



whitedriveproducts



SERIES

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MEDIUM DUTY
Hydraulic Motor

WS



OVERVIEW

The WS targets agricultural equipment, skid steer attachments, and other applications that require greater torque under demanding conditions. A distinguishing feature of the WS in relation to competitive products is its heavy duty drive link with a larger pitch diameter. This enables the WS to better withstand pressure and torque spikes and is reflected in its intermittent and peak performance ratings. Additional product features include a three zone commutator valve, heavy-duty tapered roller bearings, and case drain with integral internal drain*. The WS offers numerous housing, displacement and shaft options to meet most common SAE and European requirements.

FEATURES / BENEFITS

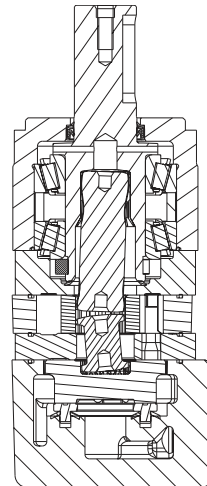
- Nine shaft and seven mounting options to meet the most common SAE and European requirements.
- Heavy-duty tapered roller bearings for extra side load capacity.
- Heavy-duty drive link with larger pitch diameter than competitors for greater resistance to pressure and torque spikes.
- Three zone commutator valve for high flow capacity.
- Standard case drain with integral internal drain* for extended shaft seal life.

TYPICAL APPLICATIONS

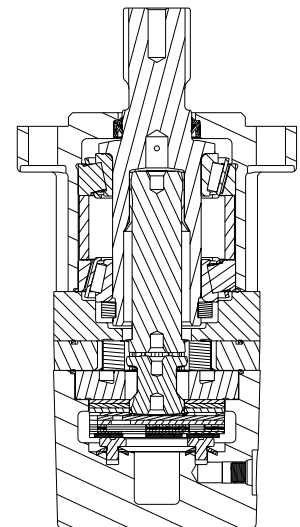
Medium-duty wheel drives, sweepers, grain augers, spreaders, feed rollers, brush drives, mowers, harvesting equipment gear box mounts and more

SERIES DESCRIPTIONS

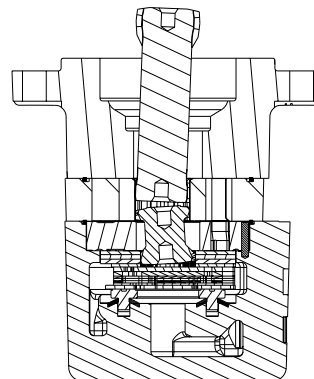
350/351 - Hydraulic Motor
Compact



355/356 - Hydraulic Motor
Standard



357/358 - Hydraulic Motor
Short Motor



SPECIFICATIONS

CODE	Displacement cm ³ [in ³ /rev]	Max. Speed rpm		Max. Flow lpm [gpm]		Max. Torque Nm [lb-in]		Max. Pressure bar [psi]		
		cont.	inter.	cont.	inter.	cont.	inter.	cont.	inter.	peak
080	79 [4.78]	870	1060	61 [16]	68 [18]	207 [1832]	286 [2528]	207 [3000]	276 [4000]	276 [4000]
100	100 [6.10]	745	880	76 [20]	95 [25]	280 [2475]	416 [3680]	207 [3000]	310 [4500]	310 [4500]
110	112 [6.85]	675	840	76 [20]	95 [25]	307 [2715]	468 [4145]	207 [3000]	310 [4500]	310 [4500]
130	129 [7.86]	580	730	76 [20]	95 [25]	370 [3275]	550 [4865]	207 [3000]	310 [4500]	310 [4500]
160	162 [9.90]	465	700	76 [20]	114 [30]	462 [4090]	618 [5465]	207 [3000]	276 [4000]	310 [4500]
200	202 [12.31]	375	560	76 [20]	114 [30]	576 [5100]	768 [6795]	207 [3000]	276 [4000]	310 [4500]
230	228 [13.92]	325	490	76 [20]	114 [30]	642 [5685]	806 [7135]	207 [3000]	276 [4000]	310 [4500]
320	325 [19.81]	235	350	76 [20]	114 [30]	789 [6980]	1029 [9105]	190 [2750]	224 [3250]	259 [3750]
400	399 [24.36]	190	280	76 [20]	114 [30]	816 [7225]	1034 [9150]	155 [2250]	190 [2750]	224 [3250]
500	496 [30.29]	155	230	76 [20]	114 [30]	824 [7295]	1041 [9210]	121 [1750]	155 [2250]	172 [2500]

► Performance data is typical. Performance of production units varies slightly from one motor to another. Running at intermittent ratings should not exceed 10% of every minute of operation. * See page 14 for allowable back pressure when using the internal drain.



DISPLACEMENT PERFORMANCE

080	Pressure - bar [psi]						Max. Cont.	Max. Inter.
	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	207 [3000]	242 [3500]

80 cm³ [4.9 in³] / rev

Intermittent Ratings are below and to the right of the BOLD line.

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	2 [0.5]										Theoretical rpm		
	4 [1]	7 [61] 47	23 [201] 47									25	
	8 [2]	9 [79] 97	28 [244] 95	64 [568] 90	100 [887] 85	135 [1192] 78						49	
	15 [4]	9 [79] 194	27 [242] 192	64 [567] 186	101 [896] 178	137 [1216] 167	174 [1536] 157	207 [1832] 142					97
	23 [6]	7 [58] 291	25 [224] 289	62 [550] 282	99 [875] 271	136 [1202] 258	172 [1519] 242	207 [1830] 222	242 [2141] 198				194
	30 [8]	3 [29] 388	22 [196] 388	59 [524] 380	95 [841] 367	131 [1162] 349	167 [1479] 328	203 [1795] 305	240 [2123] 279	281 [2484] 221			291
	38 [10]		19 [171] 484	56 [495] 477	92 [814] 464	128 [1129] 444	164 [1447] 420	200 [1766] 393	236 [2092] 361	279 [2470] 306			388
	45 [12]		14 [127] 581	53 [465] 575	88 [781] 562	125 [1102] 540	159 [1411] 513	195 [1730] 481	233 [2062] 441	278 [2456] 381			484
	53 [14]		9 [80] 678	48 [422] 674	79 [704] 658	119 [1055] 635	155 [1373] 606	191 [1689] 571	229 [2028] 527				581
	61 [16]		2 [14] 775	38 [336] 771	75 [662] 757	111 [985] 736	151 [1337] 704	182 [1611] 664	238 [2109] 608	282 [2499] 540			678
	68 [18]			34 [298] 871	68 [602] 858	101 [896] 833	141 [1244] 806	188 [1661] 750	238 [2104] 680	283 [2507] 605			775

Rotor Width

Torque - Nm [lb-in], Speed rpm

Overall Efficiency - 70 - 100% 40 - 69% 0 - 39%

19.7 [7.76]	22 [194]	44 [388]	88 [777]	132 [1165]	176 [1553]	219 [1942]	263 [2330]	307 [2718]	351 [3107]
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Theoretical Torque - Nm [lb-in] Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

100	Pressure - bar [psi]						Max. Cont.	Max. Inter.	
	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	207 [3000]	242 [3500]	276 [4000]

100 cm³ [6.1 in³] / rev

Intermittent Ratings are below and to the right of the BOLD line.

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	2 [0.5]	14 [120] 11	35 [313] 8	77 [681] 6	116 [1025] 4						Theoretical rpm		
	4 [1]	15 [129] 37	38 [337] 35	80 [710] 10	122 [1079] 7	162 [1436] 5						19	
	8 [2]	16 [138] 75	40 [354] 74	88 [781] 71	136 [1205] 68	181 [1602] 58	227 [2007] 44	267 [2364] 43	315 [2791] 42	352 [3119] 41		383 [3386] 33	38
	15 [4]	16 [138] 151	40 [354] 149	89 [790] 146	138 [1222] 143	187 [1654] 137	235 [2079] 129	282 [2495] 119	324 [2871] 110	370 [3277] 101		411 [3636] 87	76
	23 [6]	14 [127] 226	39 [344] 225	88 [779] 221	137 [1214] 217	186 [1647] 210	234 [2071] 200	282 [2494] 188	324 [2869] 174	371 [3279] 162		415 [3676] 147	152
	30 [8]	12 [109] 302	37 [326] 300	86 [765] 297	136 [1200] 292	184 [1625] 284	232 [2049] 273	280 [2474] 258	323 [2859] 240	369 [3268] 224		416 [3682] 206	228
	38 [10]	10 [88] 378	34 [305] 376	83 [738] 372	133 [1174] 366	181 [1601] 357	229 [2026] 343	276 [2446] 326	318 [2810] 300	366 [3235] 281		415 [3672] 261	303
	45 [12]	7 [65] 453	32 [282] 451	81 [713] 447	129 [1145] 441	178 [1574] 430	226 [2002] 415	274 [2423] 396	316 [2793] 367	364 [3220] 345		413 [3653] 324	379
	53 [14]	4 [39] 528	29 [254] 527	77 [686] 522	126 [1116] 515	175 [1546] 504	222 [1968] 486	266 [2351] 455	315 [2791] 433	362 [3203] 407		411 [3637] 384	455
	61 [16]	2 [15] 604	25 [221] 602	74 [652] 597	122 [1084] 590	171 [1513] 578	219 [1941] 559	264 [2340] 527	312 [2760] 502	360 [3182] 475		409 [3616] 447	531
	68 [18]		21 [186] 678	69 [614] 672	118 [1047] 664	167 [1481] 651	216 [1910] 632	260 [2300] 596	309 [2735] 570	356 [3152] 541		407 [3601] 513	606
	76 [20]		16 [144] 754	65 [573] 747	114 [1009] 739	163 [1441] 725	211 [1872] 704	257 [2278] 677	307 [2712] 652	353 [3121] 624		403 [3568] 595	682
	83 [22]					156 [1379] 801	205 [1814] 782	253 [2239] 758	300 [2653] 730	347 [3075] 698		398 [3526] 668	758
91 [24]						199 [1762] 850	246 [2179] 826	294 [2604] 799	343 [3037] 768	395 [3495] 733	834		
95 [25]						196 [1737] 883	246 [2176] 863	294 [2605] 835	342 [3028] 800	392 [3472] 770	909		

Rotor Width

Torque - Nm [lb-in], Speed rpm

Overall Efficiency - 70 - 100% 40 - 69% 0 - 39%

19.7 [7.76]	27 [243]	55 [485]	110 [971]	165 [1456]	219 [1942]	274 [2427]	329 [2913]	384 [3398]	439 [3883]	494 [4369]
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Theoretical Torque - Nm [lb-in] Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

► Performance data is typical. Performance of production units varies slightly from one motor to another.



DISPLACEMENT PERFORMANCE

		Pressure - bar [psi]								Max. Cont.		Max. Inter.	
		17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	207 [3000]	242 [3500]	276 [4000]	310 [4500]		
110		112 cm ³ [6.9 in ³] / rev											
		Intermittent Ratings are below and to the right of the BOLD line.								Intermittent Ratings - 10% of Operation			
Flow - lpm [gpm]	2 [0.5]	12 [106] 9	38 [334] 8	86 [757] 6	132 [1166] 4								Theoretical rpm
	4 [1]	12 [110] 17	38 [334] 10	89 [788] 8	137 [1213] 6	184 [1624] 5							
	8 [2]	15 [129] 67	42 [373] 67	98 [863] 65	152 [1341] 62	206 [1823] 58	255 [2257] 45	297 [2629] 40	341 [3015] 36	377 [3334] 22	396 [3502] 9		
	15 [4]	15 [134] 135	43 [378] 135	97 [863] 133	152 [1350] 130	208 [1838] 125	261 [2314] 118	314 [2776] 107	357 [3158] 88	402 [3558] 71	438 [3879] 49		
	23 [6]	15 [128] 203	42 [373] 203	97 [856] 200	151 [1337] 196	206 [1826] 190	260 [2302] 182	313 [2770] 170	359 [3179] 143	411 [3633] 124	458 [4054] 103		
	30 [8]	12 [108] 269	40 [351] 267	94 [833] 265	148 [1313] 262	203 [1798] 258	258 [2281] 248	311 [2753] 234	359 [3177] 201	413 [3656] 178	466 [4122] 155		
	38 [10]	9 [80] 337	36 [322] 335	91 [803] 333	145 [1280] 331	199 [1761] 325	253 [2236] 313	307 [2715] 296	358 [3165] 255	413 [3652] 232	468 [4144] 206		
	45 [12]	8 [69] 404	33 [293] 403	87 [770] 401	141 [1247] 399	194 [1716] 391	249 [2205] 378	303 [2684] 360	353 [3124] 313	408 [3613] 289	467 [4133] 259		
	53 [14]	4 [38] 473	29 [254] 471	82 [728] 470	136 [1202] 465	189 [1676] 457	243 [2152] 442	294 [2605] 403	351 [3108] 376	407 [3601] 347	464 [4109] 316		
	61 [16]		24 [210] 540	78 [687] 538	131 [1162] 532	185 [1635] 523	239 [2114] 508	290 [2564] 467	346 [3058] 438	402 [3553] 406	462 [4092] 372		
	68 [18]		18 [163] 608	72 [639] 605	126 [1116] 599	180 [1594] 589	234 [2068] 573	286 [2534] 530	341 [3016] 502	397 [3515] 467	458 [4051] 432		
	76 [20]		13 [117] 675	68 [598] 673	121 [1068] 667	174 [1541] 656	228 [2017] 639	282 [2494] 594	336 [2977] 565	393 [3481] 528	454 [4017] 492		
	83 [22]			67 [596] 742	115 [1015] 735	169 [1500] 722	221 [1960] 699	276 [2445] 672	332 [2942] 637	388 [3436] 598	447 [3953] 557		
	91 [24]			62 [549] 808	109 [967] 801	164 [1452] 787	218 [1926] 767	272 [2403] 737	326 [2885] 702	383 [3385] 659	441 [3906] 620		
	95 [25]			60 [528] 841	105 [939] 834	161 [1425] 818	215 [1901] 800	270 [2389] 771	323 [2861] 736	380 [3361] 693	439 [3886] 648		
Rotor Width		Torque - Nm [lb-in], Speed rpm										Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>	
22.1 [871]		31 [273]	62 [545]	123 [1090]	185 [1635]	246 [2180]	308 [2726]	370 [3271]	431 [3816]	493 [4361]	554 [4906]		
mm [in]		Theoretical Torque - Nm [lb-in]										Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]	

