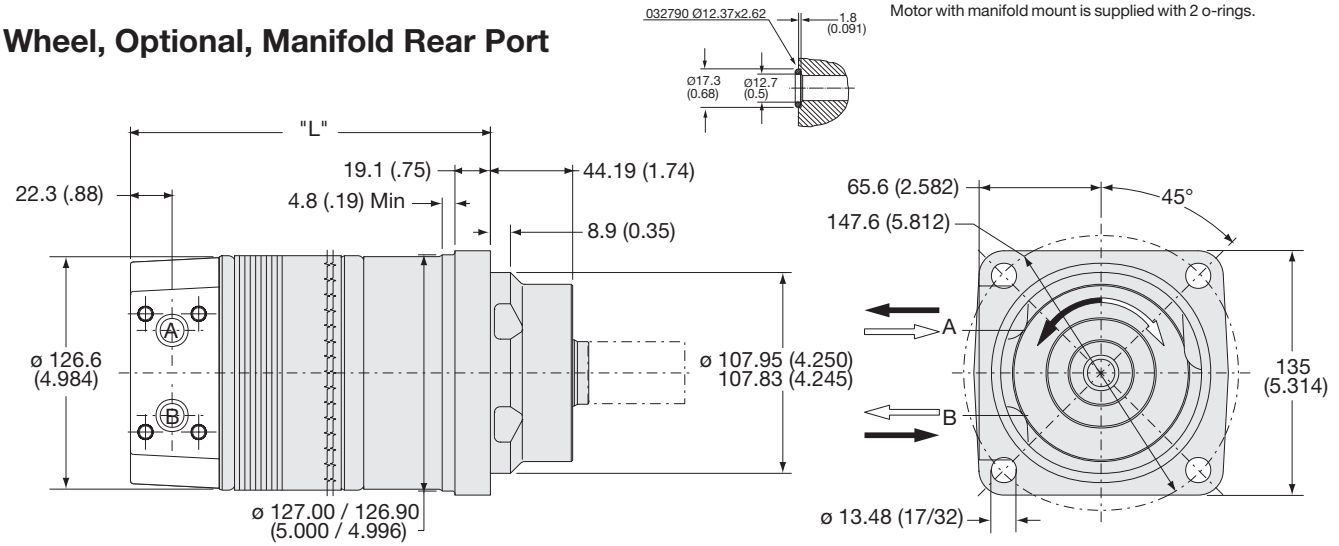


Code VB	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**14.0**	**14.0**	**14.2**	**14.3**	**14.6**	**14.9**	**15.3**	**15.6**	**16.3**	**17.0**	**17.5**
Poids/Peso	(lb)	(30.9)	(30.9)	(31.2)	(31.5)	(32.1)	(32.9)	(33.7)	(34.4)	(35.9)	(37.5)	(38.6)
Length	**"L" mm**	**213.1**	**213.1**	**215.6**	**218.4**	**221.0**	**224.0**	**229.1**	**232.9**	**242.1**	**246.9**	**256.0**
	"L" (in)	(8.39)	(8.39)	(8.49)	(8.60)	(8.70)	(8.82)	(9.02)	(9.17)	(9.53)	(9.72)	(10.08)

English equivalents for metric specifications are shown in ( ).

Code: WE

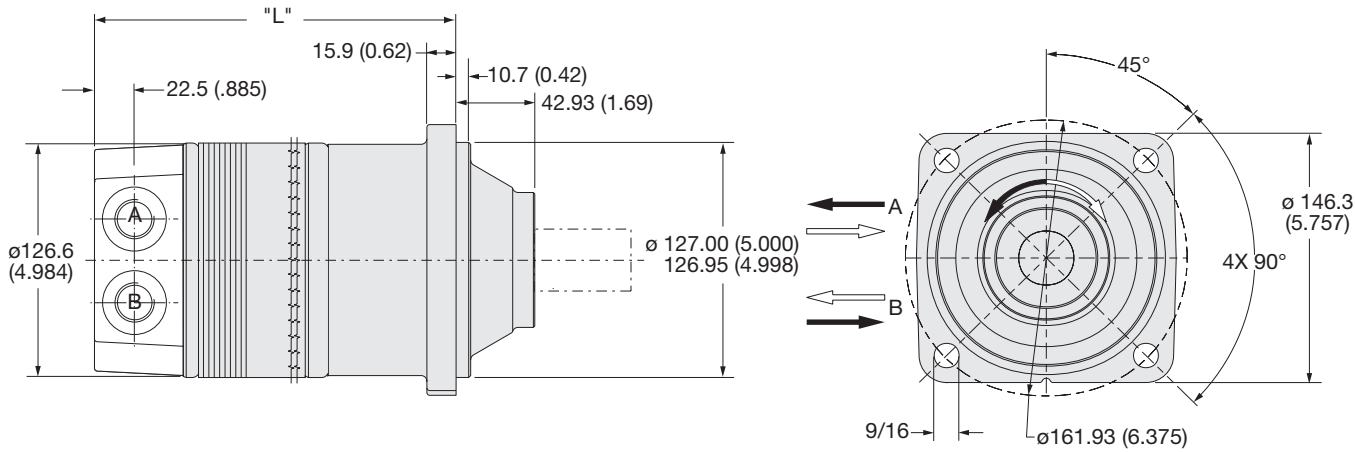
Wheel, Optional, Manifold Rear Port



Code WE	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**16.9**	**16.9**	**17.2**	**17.3**	**17.5**	**17.8**	**18.2**	**18.5**	**19.3**	**19.8**	**20.5**
Poids/Peso	(lb)	**(**37.2)	(37.3)	(37.8)	(38.0)	(38.6)	(39.2)	(40.2)	(40.8)	(42.5)	(43.7)	(45.2)
Length	**"L" mm**	**172.7**	**172.7**	**176.0**	**177.5**	**180.6**	**183.9**	**188.7**	**193.3**	**202.9**	**207.0**	**215.6**
	"L" (in)	**(**6.80)	(6.80)	(6.93)	(6.99)	(7.11)	(7.24)	(7.43)	(7.61)	(7.99)	(8.15)	**(**8.49)

