

WS (All Series)

For Medium Duty Applications

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

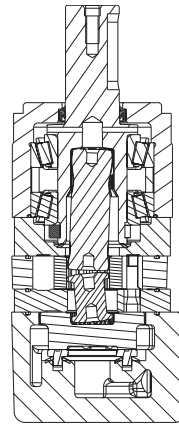
SPECIFICATIONS

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]

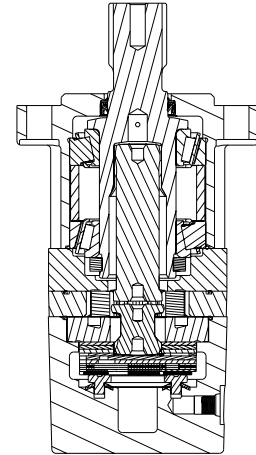
► Performance data is typical. Performance of production units varies slightly from one motor to another. Running at intermittent ratings should not exceed 10% of every minute of operation. * See page 10.121 for allowable back pressure when using the internal drain.

SERIES DESCRIPTIONS

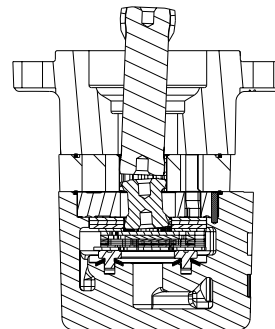
350/351 - Hydraulic Motor
Compact



355/356 - Hydraulic Motor
Standard



357/358 - Hydraulic Motor
Short Motor



WS (All Series) For Medium Duty Applications

DISPLACEMENT PERFORMANCE

		Pressure - bar [psi]								Max. Cont.	Max. Inter.		
080		17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	207 [3000]	242 [3500]	276 [4000]			
80 cm ³ [4.9 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]											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										
19.7 [.776]		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>											
mm [in]		Theoretical Torque - Nm [lb-in]											
		22 [194]	44 [388]	88 [777]	132 [1165]	176 [1553]	219 [1942]	263 [2330]	307 [2718]	351 [3107]			
		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]											

		Pressure - bar [psi]								Max. Cont.	Max. Inter.		
100		17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	207 [3000]	242 [3500]	276 [4000]	310 [4500]		
100 cm ³ [6.1 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]	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											
19.7 [.776]		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>											
mm [in]		Theoretical Torque - Nm [lb-in]											
		27 [243]	55 [485]	110 [971]	165 [1456]	219 [1942]	274 [2427]	329 [2913]	384 [3398]	439 [3883]	494 [4369]	947	
		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. See page 10.03 for additional information on product testing.