		Pressure - bar [psi]								Max. Cont.		Max. Inter.	
		17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	207 [3000]	242 [3500]	276 [4000]	310 [4500]		
130		129 cm ³ [7.9 in ³] / rev											
		Intermittent Ratings are below and to the right of the BOLD line.								Intermittent Ratings - 10% of Operation			
Flow - lpm [gpm]	2 [0.5]	13 [114] 8	41 [367] 6	94 [830] 3								Theoretical rpm	
	4 [1]	16 [144] 17	45 [400] 9	101 [890] 6	151 [1334] 4	201 [1780] 3	256 [2264] 3	306 [2706] 2					
	8 [2]	19 [172] 58	52 [456] 57	115 [1022] 55	180 [1592] 52	235 [2081] 50	294 [2600] 38	348 [3084] 35	402 [3560] 31	448 [3962] 22	477 [4219] 9		
	15 [4]	21 [182] 117	53 [469] 116	117 [1037] 114	182 [1609] 111	246 [2175] 107	309 [2735] 101	369 [3265] 92	424 [3749] 80	480 [4249] 68	528 [4671] 53		
	23 [6]	20 [174] 175	52 [460] 174	116 [1026] 172	180 [1591] 169	244 [2163] 165	308 [2730] 158	371 [3285] 148	427 [3783] 132	489 [4330] 117	547 [4837] 99		
	30 [8]	17 [150] 234	49 [436] 233	113 [1004] 230	178 [1571] 227	242 [2143] 223	307 [2714] 215	370 [3276] 202	426 [3767] 186	488 [4322] 168	550 [4866] 147		
	38 [10]	14 [120] 293	46 [403] 291	110 [974] 289	174 [1537] 285	238 [2109] 280	303 [2677] 272	367 [3246] 260	423 [3741] 240	486 [4305] 220	549 [4860] 197		
	45 [12]	10 [86] 351	42 [367] 350	106 [935] 347	169 [1499] 343	234 [2069] 337	298 [2633] 329	362 [3204] 315	417 [3688] 289	482 [4264] 266	547 [4837] 243		
	53 [14]	6 [53] 410	37 [329] 408	101 [891] 405	165 [1458] 401	229 [2027] 395	294 [2600] 385	349 [3092] 361	414 [3661] 341	478 [4230] 317	544 [4818] 289		
	61 [16]		33 [289] 467	96 [853] 464	160 [1415] 460	224 [1979] 453	287 [2543] 442	344 [3048] 415	409 [3620] 392	474 [4195] 367	539 [4773] 338		
	68 [18]			91 [803] 522	155 [1369] 518	219 [1934] 510	282 [2498] 499	340 [3007] 471	404 [3571] 448	469 [4147] 421	536 [4744] 389		
	76 [20]			85 [753] 580	148 [1314] 575	212 [1879] 568	277 [2447] 556	335 [2960] 526	399 [3528] 503	464 [4108] 474	533 [4714] 441		
	83 [22]			77 [681] 641	140 [1242] 637	204 [1805] 627	267 [2362] 613	332 [2938] 592	397 [3510] 567	461 [4076] 536	526 [4651] 504		
	91 [24]			71 [625] 701	134 [1185] 696	198 [1751] 686	261 [2307] 672	325 [2872] 651	389 [3442] 625	453 [4011] 594	520 [4599] 563		
	95 [25]			68 [601] 730	131 [1158] 726	195 [1722] 717	258 [2285] 703	322 [2849] 683	384 [3399] 657	450 [3986] 625	519 [4594] 589		
Rotor Width		Torque - Nm [lb-in], Speed rpm										Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>	
25.4 [1,001]		35 [313]	71 [625]	141 [1251]	212 [1876]	283 [2502]	353 [3127]	424 [3753]	495 [4378]	565 [5004]	636 [5629]		
mm [in]		Theoretical Torque - Nm [lb-in]										Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]	

► Performance data is typical. Performance of production units varies slightly from one motor to another.



DISPLACEMENT PERFORMANCE

► Performance data is typical. Performance of production units varies slightly from one motor to another.

160

Pressure - bar [psi] table with 10 columns and 1 row of values: 17 [250], 35 [500], 69 [1000], 104 [1500], 138 [2000], 172 [2500], 207 [3000], 242 [3500], 259 [3750], 276 [4000]

161 cm³ [9.8 in³] / rev

Intermittent Ratings are below and to the right of the BOLD line.

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm] and Max. Cont. / Max. Inter. labels for the 160 series

Main performance data table for 160 series with 10 columns and 18 rows of values

Theoretical rpm column for the 160 series

Rotor Width

Torque - Nm [lb-in], Speed rpm

Overall Efficiency - 70 - 100% 40 - 69% 0 - 39%

31.8 [1.251] mm [in]

Theoretical Torque - Nm [lb-in] table with 10 columns and 1 row of values

Theoretical Torque - Nm [lb-in]

Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

200

Pressure - bar [psi] table with 10 columns and 1 row of values: 17 [250], 35 [500], 69 [1000], 104 [1500], 138 [2000], 172 [2500], 190 [2750], 207 [3000], 242 [3500], 276 [4000]

200 cm³ [12.2 in³] / rev

Intermittent Ratings are below and to the right of the BOLD line.

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm] and Max. Cont. / Max. Inter. labels for the 200 series

Main performance data table for 200 series with 10 columns and 18 rows of values

Theoretical rpm column for the 200 series

Rotor Width

Torque - Nm [lb-in], Speed rpm

Overall Efficiency - 70 - 100% 40 - 69% 0 - 39%

39.4 [1.552] mm [in]

Theoretical Torque - Nm [lb-in] table with 10 columns and 1 row of values

Theoretical Torque - Nm [lb-in]

Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]



DISPLACEMENT PERFORMANCE

► Performance data is typical. Performance of production units varies slightly from one motor to another.

		Pressure - bar [psi]							Max. Cont.	Max. Inter.	
		17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	190 [2750]	207 [3000]	242 [3500]	276 [4000]
230		229 cm ³ [14.0 in ³] / rev									
		Intermittent Ratings are below and to the right of the BOLD line.					Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	2 [0.5]	40 [353] 7	90 [798] 7	189 [1673] 6							
	4 [1]	49 [435] 16	97 [856] 15	199 [1764] 14	293 [2592] 12	391 [3457] 10	483 [4272] 7	530 [4692] 5	576 [5094] 4		
	8 [2]	43 [378] 32	100 [889] 31	212 [1878] 30	316 [2798] 28	414 [3664] 25	507 [4491] 21	552 [4881] 19	596 [5271] 16		
	15 [4]	49 [433] 65	100 [884] 65	217 [1918] 63	333 [2943] 61	442 [3909] 57	542 [4801] 51	589 [5215] 48	642 [5685] 43	724 [6407] 33	806 [7135] 21
	23 [6]	45 [402] 98	97 [861] 98	214 [1897] 97	331 [2929] 93	446 [3950] 89	556 [4925] 81	609 [5393] 76	651 [5762] 68	747 [6610] 56	833 [7371] 43
	30 [8]	41 [360] 131	98 [871] 130	209 [1852] 130	327 [2896] 126	444 [3928] 121	557 [4933] 113	607 [5370] 102	662 [5863] 96	766 [6781] 82	858 [7595] 67
	38 [10]	34 [302] 164	94 [829] 163	204 [1804] 162	321 [2841] 159	439 [3881] 154	550 [4868] 139	608 [5380] 133	665 [5882] 126	775 [6857] 110	875 [7743] 92
	45 [12]	27 [235] 197	86 [763] 196	196 [1734] 195	313 [2772] 192	431 [3815] 186	545 [4819] 171	603 [5334] 164	660 [5837] 157	772 [6829] 140	882 [7803] 119
	53 [14]	19 [167] 229	78 [690] 229	188 [1660] 229	305 [2698] 229	422 [3734] 219	538 [4757] 204	595 [5269] 197	653 [5778] 189	766 [6781] 170	878 [7772] 146
	61 [16]	11 [100] 262	69 [612] 261	178 [1576] 262	295 [2614] 258	413 [3657] 252	528 [4677] 235	586 [5188] 227	644 [5697] 219	700 [6198] 210	815 [7214] 190
	68 [18]		60 [527] 294	168 [1487] 295	286 [2514] 292	402 [3559] 280	519 [4592] 268	577 [5106] 260	634 [5611] 251	748 [6617] 229	862 [7632] 204
	76 [20]		49 [430] 327	155 [1375] 328	272 [2408] 325	391 [3457] 314	506 [4482] 302	565 [5001] 294	623 [5514] 285	739 [6537] 262	850 [7525] 235
	83 [22]		40 [352] 360	149 [1319] 360	262 [2321] 357	379 [3357] 350	495 [4382] 338	553 [4894] 330	611 [5409] 320	724 [6409] 298	839 [7423] 270
	91 [24]		30 [268] 392	138 [1220] 392	251 [2217] 389	368 [3253] 389	482 [4268] 361	540 [4781] 361	598 [5295] 351	713 [6309] 328	829 [7333] 301
95 [25]			131 [1161] 408	245 [2167] 405	362 [3202] 397	478 [4227] 384	537 [4755] 376	592 [5237] 365	708 [6263] 343	823 [7283] 316	
114 [30]			92 [816] 492	208 [1837] 487	325 [2876] 480	442 [3908] 467	499 [4419] 458	557 [4928] 448	617 [5942] 423	790 [6991] 394	
Rotor Width		Torque - Nm [lb-in], Speed rpm									
45.5 [1.791]		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>									
mm [in]		63 [554]	125 [1108]	250 [2215]	376 [3323]	501 [4431]	626 [5539]	688 [6092]	751 [6646]	876 [7754]	1001 [8862]
		Theoretical Torque - Nm [lb-in]					Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]				

9	Theoretical rpm
17	
34	
67	
100	
133	
166	
200	
233	
266	
299	
332	
366	
399	
415	
498	

		Pressure - bar [psi]							Max. Cont.	Max. Inter.	
		17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]	224 [3250]
320		322 cm ³ [19.7 in ³] / rev									
		Intermittent Ratings are below and to the right of the BOLD line.					Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	2 [0.5]	65 [571] 5	135 [1196] 4	272 [2406] 3	398 [3524] 1						
	4 [1]	67 [595] 11	146 [1291] 10	290 [2568] 9	425 [3764] 7	558 [4937] 6	623 [5514] 4	689 [6101] 3	746 [6599] 1		
	8 [2]	67 [597] 22	150 [1328] 22	311 [2751] 20	461 [4083] 18	596 [5277] 16	659 [5834] 14	723 [6396] 12	788 [6977] 11	849 [7510] 9	
	15 [4]	64 [565] 46	147 [1299] 46	312 [2761] 44	474 [4197] 41	627 [5547] 36	698 [6173] 33	762 [6747] 30	821 [7261] 26	880 [7785] 20	942 [8337] 19
	23 [6]	77 [677] 70	154 [1367] 69	320 [2834] 67	484 [4283] 64	642 [5679] 57	717 [6347] 52	791 [7004] 48	853 [7548] 42	917 [8116] 37	977 [8646] 32
	30 [8]	72 [641] 93	147 [1299] 93	313 [2766] 91	477 [4221] 87	637 [5640] 80	715 [6329] 75	786 [6959] 65	861 [7617] 59	937 [8236] 53	996 [8816] 49
	38 [10]	64 [566] 117	137 [1217] 117	303 [2683] 114	468 [4142] 110	629 [5568] 103	705 [6241] 94	784 [6935] 87	859 [7603] 80	934 [8265] 74	1005 [8895] 68
	45 [12]	53 [473] 140	131 [1155] 139	292 [2587] 138	458 [4049] 134	619 [5479] 125	695 [6151] 116	774 [6850] 109	850 [7523] 103	926 [8197] 96	1001 [8861] 89
	53 [14]	30 [262] 164	122 [1076] 164	281 [2483] 161	446 [3943] 157	606 [5367] 146	687 [6078] 139	764 [6764] 132	840 [7434] 124	915 [8099] 116	990 [8761] 109
	61 [16]	18 [161] 187	112 [994] 186	267 [2359] 185	431 [3818] 181	594 [5253] 169	674 [5966] 163	753 [6660] 155	824 [7290] 149		
	68 [18]	18 [160] 209	113 [997] 207	265 [2344] 206	430 [3805] 204	593 [5244] 192	673 [5953] 185	751 [6649] 178	811 [7178] 174		
	76 [20]	3 [25] 234	97 [863] 233	248 [2198] 232	415 [3673] 227	578 [5114] 216	658 [5821] 202	736 [6515] 202	797 [7052] 197		
	83 [22]		84 [747] 257	236 [2091] 255	400 [3540] 249	562 [4973] 240	641 [5676] 234	720 [6368] 227	781 [6913] 222		
	91 [24]		75 [667] 280	215 [1900] 279	380 [3365] 273	543 [4804] 264	623 [5510] 258	701 [6202] 251	763 [6756] 246		
95 [25]		70 [616] 292	207 [1828] 290	370 [3272] 285	533 [4716] 276	613 [5423] 270	698 [6175] 261	758 [6711] 257			
114 [30]			153 [1353] 350	315 [2789] 344	478 [4230] 335	559 [4943] 329	639 [5653] 322	704 [6233] 318			
Rotor Width		Torque - Nm [lb-in], Speed rpm									
63.5 [2.501]		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>									
mm [in]		89 [788]	178 [1576]	356 [3153]	534 [4729]	713 [6306]	802 [7094]	891 [7882]	980 [8670]	1069 [9459]	1158 [10247]
		Theoretical Torque - Nm [lb-in]					Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]				

6	Theoretical rpm
12	
24	
47	
70	
94	
117	
140	
164	
187	
210	
234	
257	
280	
292	
350	



DISPLACEMENT PERFORMANCE

► Performance data is typical. Performance of production units varies slightly from one motor to another.

Pressure - bar [psi] Max. Cont. Max. Inter. 400 17 [250] 35 [500] 69 [1000] 86 [1250] 104 [1500] 121 [1750] 138 [2000] 155 [2250] 172 [2500] 190 [2750]

409 cm³ [25.0 in³] / rev

Intermittent Ratings are below and to the right of the BOLD line.

Intermittent Ratings - 10% of Operation

Main performance table for 400 series with columns for Flow-lpm [gpm], Max. Cont., Max. Inter., and Theoretical rpm. Includes rotor width and torque data.