Code: DB

Large Wheel Mount, 7/8-14 SAE Rear Port

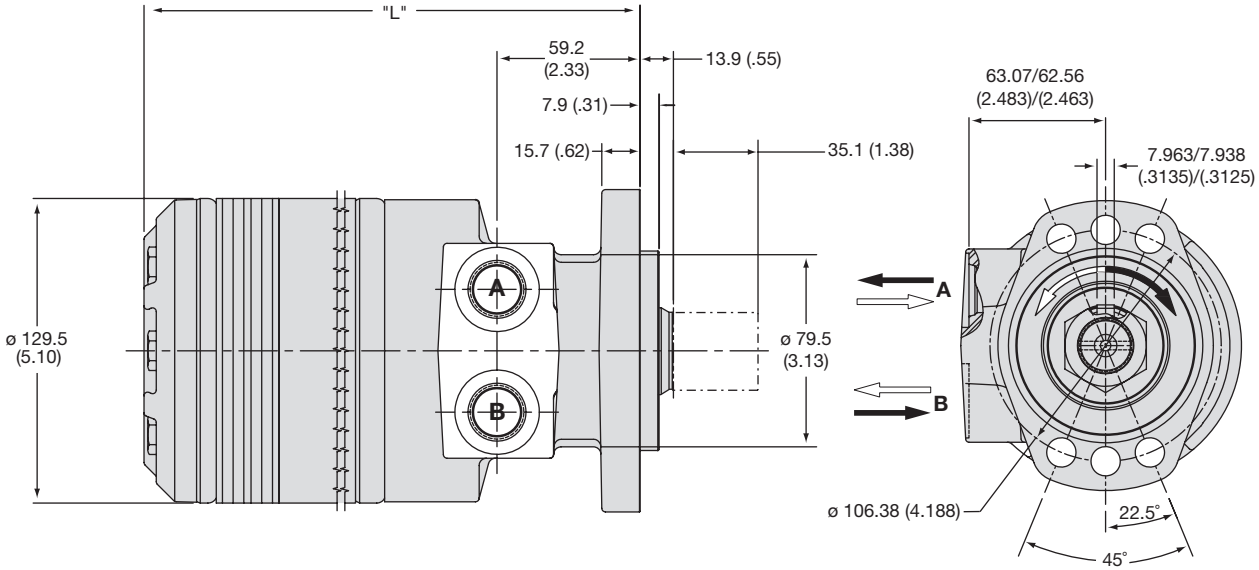


Code DB	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight	**kg**	**16.9**	**16.9**	**17.2**	**17.3**	**17.5**	**17.8**	**18.2**	**18.5**	**19.3**	**19.8**	**20.5**
	(lb)	(37.2)	(37.3)	(37.8)	(38.0)	(38.6)	(39.2)	(40.2)	(40.8)	(42.5)	(43.7)	(45.2)
Length	**"L" mm**	**173.0**	**173.0**	**175.5**	**178.8**	**182.1**	**185.2**	**190.0**	**194.8**	**200.9**	**208.5**	**216.9**
	"L" (in)	(6.81)	(6.81)	(6.91)	(7.04)	(7.17)	(7.29)	(7.48)	(7.67)	(7.91)	(8.21)	(8.54)

English equivalents for metric specifications are shown in ( ).

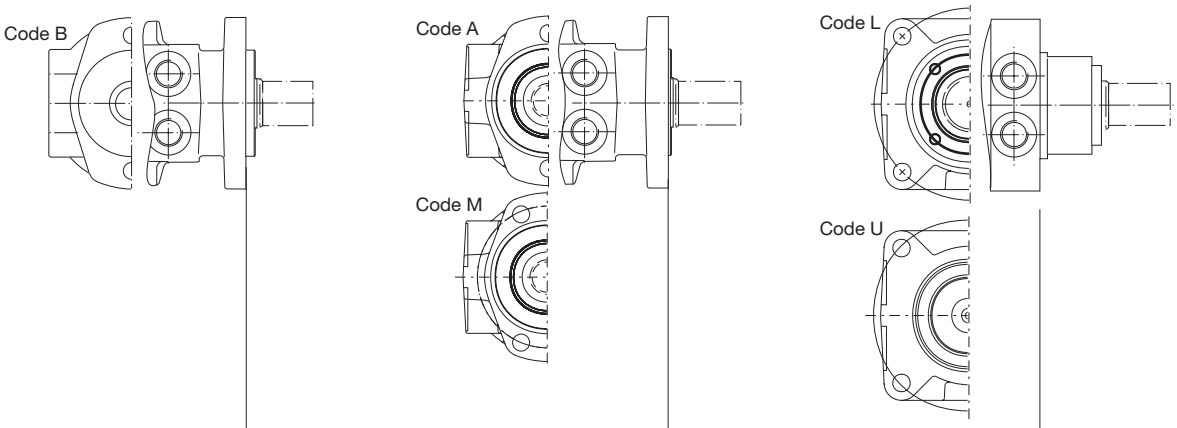
Code: ES

Modified SAE A 6-Bolt, 7/8-14 SAE O-Ring



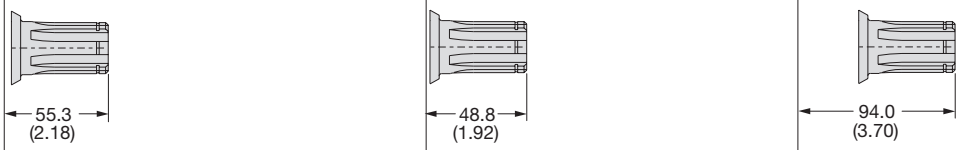
Code ES	disp.	0080	0100	0130	0140	0170	0195	0240	0280	0360	0405	0475
Weight/Gewicht	**kg**	**13.6**	**13.6**	**13.8**	**13.9**	**14.2**	**14.5**	**14.9**	**15.2**	**16.0**	**16.5**	**17.2**
Poids/Peso	(lb)	(29.9)	(30.0)	(30.5)	(30.7)	(31.3)	(31.9)	(32.9)	(33.5)	(35.2)	(36.4)	(37.9)
Length	**"L" mm**	**184.7**	**184.7**	**187.7**	**189.5**	**192.5**	**195.8**	**200.4**	**205.2**	**214.9**	**218.9**	**227.6**
	"L" (in)	(7.27)	(7.27)	(7.39)	(7.46)	(7.58)	(7.71)	(7.89)	(8.08)	(8.46)	(8.62)	(8.96)

English equivalents for metric specifications are shown in ( ).