WS (All Series) For Medium Duty Applications

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]	38 [334]	86 [757]	132 [1166]										17
	4 [1]	12 [110]	38 [334]	89 [788]	137 [1213]	184 [1624]								34	
	8 [2]	15 [129]	42 [373]	98 [863]	152 [1341]	206 [1823]	255 [2257]	297 [2629]	341 [3015]	377 [3334]	396 [3502]			68	
	15 [4]	15 [134]	43 [378]	97 [863]	152 [1350]	208 [1838]	261 [2314]	314 [2776]	357 [3158]	402 [3558]	438 [3879]			135	
	23 [6]	15 [128]	42 [373]	97 [856]	151 [1337]	206 [1826]	260 [2302]	313 [2770]	359 [3179]	411 [3633]	458 [4054]			203	
	30 [8]	12 [108]	40 [351]	94 [833]	148 [1313]	203 [1798]	258 [2281]	311 [2753]	359 [3177]	413 [3656]	466 [4122]			270	
	38 [10]	9 [80]	36 [322]	91 [803]	145 [1280]	199 [1761]	253 [2236]	307 [2715]	358 [3165]	413 [3652]	468 [4144]			338	
	45 [12]	8 [69]	33 [293]	87 [770]	141 [1247]	194 [1716]	249 [2205]	303 [2684]	353 [3124]	408 [3613]	467 [4133]			405	
	53 [14]	4 [38]	29 [254]	82 [728]	136 [1202]	189 [1676]	243 [2152]	294 [2605]	351 [3108]	407 [3601]	464 [4109]			473	
	61 [16]		24 [210]	78 [687]	131 [1162]	185 [1635]	239 [2114]	290 [2564]	346 [3058]	402 [3553]	462 [4092]			540	
Max. Cont.	68 [18]	18 [163]	72 [639]	126 [1116]	180 [1594]	234 [2068]	286 [2534]	341 [3016]	397 [3515]	458 [4051]			608		
	76 [20]	13 [117]	68 [598]	121 [1068]	174 [1541]	228 [2017]	282 [2494]	336 [2977]	393 [3481]	454 [4017]			675		
	83 [22]		67 [596]	115 [1015]	169 [1500]	221 [1960]	276 [2445]	332 [2942]	388 [3436]	447 [3953]			742		
	91 [24]		62 [549]	109 [967]	164 [1452]	218 [1926]	272 [2403]	326 [2885]	383 [3385]	441 [3906]			810		
	95 [25]		60 [528]	105 [939]	161 [1425]	215 [1901]	270 [2389]	323 [2861]	380 [3361]	439 [3886]			844		
			67 [596]	115 [1015]	169 [1500]	221 [1960]	276 [2445]	332 [2942]	388 [3436]	447 [3953]					
			62 [549]	109 [967]	164 [1452]	218 [1926]	272 [2403]	326 [2885]	383 [3385]	441 [3906]					
			60 [528]	105 [939]	161 [1425]	215 [1901]	270 [2389]	323 [2861]	380 [3361]	439 [3886]					
			67 [596]	115 [1015]	169 [1500]	221 [1960]	276 [2445]	332 [2942]	388 [3436]	447 [3953]					
			62 [549]	109 [967]	164 [1452]	218 [1926]	272 [2403]	326 [2885]	383 [3385]	441 [3906]					
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]	41 [367]	94 [830]										15	
	4 [1]	16 [144]	45 [400]	101 [890]	151 [1334]	201 [1780]	256 [2264]	306 [2706]						30	
	8 [2]	19 [172]	52 [456]	115 [1022]	180 [1592]	235 [2081]	294 [2600]	348 [3084]	402 [3560]	448 [3962]	477 [4219]			59	
	15 [4]	21 [182]	53 [469]	117 [1037]	182 [1609]	246 [2175]	309 [2735]	369 [3265]	424 [3749]	480 [4249]	528 [4671]			118	
	23 [6]	17 [147]	52 [460]	116 [1026]	180 [1591]	244 [2163]	308 [2730]	371 [3285]	427 [3783]	489 [4330]	547 [4837]			177	
	30 [8]	15 [150]	49 [436]	113 [1004]	178 [1571]	242 [2143]	307 [2714]	370 [3276]	426 [3767]	488 [4322]	550 [4866]			236	
	38 [10]	14 [120]	46 [403]	110 [974]	174 [1537]	238 [2109]	303 [2677]	367 [3246]	423 [3741]	486 [4305]	549 [4860]			294	
	45 [12]	10 [86]	42 [367]	106 [935]	169 [1499]	234 [2069]	298 [2633]	362 [3204]	417 [3688]	482 [4264]	547 [4837]			353	
	53 [14]	6 [53]	37 [329]	101 [891]	165 [1458]	229 [2027]	294 [2600]	349 [3092]	414 [3661]	478 [4230]	544 [4818]			412	
	61 [16]		33 [289]	96 [853]	160 [1415]	224 [1979]	287 [2543]	344 [3048]	409 [3620]	474 [4195]	539 [4773]			471	
Max. Cont.	68 [18]		91 [803]	155 [1369]	219 [1934]	282 [2498]	340 [3007]	404 [3571]	469 [4147]	536 [4744]			530		
	76 [20]		85 [753]	148 [1314]	212 [1879]	277 [2447]	335 [2960]	399 [3528]	464 [4108]	533 [4714]			588		
	83 [22]		77 [681]	140 [1242]	204 [1805]	267 [2362]	332 [2938]	397 [3510]	461 [4076]	526 [4651]			647		
	91 [24]		71 [625]	134 [1185]	198 [1751]	261 [2307]	325 [2872]	389 [3442]	453 [4011]	520 [4599]			706		
	95 [25]		68 [601]	131 [1158]	195 [1722]	258 [2285]	322 [2849]	384 [3399]	450 [3986]	519 [4594]			735		
			40 [351]	126 [1116]	180 [1594]	234 [2068]	286 [2534]	341 [3016]	397 [3515]	458 [4051]					
			42 [373]	129 [1141]	183 [1638]	237 [2109]	289 [2564]	344 [3021]	399 [3528]	461 [4076]					
			44 [395]	132 [1166]	186 [1663]	240 [2134]	292 [2589]	347 [3046]	402 [3558]	464 [4109]					
			46 [417]	135 [1191]	189 [1688]	243 [2159]	295 [2614]	350 [3071]	405 [3613]	467 [4133]					
			48 [439]	138 [1216]	192 [1713]	246 [2184]	298 [2639]	353 [3096]	408 [3633]	470 [4158]					
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. See page 10.03 for additional information on product testing.