Rotor Width 63.5 [2.501] mm [in]

Torque - Nm [lb-in], Speed rpm

Overall Efficiency - 70 - 100% 40 - 69% 0 - 39%

Torque and speed data for 400 series: 110 [969] 219 [1939] 438 [3877] 548 [4846] 657 [5816] 767 [6785] 876 [7754] 986 [8723] 1095 [9693] 1205 [10662]

Theoretical Torque - Nm [lb-in]

Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

Pressure - bar [psi] Max. Cont. Max. Inter. 500 17 [250] 35 [500] 52 [750] 69 [1000] 86 [1250] 104 [1500] 121 [1750] 138 [2000] 155 [2250]

508 cm³ [31.0 in³] / rev

Intermittent Ratings are below and to the right of the BOLD line.

Intermittent Ratings - 10% of Operation

Main performance table for 500 series with columns for Flow-lpm [gpm], Max. Cont., Max. Inter., and Theoretical rpm. Includes rotor width and torque data.

Rotor Width 78.9 [3.105] mm [in]

Torque - Nm [lb-in], Speed rpm

Overall Efficiency - 70 - 100% 40 - 69% 0 - 39%

Torque and speed data for 500 series: 136 [1205] 272 [2410] 409 [3616] 545 [4821] 681 [6026] 817 [7231] 953 [8436] 1090 [9642] 1226 [10847]

Theoretical Torque - Nm [lb-in]

Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

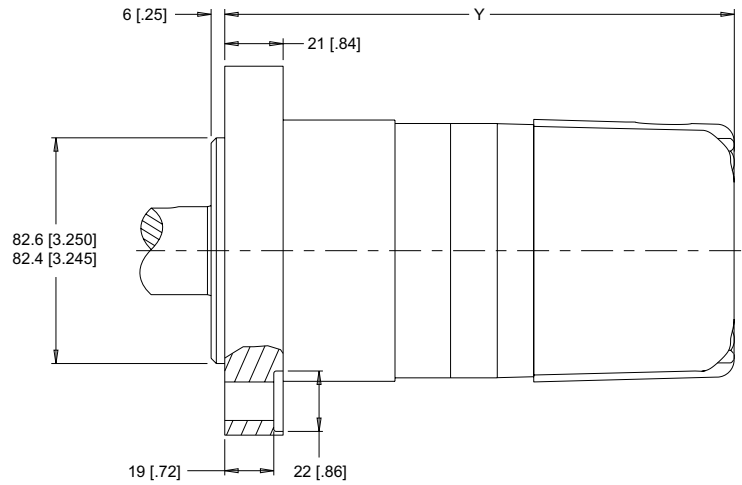
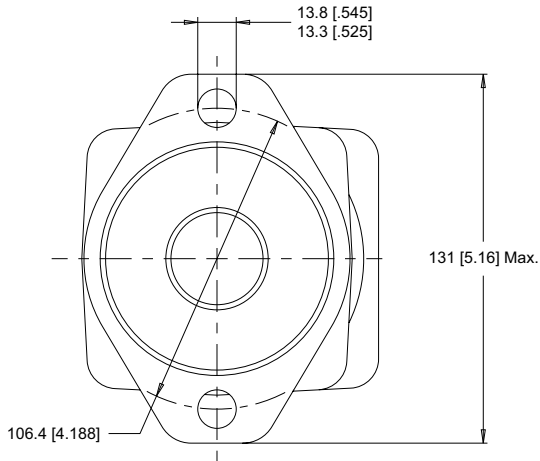


HOUSINGS

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

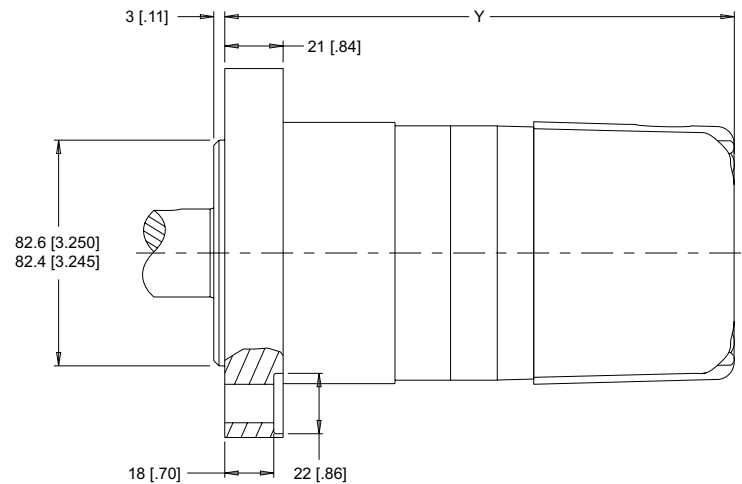
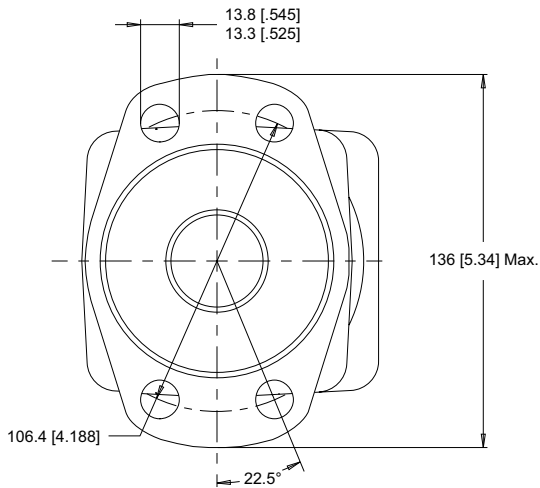
2-HOLE, SAE A MOUNT

A0 End Ports **A7** Side Ports



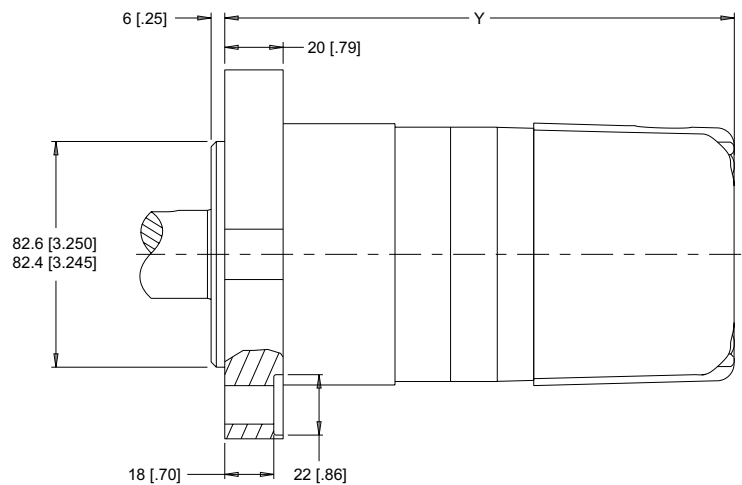
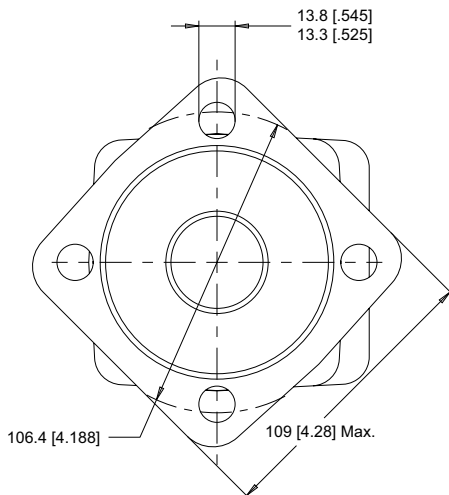
4-HOLE, MAGNETO MOUNT

A2 End Ports **A8** Side Ports



4-HOLE, SAE A MOUNT

AG End Ports **AH** Side Ports



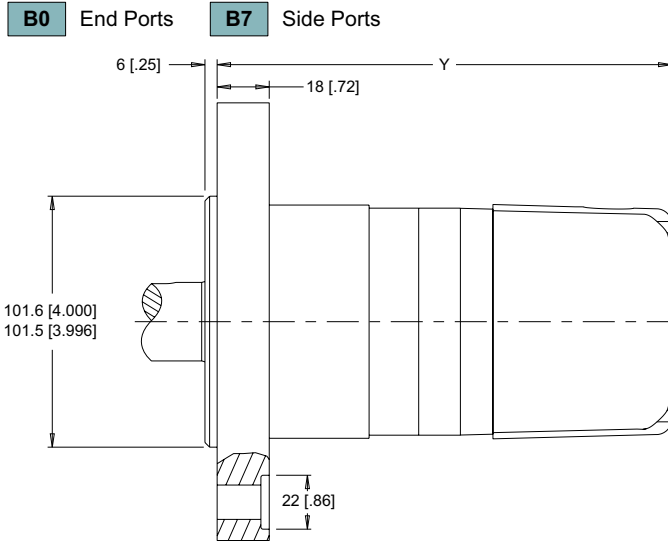
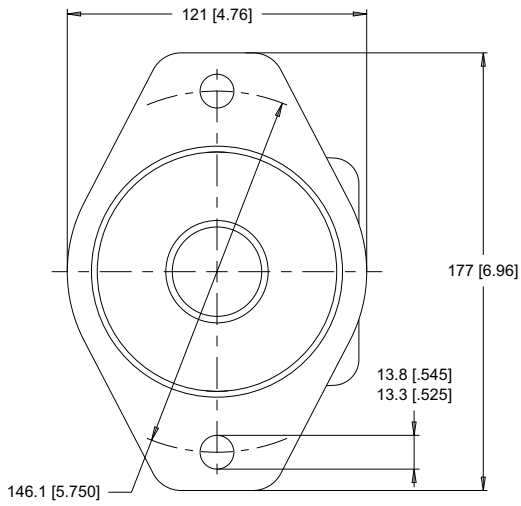
► Dimension Y is charted on page 10. Porting options listed on pages 11-12.



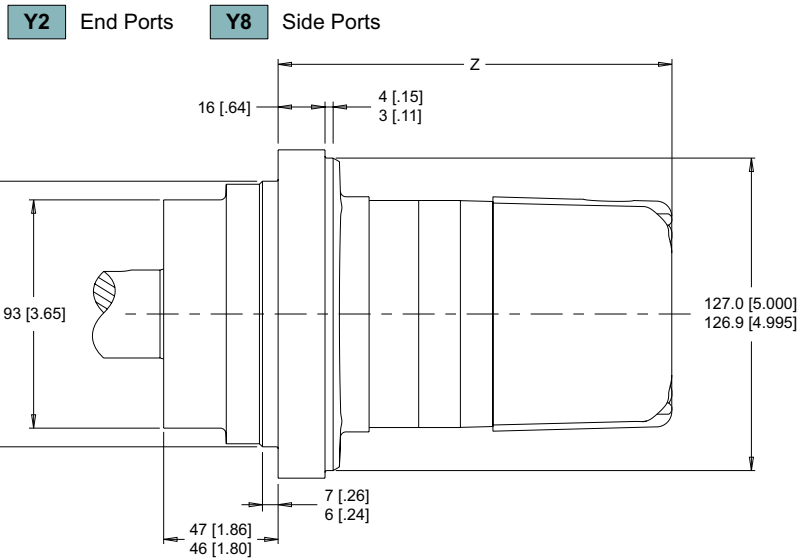
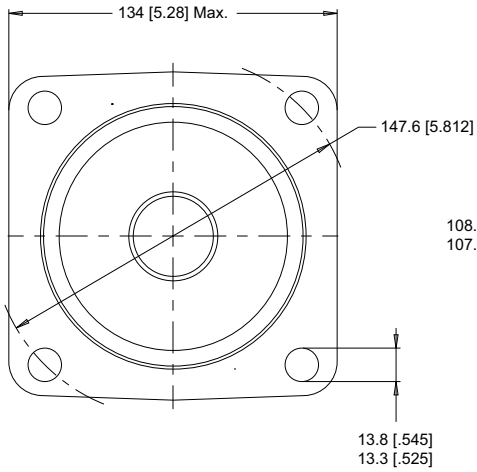
HOUSINGS

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

2-HOLE, SAE B MOUNT



4-HOLE, 4.25" WHEEL MOUNT



► Dimensions Y & Z are charted on page 10. Porting options listed on pages 11-12.



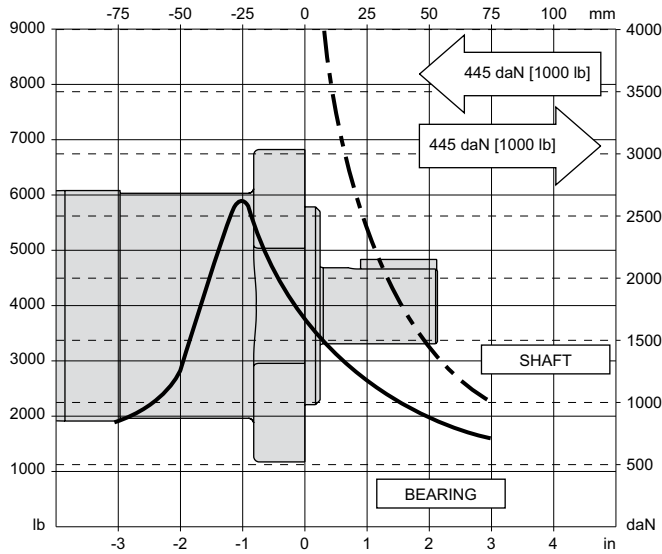
TECHNICAL INFORMATION

▶ Permissible shaft seal pressure information is found on page 17.

ALLOWABLE SHAFT LOAD / BEARING CURVE

The bearing curve represents allowable bearing loads for a B10 life of 2,000 hours at 100 rpm. The curve includes affects of 1,000 lbs inward/outward net thrust*. Radial loads for speeds other than 100 rpm may be calculated using the multiplication factor table below.

SAE A, SAE B & MAGNETO MOUNTS



LENGTH & WEIGHT CHART

Dimension Y is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 8 & 9.