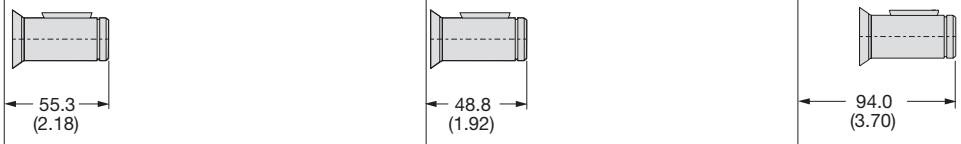
Code: 01

1" 6B Spline



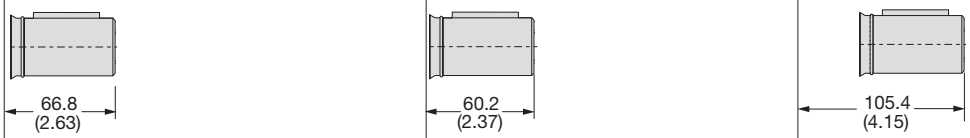
Code: 02

1" Keyed



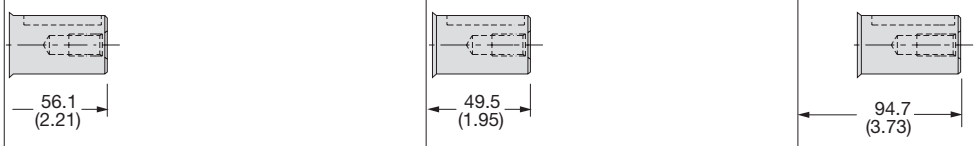
Code: 03

1 1/4" Keyed



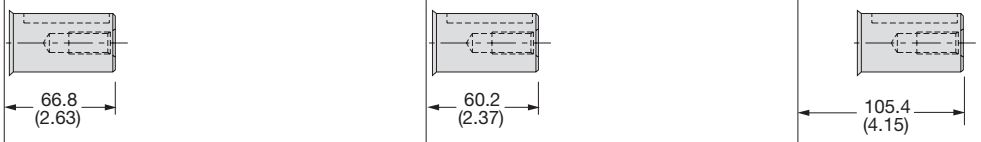
Code: 22

25 mm Keyed



Code: 46

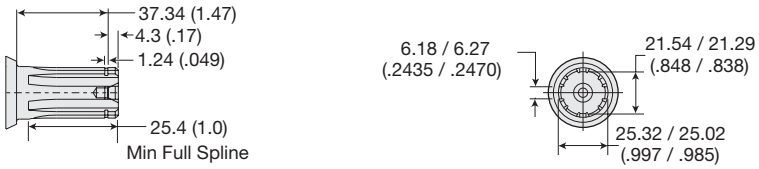
32 mm Keyed



English equivalents for metric specifications are shown in ( ).

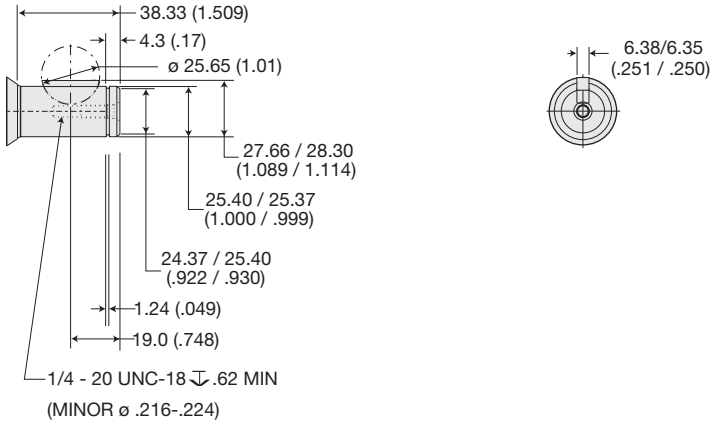
Code: 01

1" 6B Spline



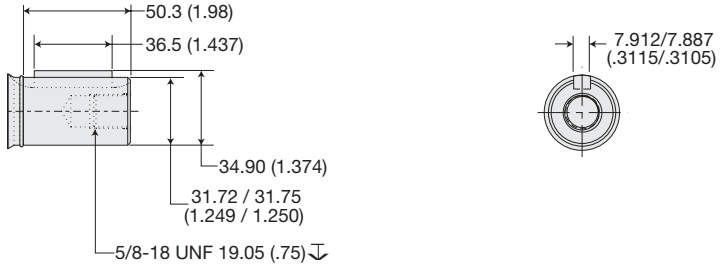
Code: 02

1" Keyed



Code: 03

1 1/4" Keyed



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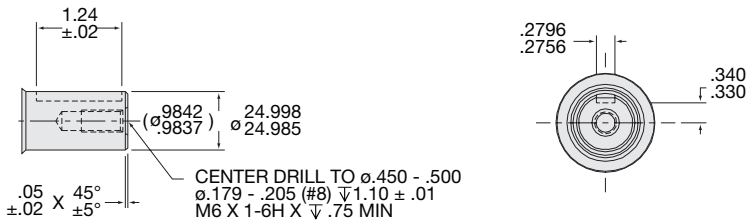
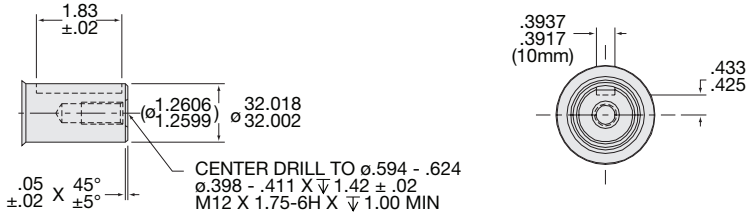
25 mm Keyed



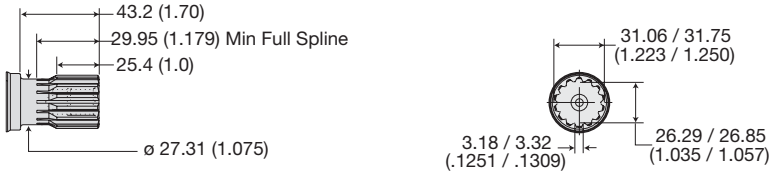
Code: 46

32 mm Keyed

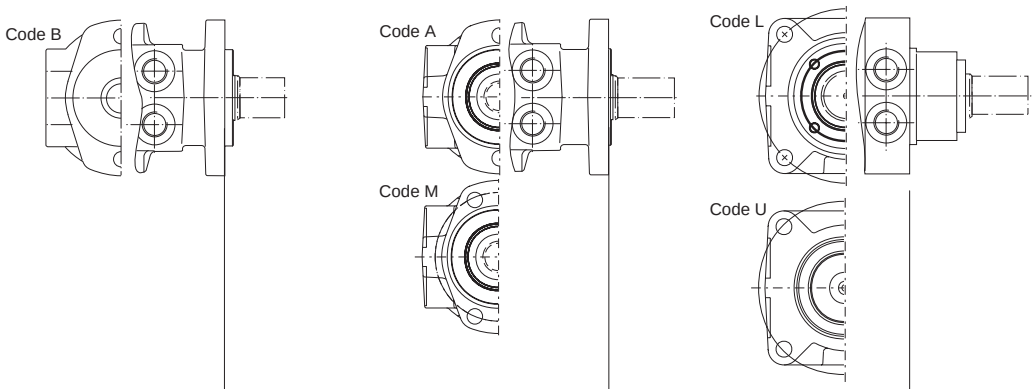


Code: 62

1 1/4" 14 Tooth Spline SAE

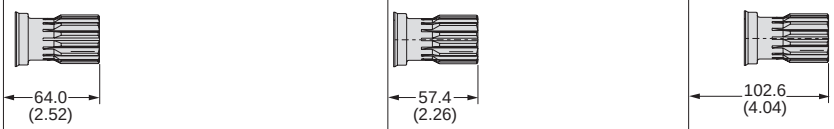


English equivalents for metric specifications are shown in ( ).



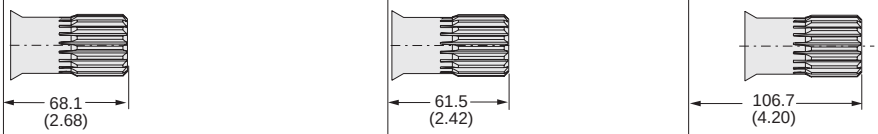
Code: 05

1 1/4" 14 Tooth Spline



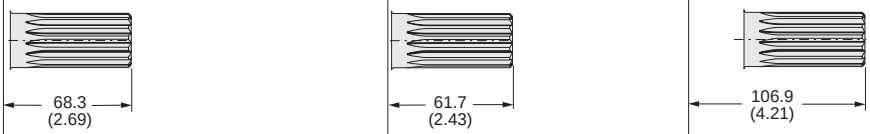
Code: 06

19 Tooth Spline



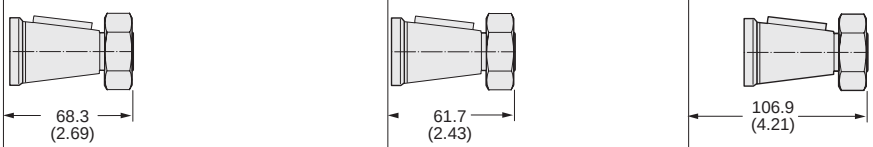
Code: 07

15 Tooth Spline



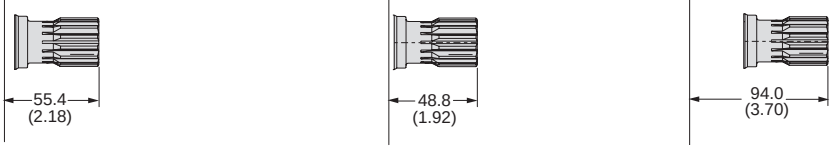
Code: 08

1 1/4" Tapered



Code: 62

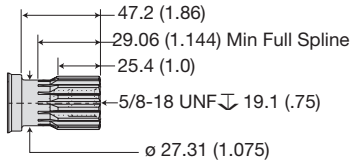
1 1/4" 14 Tooth Spline SAE

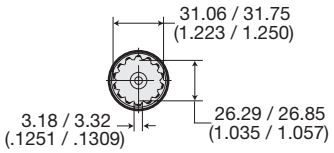


English equivalents for metric specifications are shown in ( ).