Y	SAE A & B Mounts	Magneto Mounts	Weight
#	mm [in]	mm [in]	kg [lb]
080	185 [7.27]	189 [7.42]	11.3 [24.9]
100	185 [7.27]	189 [7.42]	11.3 [24.9]
110	187 [7.36]	191 [7.51]	11.4 [25.1]
130	190 [7.49]	194 [7.64]	11.5 [25.3]
160	197 [7.74]	201 [7.89]	11.8 [26.0]
200	204 [8.04]	208 [8.19]	12.2 [26.8]
230	210 [8.28]	214 [8.43]	12.6 [27.7]
320	228 [8.99]	232 [9.14]	13.5 [29.7]
400	228 [8.99]	232 [9.14]	13.5 [29.7]
500	244 [9.60]	248 [9.75]	14.2 [31.2]

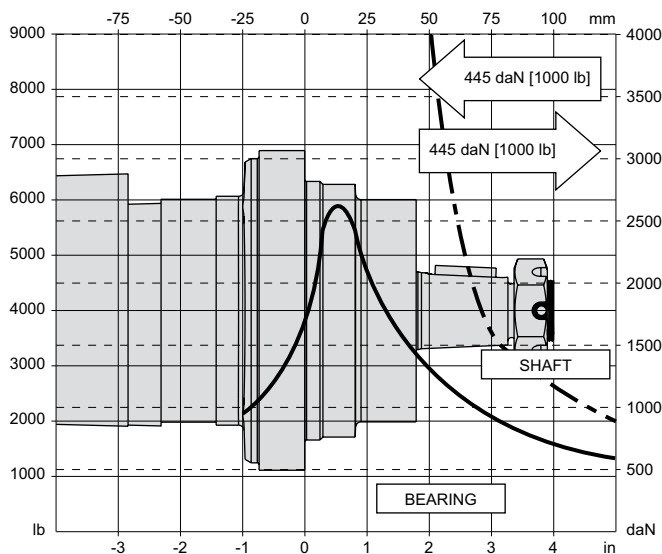
▶ Add 1.2 kg [2.6 lb] to the weight listed to the right for SAE B mount housings.

Dimension Z is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on page 9.

Z	Length	Weight
#	mm [in]	kg [lb]
080	145 [5.69]	12.5 [27.5]
100	145 [5.69]	12.5 [27.5]
110	147 [5.78]	12.6 [27.7]
130	150 [5.91]	12.7 [27.9]
160	157 [6.16]	13.0 [28.6]
200	164 [6.46]	13.4 [29.5]
230	170 [6.70]	13.8 [30.4]
320	188 [7.41]	14.7 [32.3]
400	188 [7.41]	14.7 [32.3]
500	204 [8.02]	15.4 [33.9]

▶ 350 series motor weights can vary ± 1kg [2 lb] depending on model configurations such as housing, shaft, endcover, options etc.

4.25" WHEEL MOUNT



BEARING LOAD MULTIPLICATION FACTOR TABLE			
RPM	FACTOR	RPM	FACTOR
50	1.23	500	0.62
100	1.00	600	0.58
200	0.81	700	0.56
300	0.72	800	0.50
400	0.66		

▶ * Case pressure will push outward on the shaft. If case drain line is attached and routed directly to tank, case pressure should be negligible. If case drain line is not attached, case pressure will be nearly the same as motor return pressure. When case pressure is acting, the allowable inward axial load can be increased and the allowable outward axial load must be decreased at a rate of 59 kg / 7 bar [130 lb / 100 psi] for shaft codes 02, 10, 12, 20, 21, 22 & 23. The rate for shaft codes 28 & 31 is 78 kg / 7 bar [175 lb / 100 psi].



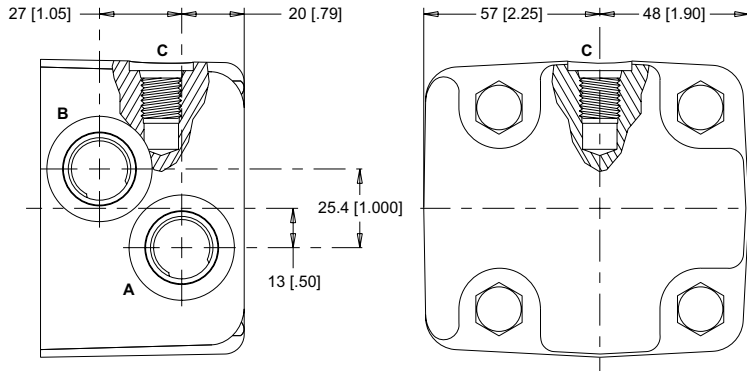
PORTING

SIDE PORTED - OFFSET

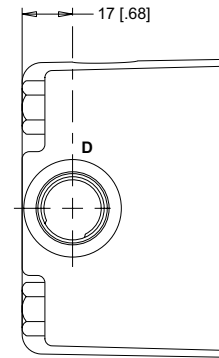
1 Main Ports **A, B:** 7/8-14 UNF
Drain Port **C:** 7/16-20 UNF

2 Main Ports **A, B:** G 1/2
Drain Port **C:** G 1/4

STANDARD



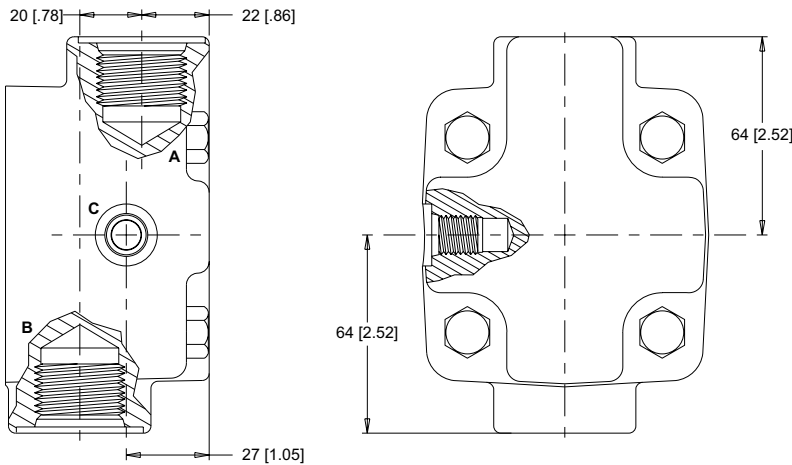
OPTIONAL



D: 10 Series/2-Way Valve Cavity 7/8-14 UNF

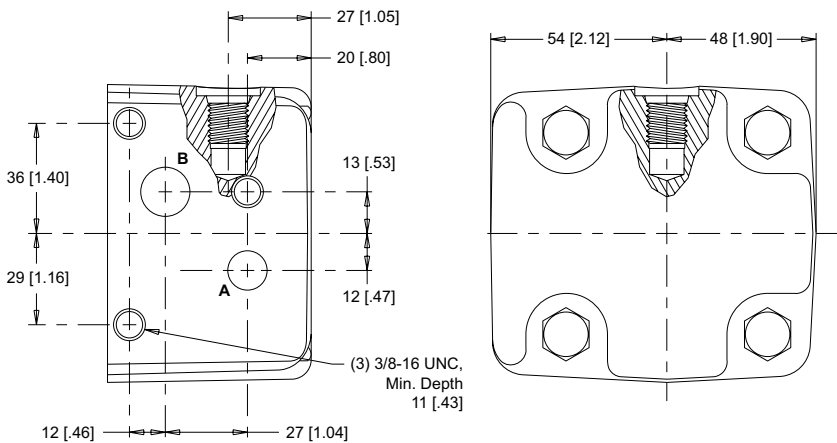
SIDE PORTED - 180° OPPOSED

6 Main Ports **A, B:** 1 1/16-12 UN
Drain Port **C:** 7/16-20 UNF



SIDE PORTED - OFFSET MANIFOLD

B Main Ports **A:** 12.7 [.500] Drilled **B:** 15.9 [.625] Drilled
Drain Port **C:** 7/16-20 UNF



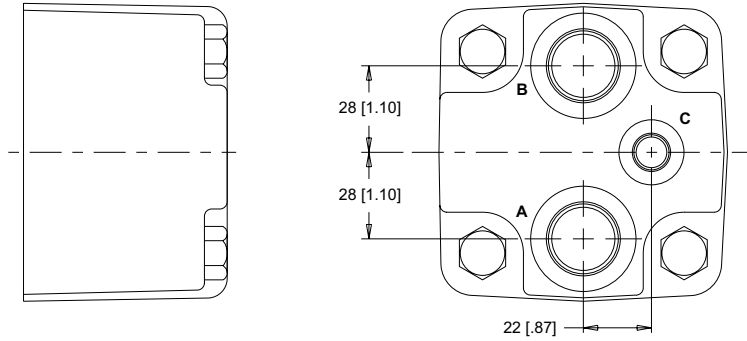


PORTING

END PORTED - ALIGNED

1 Main Ports **A, B:** 7/8-14 UNF
Drain Port **C:** 7/16-20 UNF

2 Main Ports **A, B:** G 1/2
Drain Port **C:** G 1/4



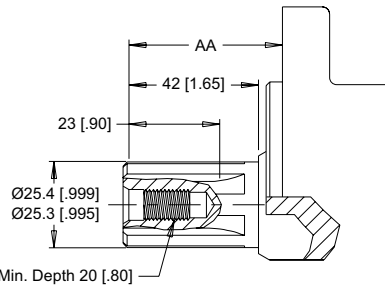
SHAFTS

02 1" 6B Spline

6B Spline
SAE J499 Standard

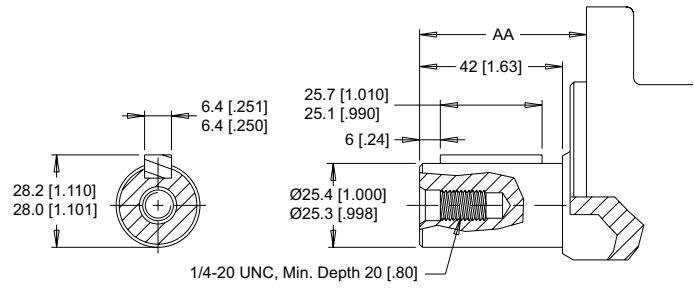


1/4-20 UNC, Min. Depth 20 [.80]



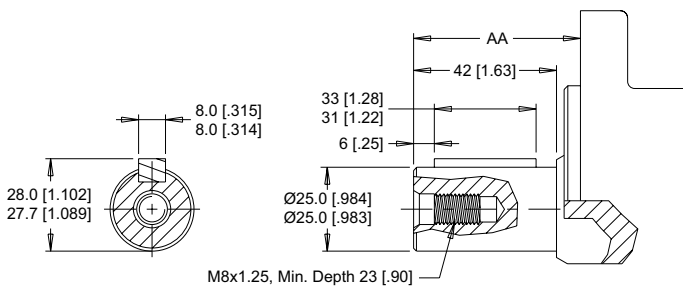
Max. Torque: 678 Nm [6000 lb-in]

10 1" Straight



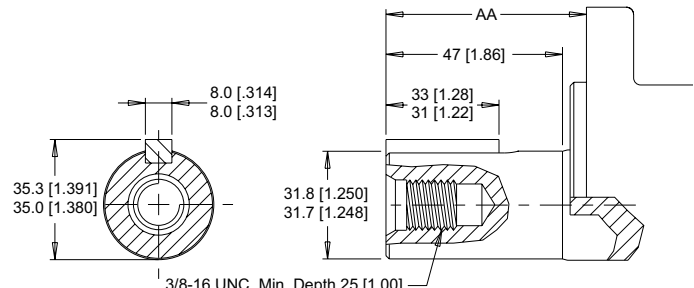
Max. Torque: 655 Nm [5800 lb-in]

12 25mm Straight



Max. Torque: 678 Nm [6000 lb-in]

20 1-1/4" Straight



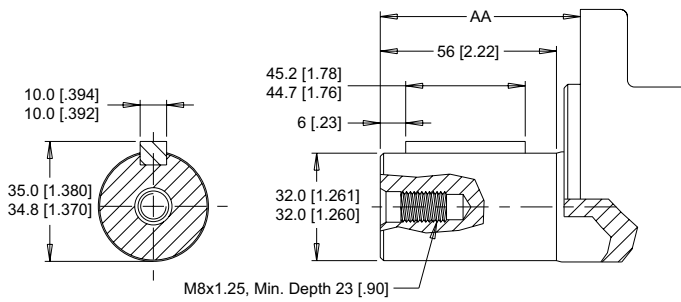
Max. Torque: 881 Nm [7800 lb-in]

► Dimension AA is charted on page 13.



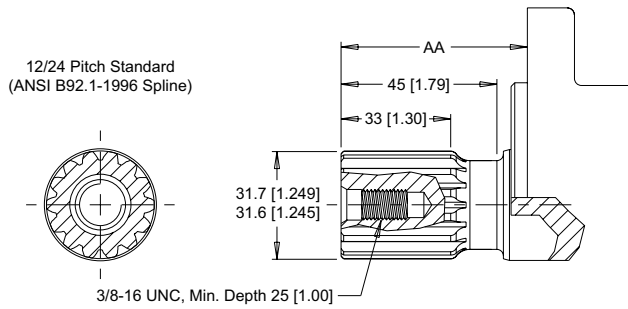
SHAFTS

21 32mm Straight



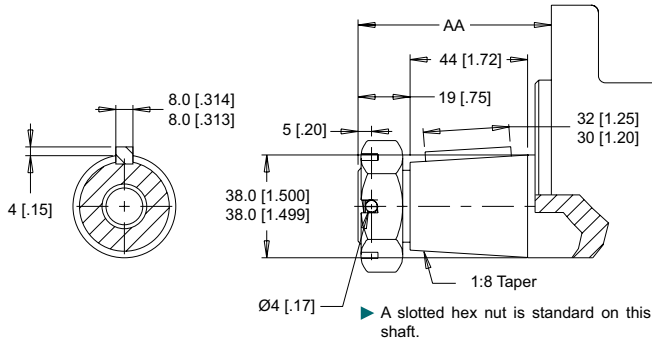
Max. Torque: 881 Nm [7800 lb-in]

23 14 Tooth Spline



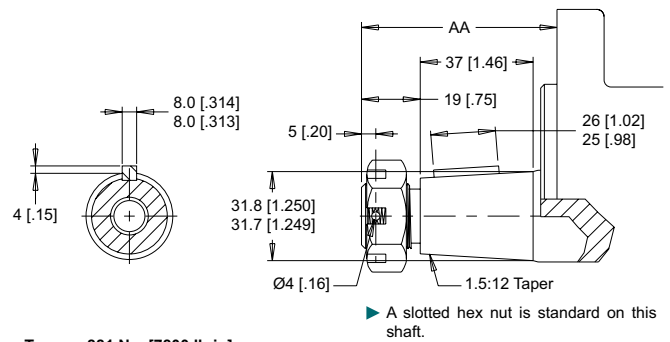
Max. Torque: 881 Nm [7800 lb-in]

31 1-1/2" Tapered



Max. Torque: 881 Nm [7800 lb-in]

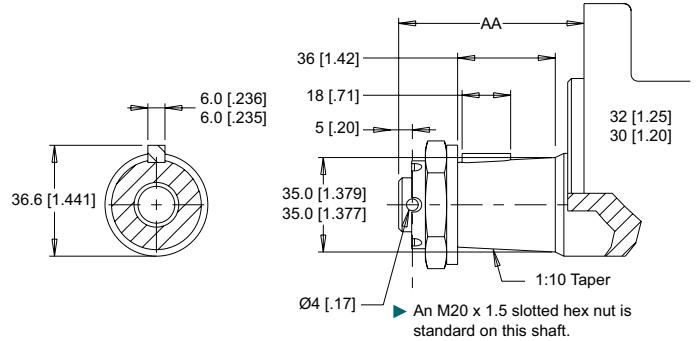
22 1-1/4" Tapered



Max. Torque: 881 Nm [7800 lb-in]

► A slotted hex nut is standard on this shaft.

28 35mm Tapered



Max. Torque: 881 Nm [7800 lb-in]

► An M20 x 1.5 slotted hex nut is standard on this shaft.

MOUNTING / SHAFT LENGTH CHART

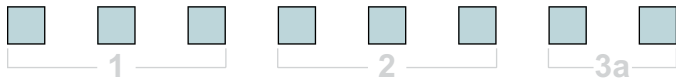
Dimension AA is the overall distance from the motor mounting surface to the end of the shaft and is referenced on detailed shaft drawings above as well as shafts on page 12.

AA	SAE A & B Mounts	Magneto Mounts	Wheel Mounts
#	mm [in]	mm [in]	mm [in]
02	51 [2.00]	47 [1.85]	91 [3.58]
10	51 [2.00]	47 [1.85]	91 [3.58]
12	51 [2.00]	47 [1.85]	91 [3.58]
20	55 [2.18]	52 [2.03]	96 [3.76]
21	65 [2.54]	61 [2.39]	105 [4.12]
22	64 [2.51]	60 [2.36]	104 [4.09]
23	55 [2.18]	52 [2.03]	96 [3.76]
28	N/A	N/A	107 [4.20]
31	N/A	N/A	123 [4.86]

► Shaft lengths vary ± 0.8 mm [.030 in.]

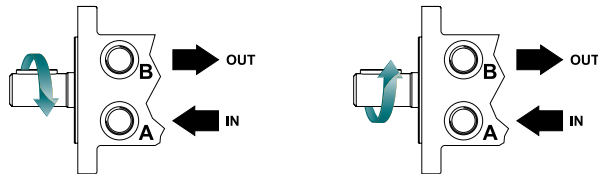


ORDERING INFORMATION



1. CHOOSE SERIES DESIGNATION

- 350** Clockwise Rotation
- 351** Counterclockwise Rotation



► The 350 & 351 series are bi-directional. Reversing the inlet hose will reverse shaft rotation.

2. SELECT A DISPLACEMENT OPTION

- | | |
|--|---|
| 080 78 cm ³ /rev [4.8 in ³ /rev] | 200 202 cm ³ /rev [12.3 in ³ /rev] |
| 100 100 cm ³ /rev [6.1 in ³ /rev] | 230 228 cm ³ /rev [13.9 in ³ /rev] |
| 110 112 cm ³ /rev [6.9 in ³ /rev] | 320 325 cm ³ /rev [19.8 in ³ /rev] |
| 130 129 cm ³ /rev [7.9 in ³ /rev] | 400 399 cm ³ /rev [24.4 in ³ /rev] |
| 160 162 cm ³ /rev [9.9 in ³ /rev] | 500 496 cm ³ /rev [30.3 in ³ /rev] |

3a. SELECT MOUNT TYPE

- ▼ **END MOUNT**
- A0** 2-Hole, SAE A Mount
 - A2** 4-Hole, Magneto Mount
 - AG** 4-Hole SAE A Mount
 - B0** 2-Hole SAE B Mount
 - Y2** 4-Hole Wheel Mount

- ▼ **SIDE MOUNT**
- A7** 2-Hole, SAE A Mount
 - A8** 4-Hole, Magneto Mount
 - AH** 4-Hole SAE A Mount
 - B7** 2-Hole SAE B Mount
 - Y8** 4-Hole Wheel Mount

3b. SELECT PORT SIZE

- ▼ **END PORT OPTIONS**
- 1** 7/8-14 UNF Aligned
 - 2** G 1/2 Aligned
- ▼ **SIDE PORT OPTIONS**
- 1** 7/8-14 UNF, Offset
 - 2** G 1/2, Offset
 - 6** 1 1/16-20 UN, 180° Opposed
 - B** Drilled Offset Manifold



4. SELECT A SHAFT OPTION

- | | |
|---------------------------|---------------------------|
| 02 6B Spline | 22 1-1/4" Tapered |
| 10 1" Straight | 23 14 Tooth Spline |
| 12 25mm Straight | 28 35mm Tapered |
| 20 1-1/4" Straight | 31 1-1/2" Tapered |
| 21 32mm Straight | |

► The 28 and 31 shafts are not available on the SAE A, SAE B, or the Magneto mounts.

5. SELECT A PAINT OPTION

- A** Black
- B** Black, Unpainted Mounting Surface
- Z** No Paint

6. SELECT A VALVE CAVITY / CARTRIDGE OPTION

- | | |
|------------------------------------|------------------------------------|
| A None | F 121 bar [1750 psi] Relief |
| B Valve Cavity Only | G 138 bar [2000 psi] Relief |
| C 69 bar [1000 psi] Relief | J 173 bar [2500 psi] Relief |
| D 86 bar [1250 psi] Relief | L 207 bar [3000 psi] Relief |
| E 104 bar [1500 psi] Relief | |

► Valve cavity is only available on side ports 1 & 2.

7. SELECT AN ADD-ON OPTION

- A** Standard
- B** Lock Nut
- C** Solid Hex Nut

8. SELECT A MISCELLANEOUS OPTION

- AA** None
- AC** Freeturning Rotor
- MA** Mounting Rotated 90°
- MB** Freeturning Rotor With Mounting Rotated 90°

► Rotated mounting not available on the 4-Hole SAE A & wheel mounts

All WS series motors have been tested per NFPA/T2.6.1-1974 in order to establish ratings for infinite housing life. These ratings are based on pressure cycles with the case drain closed. The ratings for each housing are listed below:

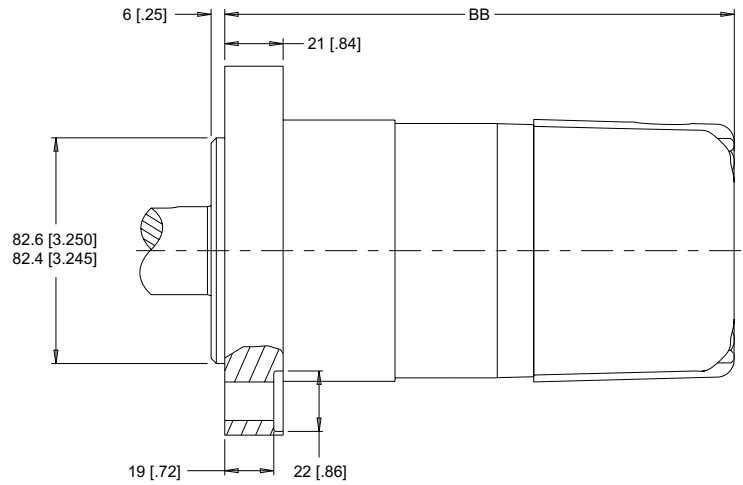
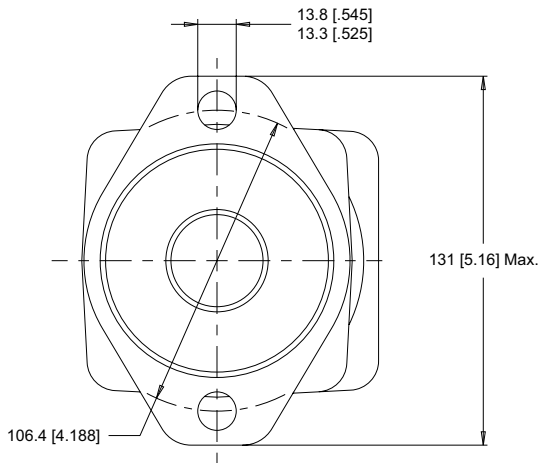
Mounting Option	Rated Fatigue Pressure
4-Hole Square SAE A Mount.....	34 bar [500 psi]
2-Hole SAE A, B and 4-Hole Magneto Mounts.....	48 bar [700 psi]
4.25" Wheel Mount.....	117 bar [1700 psi]

HOUSINGS

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

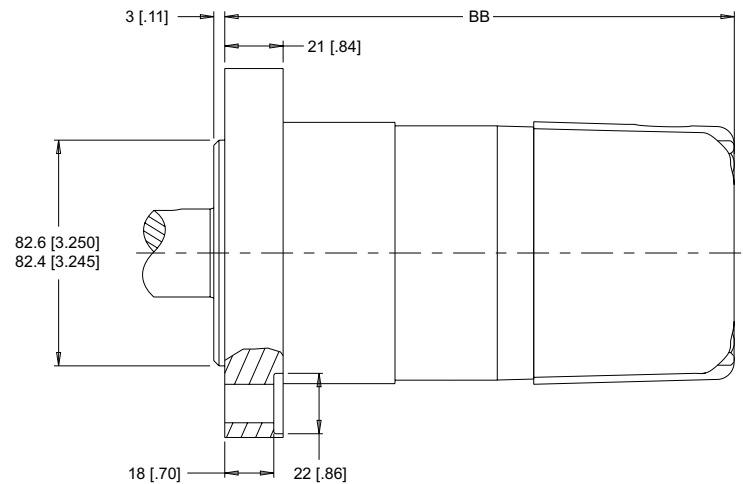
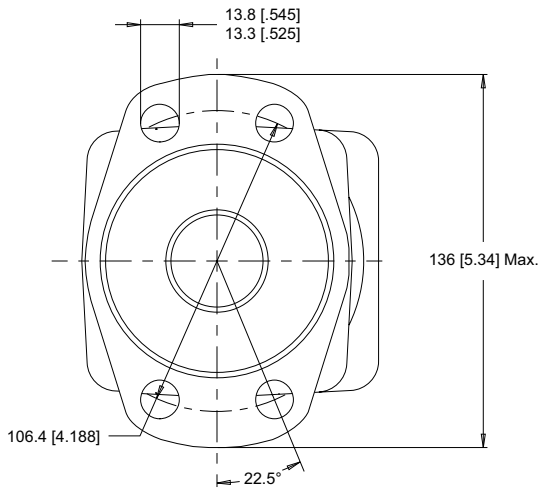
2-HOLE, SAE A MOUNT

A0 End Ports **A7** Side Ports



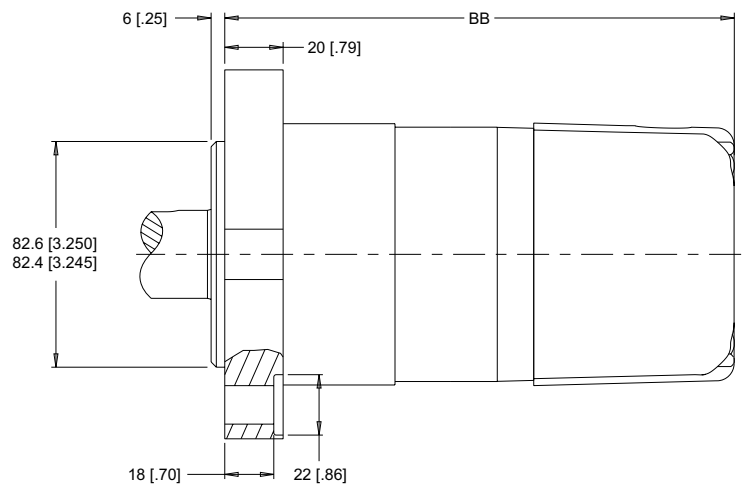
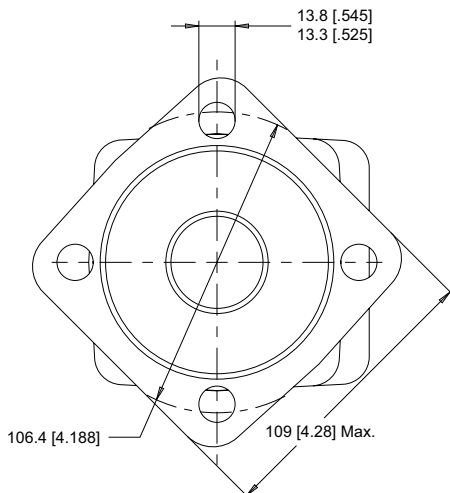
4-HOLE, MAGNETO MOUNT

A2 End Ports **A8** Side Ports



4-HOLE, SAE A MOUNT

AG End Ports **AH** Side Ports



► Dimension BB is charted on page 16. Porting options listed on pages 18-19.