Code: 05

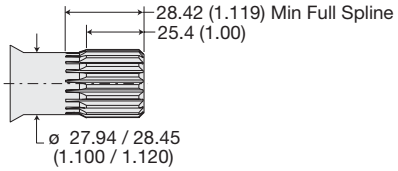
1 1/4" 14 Tooth Spline

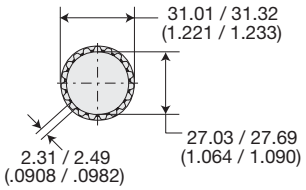




Code: 06

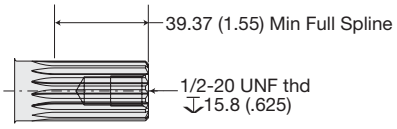
19 Tooth Spline

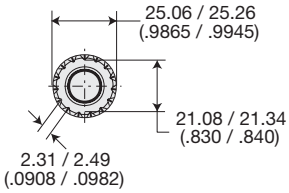




Code: 07

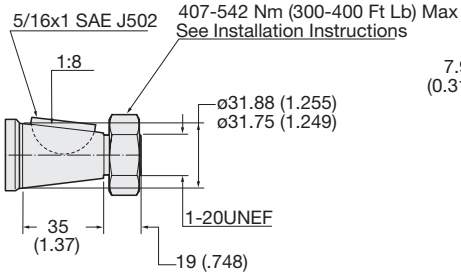
15 Tooth Spline

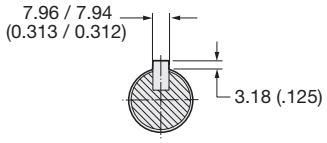




Code: 08

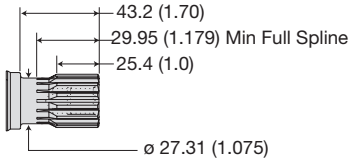
1 1/4" Tapered

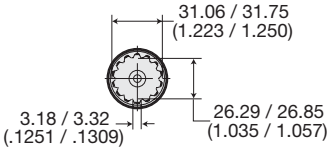




Code: 62

1 1/4" 14 Tooth Spline SAE





English equivalents for metric specifications are shown in ( ).

Hydraulic Formulas

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

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

$$T = \frac{D \Delta Pe_m}{2 \pi}$$

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

Where

- HP = Horsepower
- Q = Flow, GPM
- P = Pressure, PSI
- ΔP = 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

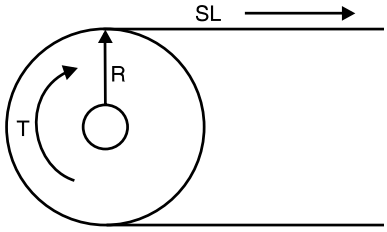
To Convert → Into → Multiply By		
Into ← To Convert ← Divide By		
bars	pounds/sq.in.	14.5
BTU/min	horsepower	.02356
BTU/min	kilowatts	.01757
centigrade	fahrenheit	(C°x9/5)+32
centimeters	inches	.3937
cu. cms.	cu. inches	.06102
cu. cms.	liters	.001
cu. inches	cu.cms.	16.39
cu. inches	liters	.01639
feet	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
pound-inches	newton-meters	.113
pound-inches	daNM	.0113
radians	degrees	57.3
square inches	sq. cms.	6.452

Side Load

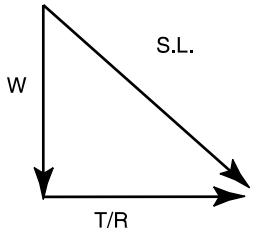
Side loads are imposed upon the shaft of a motor by:

- 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 a 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) x 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 x 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.

• 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 x GVW x 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.

$$F = \frac{V \times GVW}{T \times 32.16}$$ 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) x 1.1

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

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

• 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.

$$ST = \frac{VW \times u \times r}{G \times N}$$ 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.

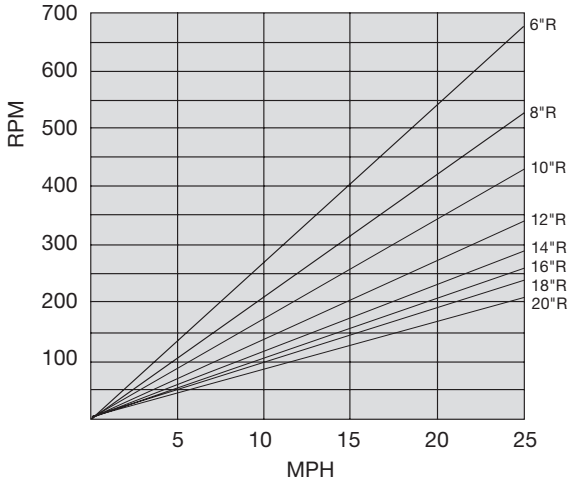
• Hydraulic Motor Speed

$$S = \frac{168 \times V \times G}{r}$$ 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.

MPH -vs- RPM
for different Rolling Radii



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.

Shaft Loading

The use of 1 inch and 25mm diameter shafts are not recommended when torque loads exceed 3500 lb-in. 316 stainless shafts should be limited to 2000 lb-in. For 7/8 inch diameter shafts, torque should be limited to 1250 lb-in. Corrosion resistant Nitrotec shafts have reduced torque-carrying capability. Consult factory for values for specific shafts. The maximum thrust load on all shafts should not exceed 1000 lbs inward or outward.

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

Unless specified otherwise, motors are shipped unpainted and coated with a rust inhibitor. Paint options are:

* Single coat of black paint.
* Single coat of black paint plus a coat of red oxide primer. (Double paint).

Reverse Timed Manifold

All motors in this catalog are bi-rotational. The efficiency of the motors is essentially unaffected by direction of rotation.

The direction of output shaft rotation depicted below is that which will result from pressurizing the “A” port of the motor. Pressurizing the “B” port will cause shaft rotation in the opposite direction. Direction of rotation is as seen by looking directly at the shaft.

“Front ported” motors have the ports at the shaft end of the motor. “Rear ported” motors have the ports in the end cap of the motor. Standard motors are Rotation Code “0”. Reverse timed motors are Rotation Code “1”.

Series	Standard Code “0”		Reverse Timed Code “1”	
	Front Ported	Rear Ported	Front Ported	Rear Ported
TC, TB, TE, TJ	CW	CCW	CCW	CW
TF, DF, TG, BG, DG, TH, BH	CCW	CW	CW	CCW
TK	N/A	CW	N/A	CCW
110A	CW	N/A	N/A	N/A
700, 716	CCW	N/A	N/A	N/A

⚠ CAUTION!