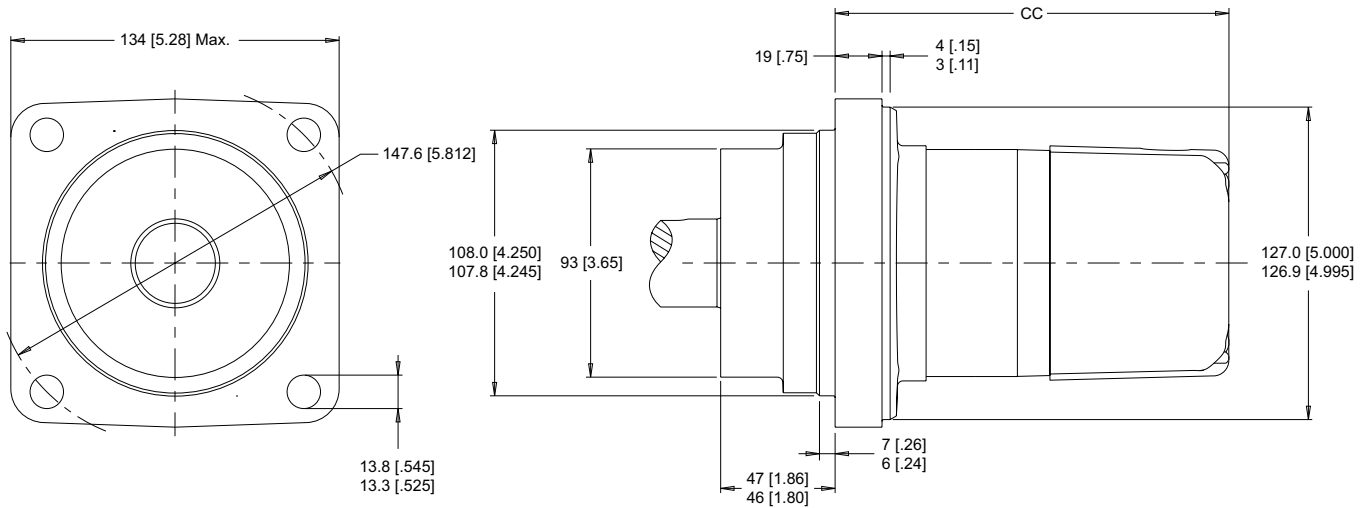


HOUSINGS

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

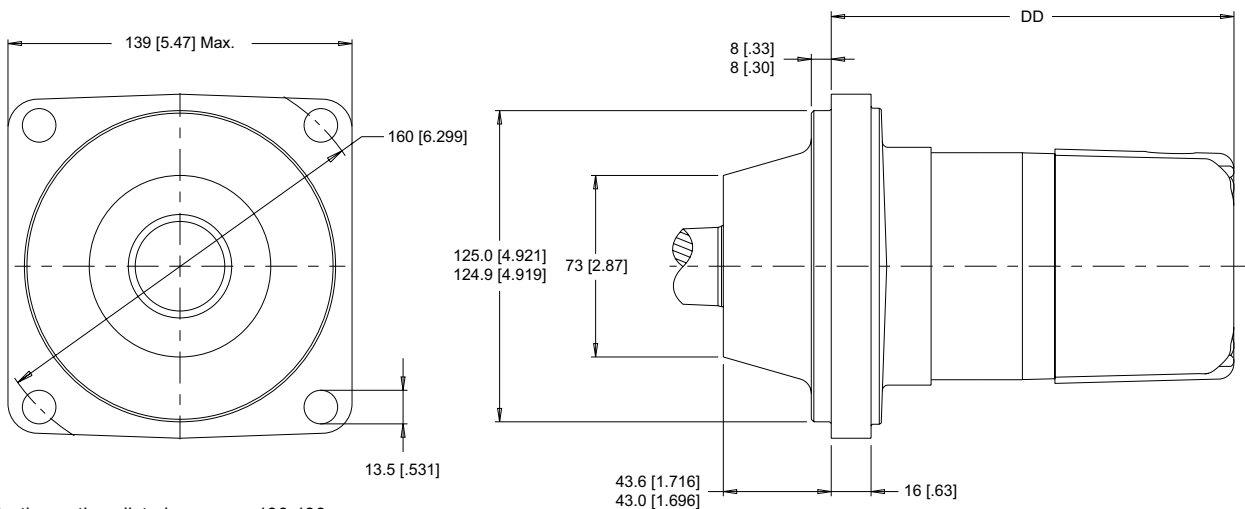
4-HOLE, 4.25" WHEEL MOUNT

Y2 End Ports **Y8** Side Ports



4-HOLE, EURO WHEEL MOUNT

Z2 End Ports **Z8** Side Ports



► Porting options listed on pages 138-139.

LENGTH & WEIGHT CHARTS

Dimensions BB, CC & DD are the overall motor lengths from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed above as well as page 15

BB	SAE A Mounts	Magneto Mounts	Weight
#	mm [in]	mm [in]	kg [lb]
080	193 [7.60]	197 [7.75]	10.8 [23.8]
100	193 [7.60]	197 [7.75]	10.8 [23.8]
110	196 [7.70]	200 [7.85]	11.0 [24.1]
130	199 [7.83]	203 [7.98]	11.1 [24.5]
160	205 [8.08]	209 [8.23]	11.5 [25.4]
200	213 [8.38]	217 [8.53]	11.9 [26.2]
230	219 [8.62]	223 [8.77]	12.3 [27.1]
320	237 [9.33]	241 [9.48]	13.3 [29.2]
400	237 [9.33]	241 [9.48]	13.3 [29.2]
500	252 [9.93]	256 [10.08]	14.0 [30.9]

CC	Length	Weight
#	mm [in]	kg [lb]
080	153 [6.02]	12.0 [26.5]
100	153 [6.02]	12.0 [26.5]
110	155 [6.12]	12.2 [26.8]
130	159 [6.25]	12.4 [27.2]
160	165 [6.50]	12.8 [28.1]
200	173 [6.80]	13.1 [28.9]
230	179 [7.04]	13.5 [29.8]
320	197 [7.75]	14.5 [31.9]
400	197 [7.75]	14.5 [31.9]
500	212 [8.35]	15.3 [33.6]

DD	Length	Weight
#	mm [in]	kg [lb]
080	156 [6.14]	11.8 [26.0]
100	156 [6.14]	11.8 [26.0]
110	158 [6.24]	12.0 [26.3]
130	162 [6.37]	12.2 [26.7]
160	168 [6.62]	12.5 [27.6]
200	176 [6.92]	12.9 [28.4]
230	182 [7.16]	13.3 [29.3]
320	200 [7.87]	14.3 [31.4]
400	200 [7.87]	14.3 [31.4]
500	215 [8.47]	15.0 [33.1]

► 355/356 series motor weights can vary ± 1kg [2 lb] depending on model configurations such as housing, shaft, endcover, options etc.

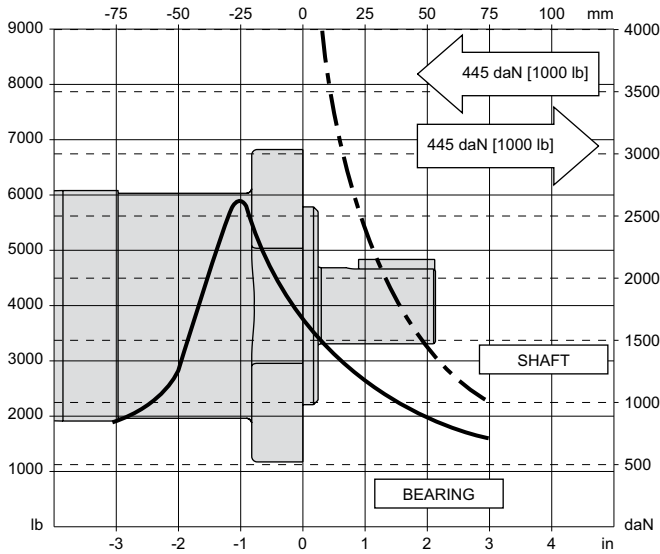


TECHNICAL INFORMATION

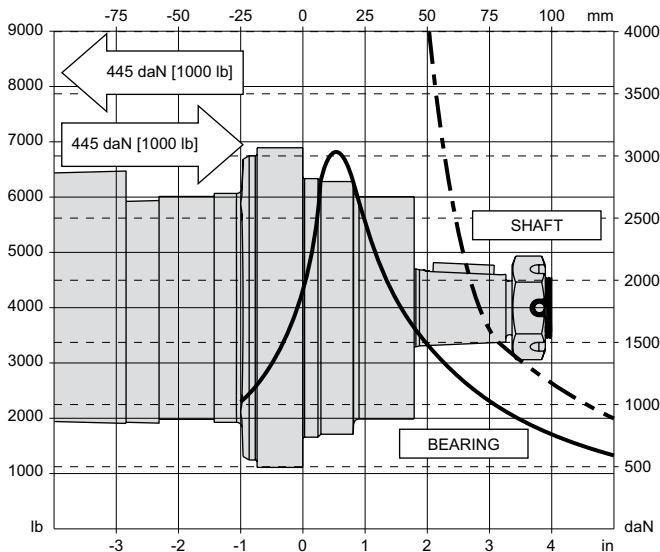
ALLOWABLE SHAFT LOAD / BEARING CURVE

The bearing curve represents allowable bearing loads for a B10 life of 2,000 hours at 100 rpm. The curve includes affects of 1,000 lbs inward/outward net thrust (see page 10). Radial loads for speeds other than 100 rpm may be calculated using the multiplication factor table on page 10.

SAE A & MAGNETO MOUNTS

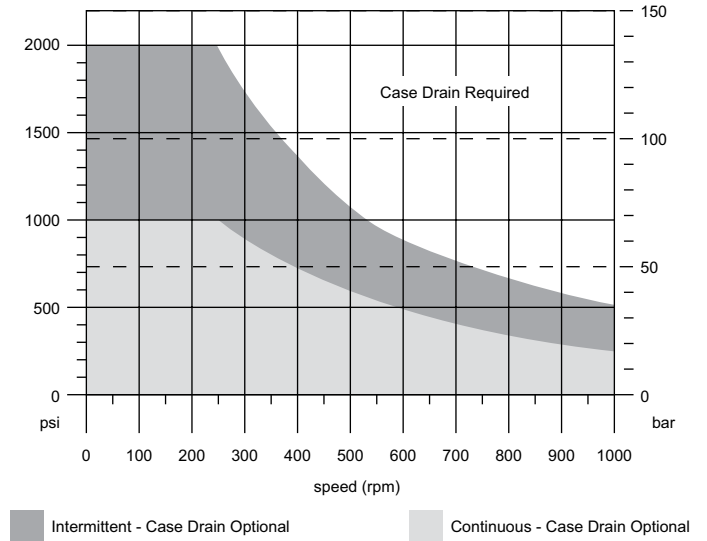


WHEEL MOUNTS

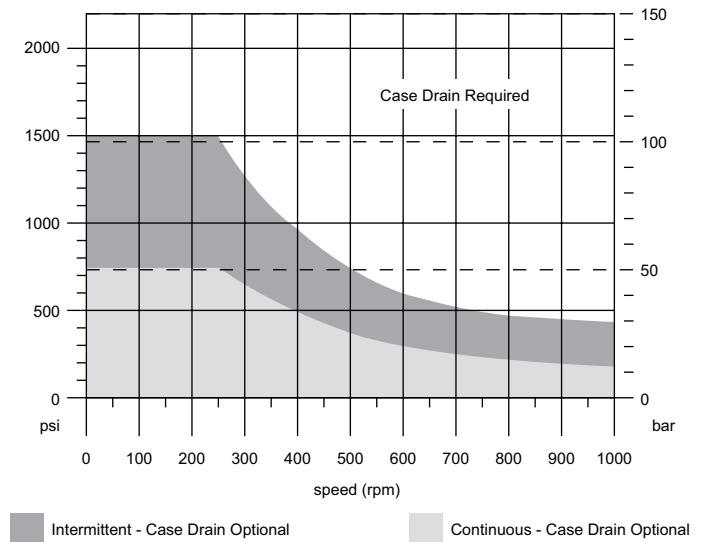


PERMISSIBLE SHAFT SEAL PRESSURE

MOTORS WITH SHAFT DIAMETERS 1-1/4" OR LESS



MOTORS WITH SHAFT DIAMETERS LARGER THAN 1-1/4"





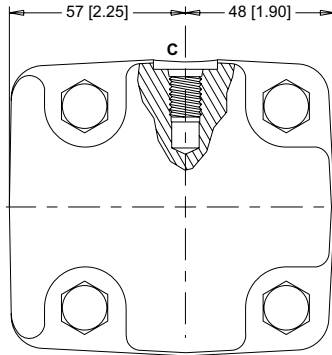
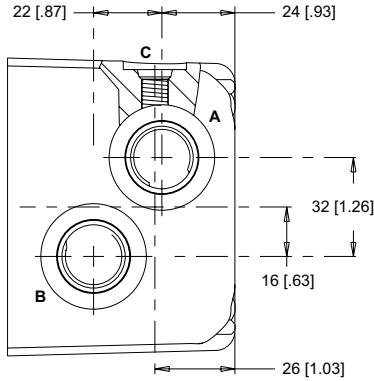
PORTING

SIDE PORTED - OFFSET

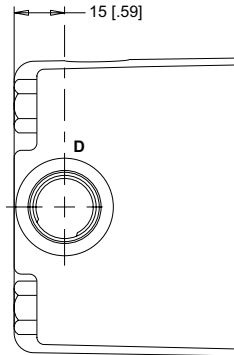
1 Main Ports **A, B:** 7/8-14 UNF
Drain Port **C:** 7/16-20 UNF

2 Main Ports **A, B:** G 1/2
Drain Port **C:** G 1/4

STANDARD



OPTIONAL

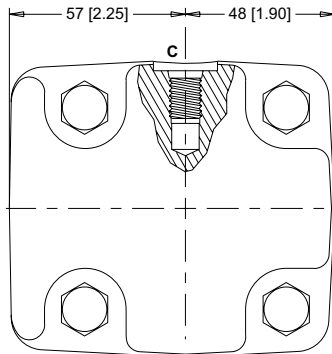
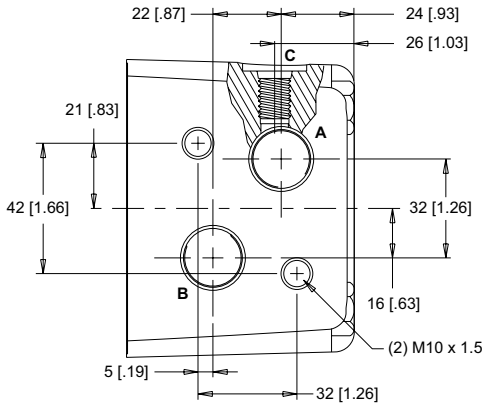


D: 10 Series/2-Way Valve Cavity 7/8-14 UNF

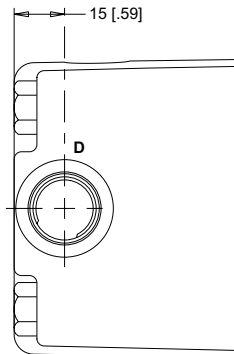
SIDE PORTED - OFFSET MANIFOLD

3 Main Ports **A, B:** G 1/2
Drain Port **C:** G 1/4

STANDARD



OPTIONAL

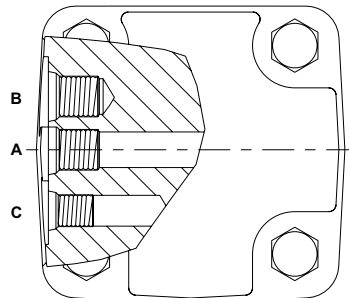
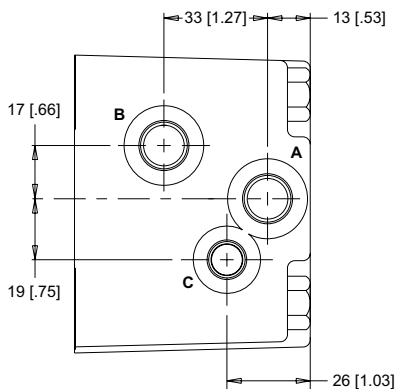


D: 10 Series/2-Way Valve Cavity 7/8-14 UNF

SIDE PORTED - OFFSET

5 Main Ports **A, B:** 9/16-18 UNF
Drain Port **C:** 7/16-20 UNF

9 Main Ports **A, B:** G 3/8
Drain Port **C:** G 1/4

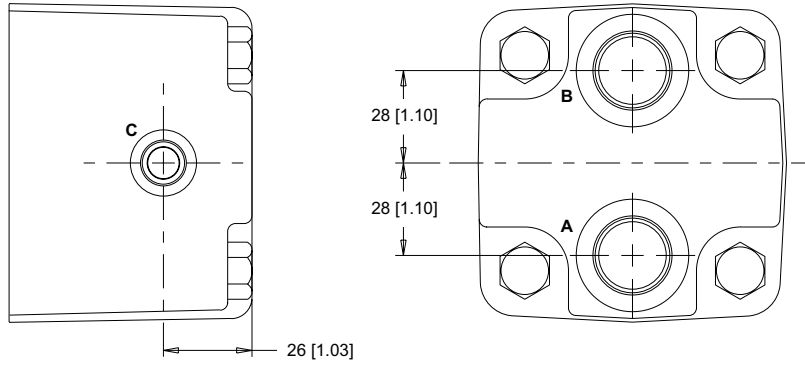


PORTING

END PORTED - ALIGNED

1 Main Ports **A, B:** 7/8-14 UNF
Drain Port **C:** 7/16-20 UNF

2 Main Ports **A, B:** G 1/2
Drain Port **C:** G 1/4

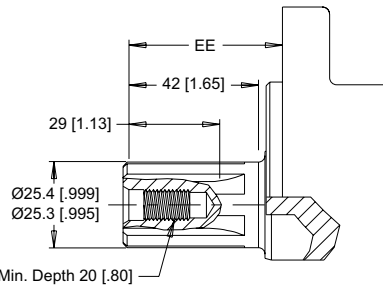
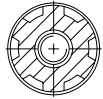




SHAFTS

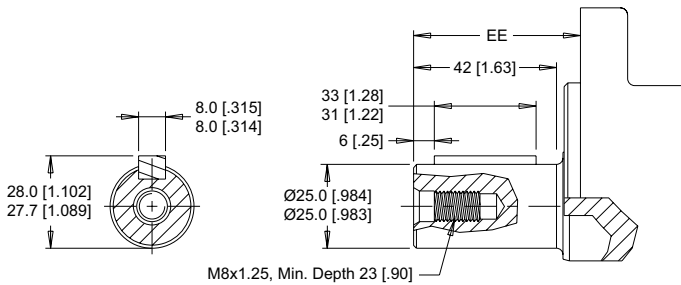
02 1" 6B Spline

6B Spline
SAE J499 Standard



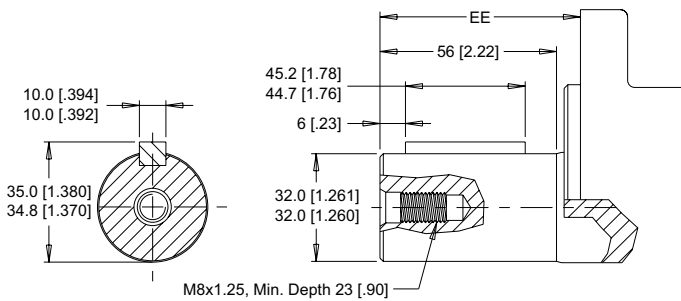
Max. Torque: 678 Nm [6000 lb-in]

12 25mm Straight



Max. Torque: 678 Nm [6000 lb-in]

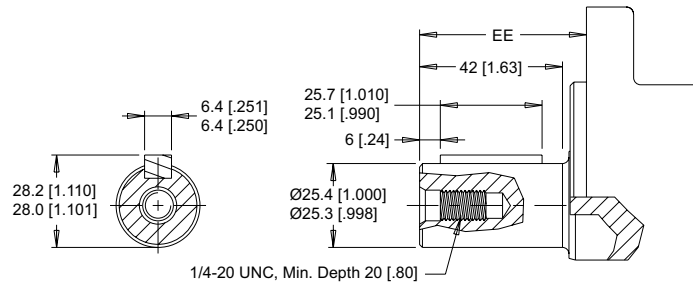
21 32mm Straight



Max. Torque: 881 Nm [7800 lb-in]

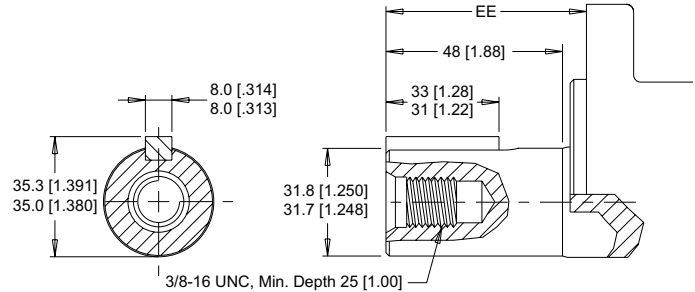
► Dimension EE is charted on page 21.

10 1" Straight



Max. Torque: 655 Nm [5800 lb-in]

20 1-1/4" Straight

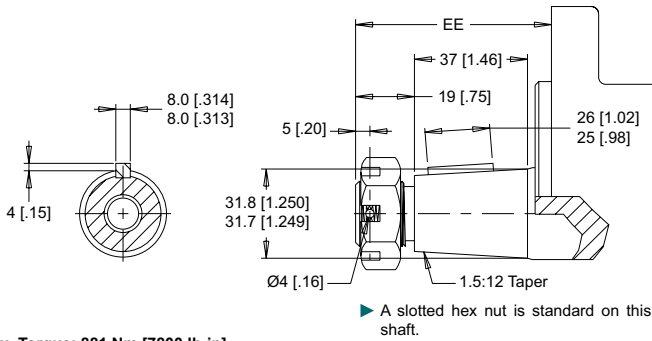


Max. Torque: 881 Nm [7800 lb-in]



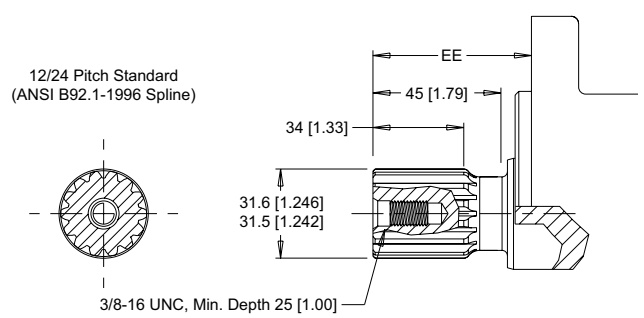
SHAFTS

22 1-1/4" Tapered



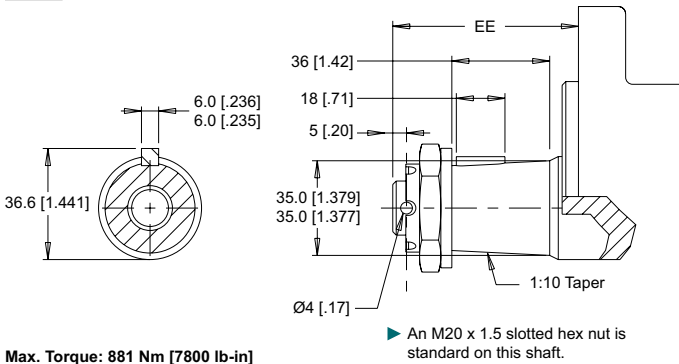
Max. Torque: 881 Nm [7800 lb-in]

23 14 Tooth Spline



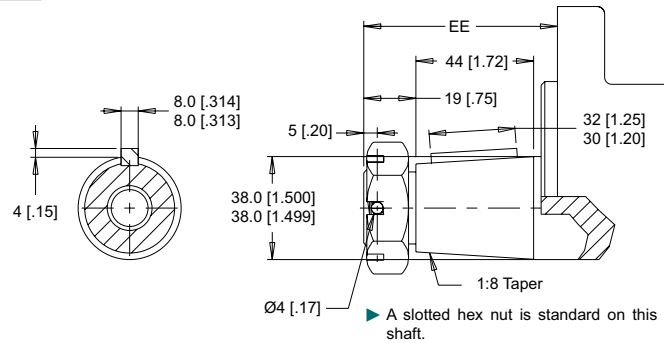
Max. Torque: 881 Nm [7800 lb-in]

28 35mm Tapered



Max. Torque: 881 Nm [7800 lb-in]

31 1-1/2" Tapered



Max. Torque: 881 Nm [7800 lb-in]

MOUNTING / SHAFT LENGTH CHART

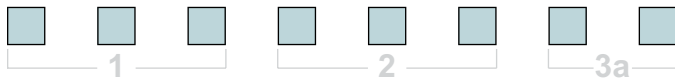
Dimension EE is the overall distance from the motor mounting surface to the end of the shaft and is referenced on detailed shaft drawings above as well as shafts on page 20.

EE #	SAE A* Mounts	Euro Wheel Mounts	4.25" Wheel Mounts
	mm [in]	mm [in]	mm [in]
02	51 [2.00]	88 [3.45]	91 [3.58]
10	51 [2.00]	88 [3.45]	91 [3.58]
12	51 [2.00]	88 [3.45]	91 [3.58]
20	55 [2.18]	92 [3.63]	96 [3.76]
21	65 [2.54]	101 [3.99]	105 [4.12]
22	64 [2.51]	101 [3.96]	104 [4.09]
23	55 [2.18]	92 [3.63]	96 [3.76]
28	N/A	104 [4.08]	107 [4.20]
31	N/A	120 [4.73]	123 [4.86]

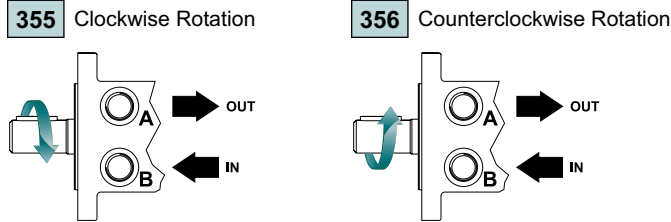
► *For the magneto mount subtract 3.8 [0.15] from dimension. Shaft lengths vary ± 0.8 mm [0.030 in.]



ORDERING INFORMATION



1. CHOOSE SERIES DESIGNATION



▶ The 355 & 356 series are bi-directional. Reversing the inlet hose will reverse shaft rotation.

2. SELECT A DISPLACEMENT OPTION

080 78 cm ³ /rev [4.8 in ³ /rev]	200 202 cm ³ /rev [12.3 in ³ /rev]
100 100 cm ³ /rev [6.1 in ³ /rev]	230 228 cm ³ /rev [13.9 in ³ /rev]
110 112 cm ³ /rev [6.9 in ³ /rev]	320 325 cm ³ /rev [19.8 in ³ /rev]
130 129 cm ³ /rev [7.9 in ³ /rev]	400 399 cm ³ /rev [24.4 in ³ /rev]
160 162 cm ³ /rev [9.9 in ³ /rev]	500 496 cm ³ /rev [30.3 in ³ /rev]

3a. SELECT MOUNT TYPE

▼ **END MOUNT**

A0 2-Hole, SAE A Mount
A2 4-Hole, Magneto Mount
AG 4-Hole SAE A Mount
B0 2-Hole SAE B Mount
Y2 4-Hole 4.25" Wheel Mount
Z2 4-Hole Euro Wheel Mount

▼ **SIDE MOUNT**

A7 2-Hole, SAE A Mount
A8 4-Hole, Magneto Mount
AH 4-Hole SAE A Mount
B7 2-Hole SAE B Mount
Y8 4-Hole Wheel Mount
Z8 4-Hole Euro Wheel Mount

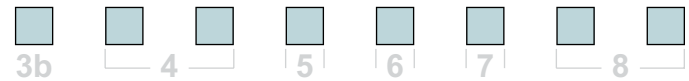
3b. SELECT PORT SIZE

▼ **END PORT OPTIONS**

1 7/8-14 UNF Aligned
2 G 1/2 Aligned

▼ **SIDE PORT OPTIONS**

1 7/8-14 UNF, Offset
2 G 1/2, Offset
3 G 1/2, Offset Manifold
5 9/16-18 UNF, Offset
9 G 3/8, Offset



4. SELECT A SHAFT OPTION

02 6B Spline	22 1-1/4" Tapered
10 1" Straight	23 14 Tooth Spline
12 25mm Straight	28 35mm Tapered
20 1-1/4" Straight	31 1-1/2" Tapered
21 32mm Straight	

▶ The 28 and 31 shafts are not available on the SAE A or the Magneto mounts.

5. SELECT A PAINT OPTION

A Black
B Black, Unpainted Mounting Surface
Z No Paint

6. SELECT A VALVE CAVITY / CARTRIDGE OPTION

A None	F 121 bar [1750 psi] Relief
B Valve Cavity Only	G 138 bar [2000 psi] Relief
C 69 bar [1000 psi] Relief	J 173 bar [2500 psi] Relief
D 86 bar [1250 psi] Relief	L 207 bar [3000 psi] Relief
E 104 bar [1500 psi] Relief	

▶ Valve cavity is only available on side ports 1, 2 and 3.