Static Brake Only:

The brakes on these motors are designed for static use only, i.e., the brake should not be used to stop the motor and the motor should not be started while the brake is applied. These brakes are "parking" brakes only. Using the brake in a dynamic condition (while the motor is turning) will damage and reduce the holding capacity of the brake. If the brake does not hold because it has been damaged, personal injury or property damage could result.

Brake holding capacity and periodic test:

The brake holding capacity rating is based on actual holding capacity when new. If properly used as a static brake only, the holding capacity will slowly decrease with time. Since holding capacity will slowly decrease over time, a proper maintenance procedure should include periodically testing the holding capacity of the brake. This can be achieved by running a vehicle ramp test per OEM instructions.

Brake orientation:

This wet sump, multi-disk brake is designed to be mounted with the shaft in a horizontal position. If your application will have the motor in any other orientation, the motor should be thoroughly tested for longevity of brake holding capacity. This can be achieved by running a vehicle ramp test per OEM instructions after a predetermined number of brake actuations. Under no circumstances, however, should the motor be mounted with the shaft pointing vertically upward because the disks will not be operating within the oil sump and damage to the brake disks will occur.

Holding torque/brake release pressure:

The brake release port is designed for 3000 psi maximum. Limiting the pressure in that port to below 1500 psi is recommended to enhance seal life. The minimum pressure required to fully release the brake depends upon the holding torque of the brake.

BG Series	Holding Torque	Release Pressure
Standard	**12,000 lb in**	**315 psi**
Optional	6,000 lb in	160 psi
Optional	9,000 lb in	240 psi
Optional	16,000 lb in	405 psi

BH Series	Holding Torque	Release Pressure
Standard	**16,000 lb in**	**315 psi**

Initial use, bleeding not required:

Bleeding the brake is not required. It is recommended that the brake release port be filled with approximately 1.2 oz. (36cc) system oil prior to installation or first use.

Torque for mounting bolts:

Customer installed mounting bolts should be grade 8 and torqued to a minimum of 90 ft-lbs.

Brake service intervals:

The seals, springs and brake disc package should be periodically (how often depends on your application) inspected and replaced if damaged or worn. All should be replaced at least every 250,000 brake cycles or 3 years, whichever occurs first.

Standard Options

Availability						Code		
TF/DF	Clutch	TG/DG	TH	BG/BH	TL	Painted	Unpainted	Description
x	x	x	x	x	x	AAAA	AAAB	Black Paint
x	x	x	x	x	x	AAAC	-	Double Paint
x[9]	x	x[15]	x[15]	x[15]	x	AAAF	AABP	Castle Nut
x	x	x	x	x	x	AAAG	AAAH	Fluorocarbon Seals
x	x	x	x	x	x	AAAJ	AAFG	High Temperature Commutator Seal
x	x	x	x	x		AABJ	AABK	Free Running Rotorset
x[10]		x[10]	x[10]	x		AAAT	AAFX	Hot Oil Shuttle (11:00)
x		x				AANM	-	Seal saver for 1.25 taper shaft only
x				x		AANB	-	678 Nm (6000 in-lb) Holding Capacity
				x		AAMN	AANH	1808 Nm (16000 in-lb) Holding Capacity
x[9,10]		x[10,15]	x[10,15]	x	x	AAAU	AAGF	Bi-directional Shuttle (11:00*), Castle Nut
x		x	x	x	x	AAAW	-	Bi-directional Shuttle (11:00*), High Temperature Commutator Seal
x	x	x	x	x		AABL	AABM	Free Running Rotor Set & No Commutator Seal
x	x	x	x	x		AABT	-	No Nut
x		x	x	x	x	AACP	-	Free Running Rotor Set, Castle Nut
x	x	x	x	x	x	-	AADJ	High Temperature Commutator Seal, Castle Nut
x	x	x		x	x	AAFW	AAFA	Fluorocarbon (Viton) Seals, High Temperature Commutator Seal
x	x	x	x	x	x	-	AAFX	Bidirectional shuttle (11:00*)
x		x	x	x	x	AAHU	-	High Temperature Commutator Seal, No Nut
x		x	x	x	x	-	AAJL	No Nut
x		x	x	x	x	AALD	-	Bidirectional shuttle (1:00*), Castle Nut
x		x	x	x	x	AALE	-	Bidirectional shuttle (1:00*)
x		x	x	x		AALF	-	No Commutator Seal
x		x	x	x		-	AALP	Free Running Rotor Set, Fluorocarbon (Viton) Seals, High Temperature Commutator Seal
				x		AAML	-	(IBM) Bidirectional shuttle (11:00*), Castle Nut, 6 Brake Springs Installed
				x		AAMM	-	(IBM) Castle Nut, 6 brake springs installed, (9000 in-lbs hold cap)
				x		AAMN	-	(IBM) 'Yellow' brake springs (8), (16,000 in-lbs hold cap)
				x		AAMP	-	(IBM) 'Yellow' brake springs (8), (16,000 in-lbs hold cap), Castle Nut
x[10]	x	x[10]	x[10]	x[10]	x	BBBA	BBBM	69 Bar (1000 PSI) Internal Bidirectional Relief
x[10]	x	x[10]	x[10]	x[10]	x	BBBG	BBBJ	103 Bar (1500 PSI) nternal Bidirectional Relief
x[10]	x	x[10,16]	x[10,16]	x[10,16]	x	BBBB	BBBN	138 Bar (2000 PSI) Internal Bidirectional Relief
x[10,12]	x[14]	x[10,18]	x[10,18]	x[10,18]	x	BBBC	BBBF	207 Bar (3000 PSI) Internal Bidirectional Relief
x[10,13]	x[13]	x[10,19]	x[10,19]	x[10,19]		BBBD	BBBW	276 Bar (4000 PSI) Internal Bidirectional Relief
x[10,11]	x[14]	x[10,17]	x[10,17]	x[10,17]	x	BBDL	BBCG	2500 PSI Int Bidirectional Relief
x		x	x	x	x	-	BBCW	3000 PSI Int Bidirectional Relief, No Nut
x		x	x	x	x	BBCX	-	2500 PSI Int Bidirectional Relief, No Nut
x		x	x	x	x	-	BBDA	3000 PSI Int Bidirectional Relief, Castle Nut
x		x	x	x	x	-	BBDH	2500 PSI Int Bidirectional Relief, Castle Nut
x[10]	x	x	x	x	x	BBDN	-	1750 PSI Int Bidirectional Relief
x	x	x	x	x	x	-	BBDP	725 PSI Int Bidirectional Relief
x		x	x	x		BBDW	-	725 PSI CCW Int Bidirectional Relief (045134)
x		x				FSAA	FSAB	Speed Sensor
x		x				FSAJ	FSAH	Int Short Speed Sensor, Castle Nut
x		x	x			-	AAUY	Complete Motor Nickel Plated, 40 um, Except Shaft
Consult factory for other positions and combinations.								