7. SELECT AN ADD-ON OPTION

A Standard
B Lock Nut
C Solid Hex Nut

8. SELECT A MISCELLANEOUS OPTION

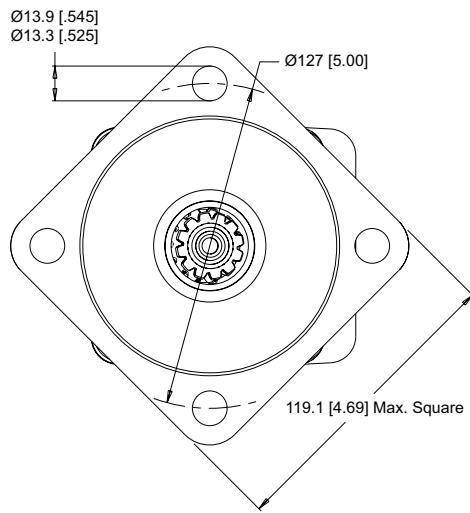
AA None
AC Freeturning Rotor
MA Mounting Rotated 90°
MB Freeturning Rotor With Mounting Rotated 90°

▶ Rotated mounting not available on the 4-Hole SAE A & wheel mounts

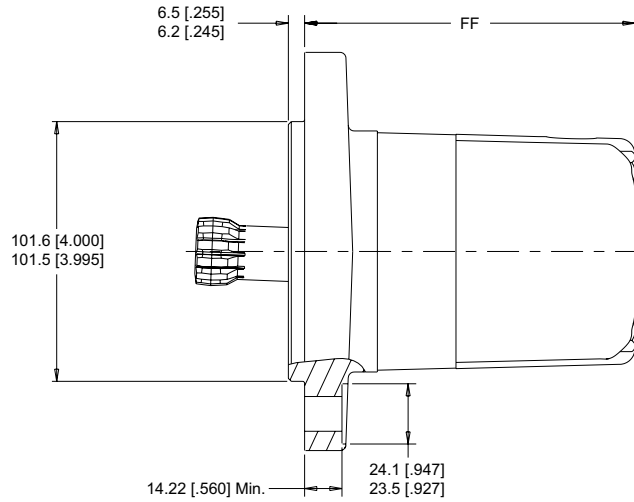


HOUSINGS

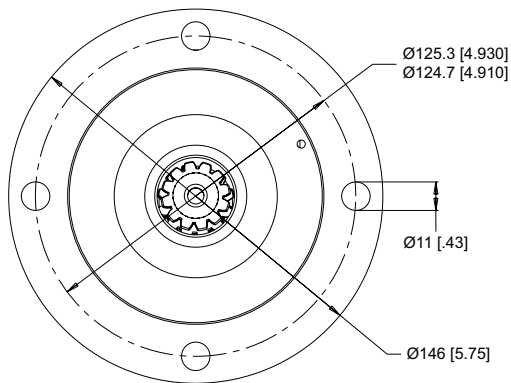
4-HOLE, 4.00" PILOT MOUNT



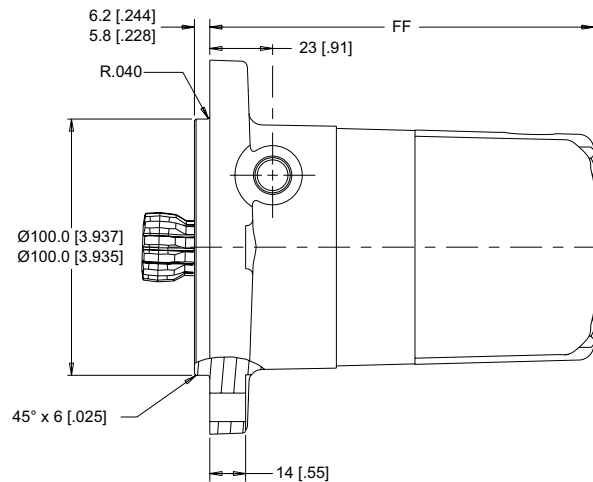
S2 End Ports **S8** Side Ports



4-HOLE, 100mm PILOT MOUNT



SG End Ports **SH** Side Ports



► Porting options listed on pages 18-19.

LENGTH & WEIGHT CHARTS

Dimension FF is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed above.

FF	4.00" Pilot Mounts	100mm Pilot Mounts	Weight*
#	mm [in]	mm [in]	kg [lb]
080	122 [4.80]	142 [5.60]	12.5 [27.5]
100	122 [4.80]	142 [5.60]	12.5 [27.5]
110	124 [4.89]	145 [5.70]	12.6 [27.8]
130	128 [5.02]	148 [5.83]	12.8 [28.2]
160	134 [5.27]	154 [6.08]	13.3 [29.2]
200	142 [5.57]	162 [6.38]	13.6 [29.9]
230	148 [5.81]	168 [6.62]	14.0 [30.8]
320	166 [6.52]	186 [7.33]	15.0 [32.9]
400	166 [6.52]	186 [7.33]	15.0 [32.9]
500	181 [7.12]	201 [7.93]	15.8 [34.7]

► 357/358 series motor weights can vary ± 1kg [2 lb] depending on model configurations such as housing, shaft, endcover, options etc. *For the SG and SH mounts subtract 2.9 kg [6.3 lb].

SHAFTS

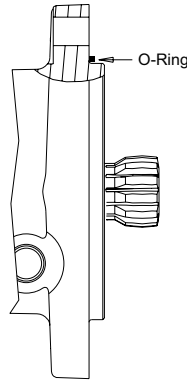
00 Cardan (For Use With SG & SH Mounts)

Fillet Root Side Fit

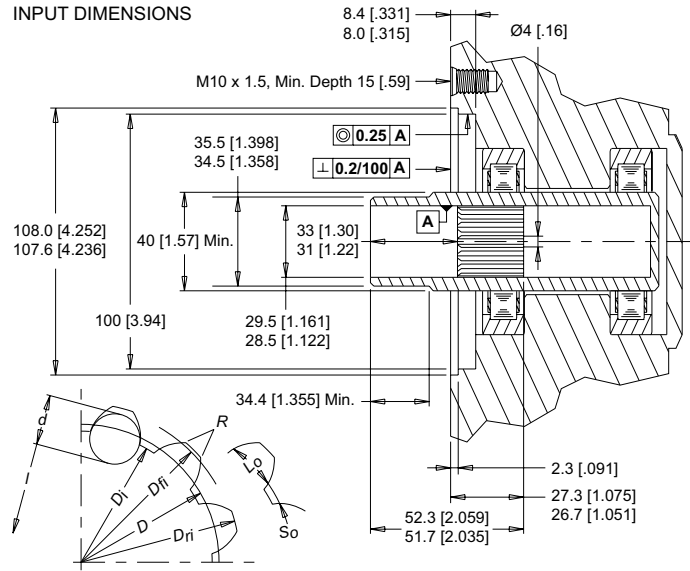
Number of Teeth	12
Pitch	12/24
Pressure Angle	30°
Pitch Diameter D	25.4 [1.000]
Major Diameter D_{rj}	28.0 [1.10] - 27.9 [1.096]
Form Diameter (Min.) D_{fi}	27.6 [1.09]
Minor Diameter D_j	23.033 [.9068] - 23.0 [.9055]
Space Width (Circular) L_O^*	4.328 [1.704] - 4.288 [1.688]
Tooth Thickness (Circular) S_O	2.341 [.09217]
Fillet Radius R min	0.2 [1.008]
Max. Distance Between Pins I	17.77 [1.700] - 17.62 [1.694]
Pin Diameter d	4.836 [1.9034] - 4.834 [1.9026]

Internal involute spline data per ANSI B92.1-1970, class 5 (corrected $m \cdot X = 0.8$; $m = 2.1166$)

► The recommended shaft material is SAE 8620 or similar case hardening steel such as 20 MoCr4 (900 N/mm²) hardened to 59 - 62 HRC to a depth of 0.762 - 1.016 [.030 - .040].
*Dimensions apply after heat treatment.



INPUT DIMENSIONS



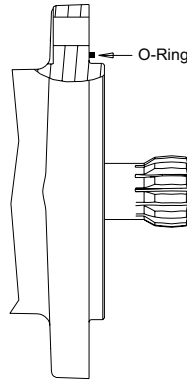
0B Cardan (For Use With S2 & S8 Mounts)

Fillet Root Side Fit

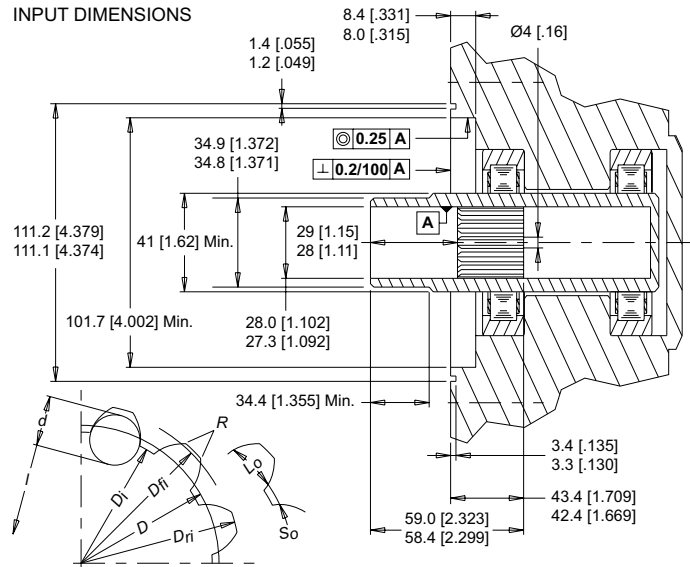
Number of Teeth	12
Pitch	12/24
Pressure Angle	30°
Pitch Diameter D	25.4 [1.000]
Base Diameter	21.997 [.8660]
Major Diameter D_{rj}	27.74 [1.092] - 27.59 [1.086]
Form Diameter (Min.) D_{fi}	26.93 [1.060]
Minor Diameter D_j	23.224 [.9143] - 23.097 [.9093]
Space Width (Circular) L_O^*	
Max. Actual	4.318 [1.700]
Min. Effective	4.216 [1.660]
Fillet Radius R	0.76 [.030] - 0.64 [.025]
Max. Distance Between Pins I	19.190 [1.7555] - 19.020 [1.7488]
Pin Diameter d	4.496 [1.770]

with 3.38 [.133] Flat for Root Clearance.

► The recommended shaft material is SAE 8620 or similar case hardening steel such as 20 MoCr4 (900 N/mm²) hardened to 59 - 62 HRC to a depth of 0.762 - 1.016 [.030 - .040].
*Dimensions apply after heat treatment.



INPUT DIMENSIONS



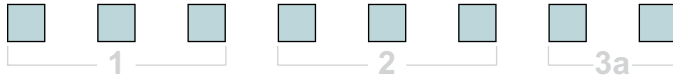
SPECIFICATIONS (REDUCED TORQUE & PRESSURE RATINGS)*

CODE	Displacement cm ³ [in ³ /rev]	Max. Speed rpm		Max. Flow lpm [gpm]		Max. Torque Nm [lb-in]		Max. Pressure bar [psi]		
		cont.	inter.	cont.	inter.	cont.	inter.	cont.	inter.	peak
080	79 [4.78]	870	1060	61 [16]	68 [18]	207 [1832]	274 [2425]	207 [3000]	275 [3990]	276 [4000]
100	100 [6.10]	745	880	76 [20]	95 [25]	280 [2475]	390 [3450]	207 [3000]	275 [3990]	295 [4280]
110	112 [6.85]	675	840	76 [20]	95 [25]	307 [2715]	418 [3700]	207 [3000]	275 [3990]	295 [4280]
130	129 [7.86]	580	730	76 [20]	95 [25]	370 [3275]	490 [4340]	207 [3000]	275 [3990]	295 [4280]
160	162 [9.90]	465	700	76 [20]	114 [30]	462 [4090]	600 [5310]	207 [3000]	260 [3770]	280 [4060]
200	202 [12.31]	375	560	76 [20]	114 [30]	576 [5100]	720 [6370]	207 [3000]	250 [3630]	270 [3920]
230	228 [13.92]	325	490	76 [20]	114 [30]	642 [5685]	806 [7135]	207 [3000]	250 [3630]	270 [3920]
320	325 [19.81]	235	350	76 [20]	114 [30]	789 [6980]	990 [8760]	190 [2750]	224 [3250]	259 [3750]
400	399 [24.36]	190	280	76 [20]	114 [30]	816 [7225]	990 [8760]	155 [2250]	190 [2750]	210 [3050]
500	496 [30.29]	155	230	76 [20]	114 [30]	824 [7295]	990 [8760]	121 [1750]	140 [2030]	160 [2320]

► Performance data is typical. Performance of production units varies slightly from one motor to another. Running at intermittent ratings should not exceed 10% of every minute of operation. *Derated performance values due to a smaller drive link used in the 357/358 series motors.

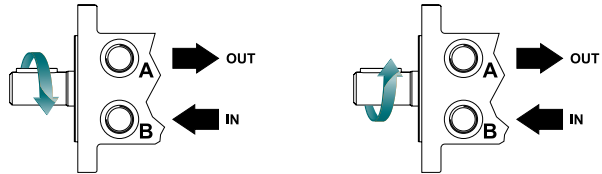


ORDERING INFORMATION



1. CHOOSE SERIES DESIGNATION

- 357** Clockwise Rotation
- 358** Counterclockwise Rotation



The 357 & 358 series are bi-directional. Reversing the inlet hose will reverse shaft rotation.

2. SELECT A DISPLACEMENT OPTION

080	78 cm ³ /rev [4.8 in ³ /rev]	200	202 cm ³ /rev [12.3 in ³ /rev]
100	100 cm ³ /rev [6.1 in ³ /rev]	230	228 cm ³ /rev [13.9 in ³ /rev]
110	112 cm ³ /rev [6.9 in ³ /rev]	320	325 cm ³ /rev [19.8 in ³ /rev]
130	129 cm ³ /rev [7.9 in ³ /rev]	400	399 cm ³ /rev [24.4 in ³ /rev]
160	162 cm ³ /rev [9.9 in ³ /rev]	500	496 cm ³ /rev [30.3 in ³ /rev]

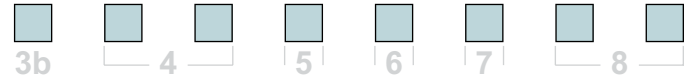
3a. SELECT MOUNT TYPE

- END MOUNT**
 - S2** 4-Hole, 4.00" Pilot Mount
 - SG** 4-Hole, 100mm Pilot Mount
- SIDE MOUNT**
 - S8** 4-Hole, 4.00" Pilot Mount
 - SH** 4-Hole, 100mm Pilot Mount

3b. SELECT PORT SIZE

- END PORT OPTIONS**
 - 1** 7/8-14 UNF Aligned
 - 2** G 1/2 Aligned
- SIDE PORT OPTIONS**
 - 1** 7/8-14 UNF, Offset
 - 2** G 1/2, Offset
 - 3** G 1/2, Offset Manifold
 - 5** 9/16-18 UNF, Offset
 - 9** G 3/8, Offset

The 357 & 358 series using the same porting options as the 355 & 356.



4. SELECT A SHAFT OPTION

- 00** Cardan
- 0B** Cardan

The 00 shaft is used with SG & SH mounts only and the 0B with S2 & S8 mounts only.

5. SELECT A PAINT OPTION

- Z** No Paint

6. SELECT A VALVE CAVITY / CARTRIDGE OPTION

A	None	F	121 bar [1750 psi] Relief
B	Valve Cavity Only	G	138 bar [2000 psi] Relief
C	69 bar [1000 psi] Relief	J	173 bar [2500 psi] Relief
D	86 bar [1250 psi] Relief	L	207 bar [3000 psi] Relief
E	104 bar [1500 psi] Relief		

Valve cavity is only available on side ports 1, 2 and 3.

7. SELECT AN ADD-ON OPTION

- A** Standard

8. SELECT A MISCELLANEOUS OPTION

- AA** None

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