[9] Available only with shaft code 08
[10] Not available with ports code A, B or E
[11] Not available with displacement 0475
[12] Not available with displacements 0360, 0405 or 0475
[13] Only available with displacement 0080
[14] Not available with displacements 0365
[15] Available only with shaft codes 08 and 19
[16] Not available with displacement 0960
[17] Not available with displacements 0625, 0785 or 0960
[18] Not available with displacements 0530, 0625, 0785 or 0960
[19] Not available with displacements 0360, 0405, 0530, 0625, 0785 or 0960

Code: AAAC

Double Paint — Base coat of red oxide primer and finish coat of black paint for increased corrosion resistance.

Code: AAAF* or AABP

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

Code: AAAJ* or AAFG

High Temperature Commutator Seal — Under conditions of high temperature, it is suggested that a high temperature commutator seal be used.

Code: AAAG* or AAAH

Fluorocarbon — is available under various registered trademarks, including VITON™ (a registered trademark of DuPont), FLUOREL™ (a registered trademark of 3M) or FPM™ (a registered trademark of DuPont).

Code: AABJ* or AABK

Free Running Rotorset — The “free running rotorset” is a specially dimensioned rotorset that allows for smoother operation at low flows and low pressure. Volumetric efficiency can be affected.

Code: AANM*

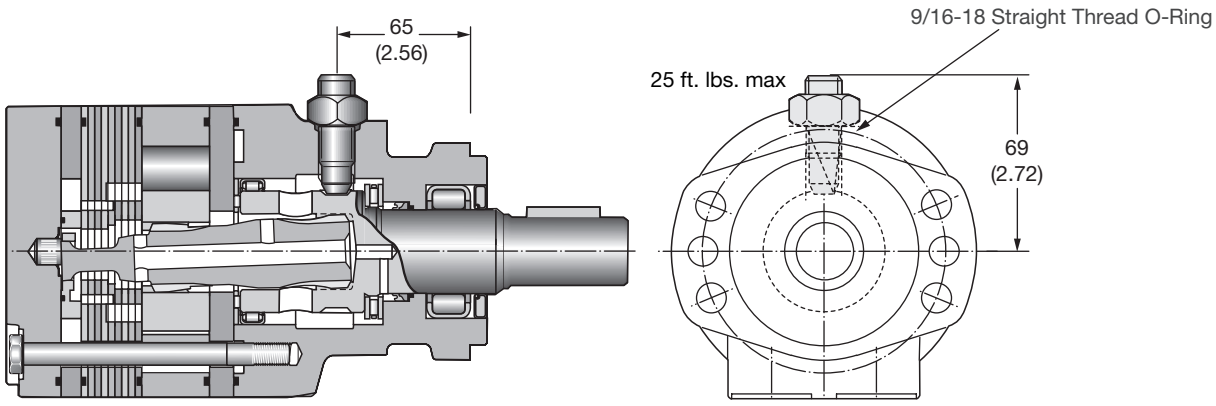
Seal Saver — Seal saver is a metal disc that presses onto the motor shaft, covering the dirt and water (D&W) seal. It’s purpose is to aid in preventing external contamination from damaging the D&W seal.

* Option code shown is with a single black coat of paint.

Code: FSAA* or FSAB

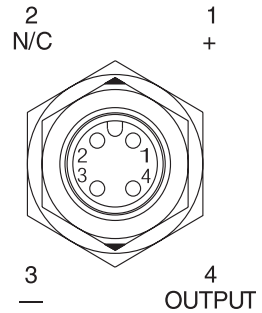
An Economical Sensor for Speed Readout

This rugged, weather resistant design is ideal for industrial and mobile applications. Applications include salt/sand/fertilizer spreader drives, conveyer drives and injection molder compression drives. The sensor is a hall-effect type, which when externally powered outputs 30 square wave digital pulses per coupling shaft revolution. The connector is a user friendly universally available 4 pin polarized M12 connector allowing for simplified field service. The integrated design does not effect the side load capacity or performance of the torque motor.



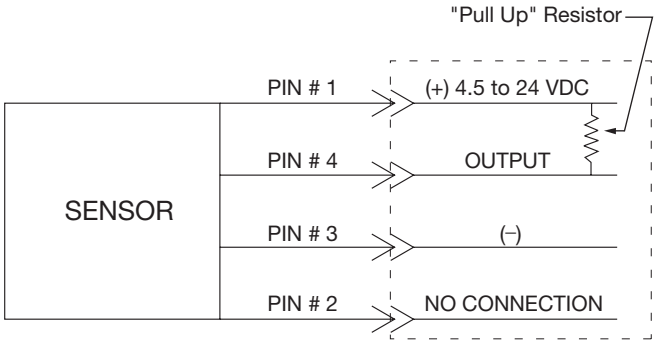
English equivalents for metric specifications are shown in ( ).

Operating voltage range	4.5...24 VDC
Operating temperature	-20° to 220° F -29°...104° C
Operating frequency range	0...10 KHZ
Max sink current	0 ... 20 mA (max.)
Connection	4 Pin Polarized (12mm)
Sensor output	30 Pulses per revolution which can be doubled electronically
Output is NPN	Open Collector



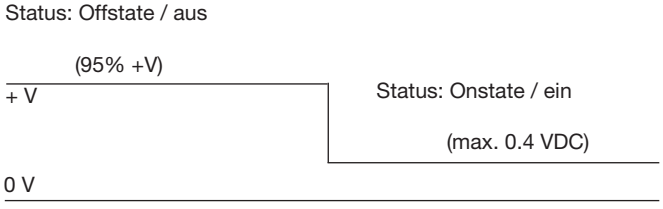
4 Pin Polarized
M12 Connector (Male)

Cable and “Pull Up” Resistor are *not* supplied by factory.



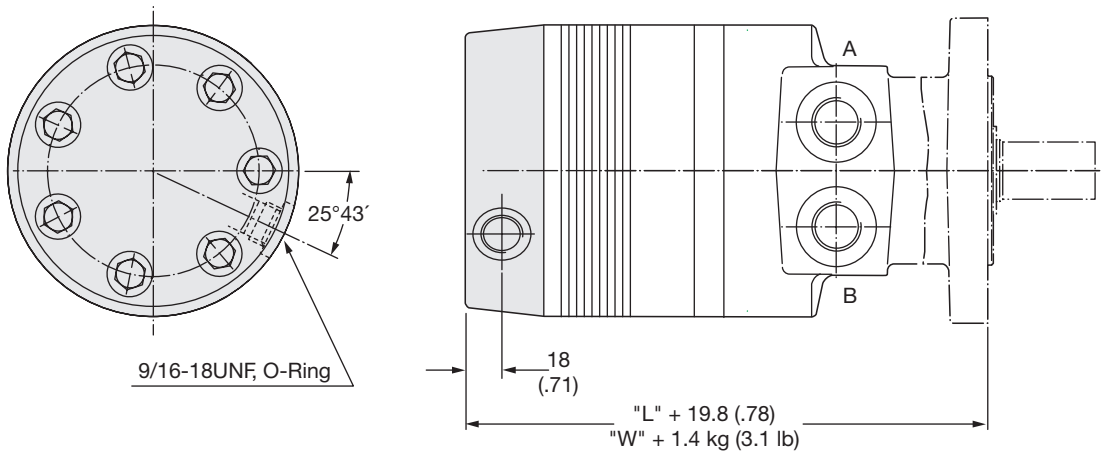
Pull-up Resistor Value Formula (0.25 Watt, Tol. 5%)

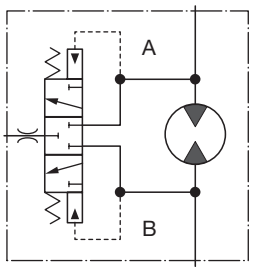
$$\frac{\text{Voltage } 4.5...24\ \text{VDC}}{\text{Sink Current } 0...20\ \text{mA}} = \text{Resistor (k Ohm)}$$



Code: AAFX or AAAT*

A Hot Oil Shuttle is used to continuously remove a portion of the fluid in a closed loop transmission or other closed loop system. At 125 PSI pressure differential between the motor return port and the shuttle outlet,1.5 GPM* will exit the circuit to cool, filter and return to the reservoir. The constant loop replenishment helps to keep heat and contamination from building up in the circuit. This option is not available with rear ports or integral cross over relief.





Q=5 l (Q=1.32 gal) p=9 bar (p=131 psi) ϑ=39 cSt (ϑ=190 SUS)

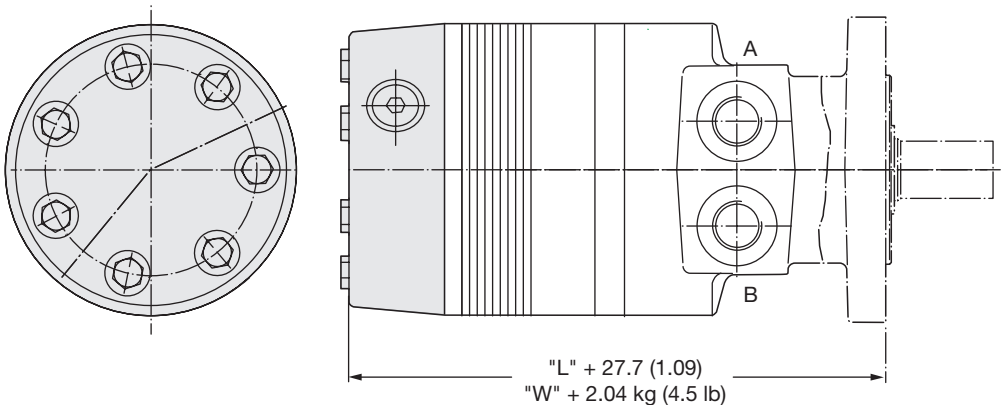
Standard Length & Weights for TF Series on Pages 131-136, TG Series on Pages 185-189 and TH Series on Pages 227-228.
L

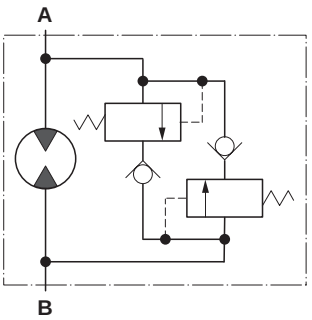
English equivalents for metric specifications are shown in ( ).

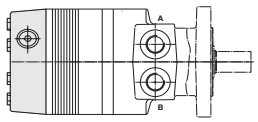
Code: BBBA*, BBBB*, BBBC*, BBBD* or BBBG*

This integrated internal relief valve is used for fixed pressure settings.

Internes Schockventil





Option		Pressure bar (psi)
BBBA	 **Opening pressure**	69 (1000)
BBBB		138 (2000)
BBBC		207 (3000)
BBBD		276 (4000)
BBBG		103 (1500)

Standard Length & Weights for TF Series on Pages 131-136, TG Series on Pages 185-189 and TH Series on Pages 227-228.

English equivalents for metric specifications are shown in ( ).