WS (All Series) For Medium Duty Applications

DISPLACEMENT PERFORMANCE

► Performance data is typical. Performance of production units varies slightly from one motor to another. See page 10.03 for additional information on product testing.

Flow - lpm [gpm]	Pressure - bar [psi]								Max. Cont.		Max. Inter.		Theoretical rpm
	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	207 [3000]	242 [3500]	259 [3750]	276 [4000]			
161 cm ³ [9.8 in ³] / rev													
Intermittent Ratings are below and to the right of the BOLD line. Intermittent Ratings - 10% of Operation													
2 [0.5]	20 [173]	55 [485]	125 [1102]	190 [1679]	255 [2258]							12	
4 [1]	22 [199]	59 [523]	135 [1194]	207 [1831]	274 [2425]	338 [2989]	397 [3511]					24	
8 [2]	32 [283]	63 [554]	144 [1273]	223 [1974]	298 [2635]	368 [3255]	433 [3830]	480 [4251]	504 [4459]	527 [4664]		47	
15 [4]	31 [278]	69 [609]	145 [1287]	228 [2014]	308 [2728]	388 [3416]	460 [4071]	526 [4654]	557 [4931]	583 [5163]		94	
23 [6]	29 [257]	69 [615]	143 [1265]	225 [1990]	306 [2711]	386 [3412]	464 [4108]	535 [4737]	573 [5074]	607 [5370]		140	
30 [8]	26 [226]	66 [583]	138 [1225]	221 [1958]	303 [2678]	383 [3387]	462 [4088]	538 [4761]	578 [5116]	617 [5463]		187	
38 [10]	21 [188]	62 [547]	133 [1180]	216 [1914]	298 [2633]	379 [3353]	458 [4055]	534 [4730]	575 [5085]	616 [5451]		234	
45 [12]	16 [145]	57 [509]	135 [1192]	210 [1861]	292 [2581]	372 [3289]	452 [4000]	530 [4688]	570 [5046]	613 [5423]		280	
53 [14]	11 [97]	51 [455]	133 [1178]	205 [1817]	286 [2530]	365 [3231]	441 [3905]	523 [4627]	563 [4986]	606 [5363]		327	
61 [16]	5 [44]	45 [402]	125 [1110]	199 [1761]	280 [2474]	359 [3173]	436 [3857]	517 [4572]	557 [4934]	599 [5301]		374	
68 [18]		37 [331]	118 [1048]	192 [1697]	272 [2408]	351 [3104]	427 [3779]	508 [4498]	548 [4853]	592 [5240]		420	
76 [20]		30 [265]	111 [980]	183 [1616]	264 [2337]	343 [3036]	419 [3712]	500 [4424]	540 [4777]	584 [5167]		467	
83 [22]		22 [193]	103 [913]	176 [1557]	256 [2264]	335 [2965]	413 [3658]	492 [4358]	533 [4721]	575 [5093]		514	
91 [24]				175 [1553]	246 [2180]	327 [2890]	405 [3587]	484 [4286]	524 [4639]	568 [5027]		560	
95 [25]				163 [1443]	241 [2134]	321 [2843]	400 [3543]	481 [4253]	521 [4611]	561 [4968]		584	
114 [30]				138 [1222]	217 [1917]	296 [2618]	376 [3324]	456 [4034]	495 [4383]	534 [4729]		700	
Rotor Width													
31.8 [1.251]	45 [394]	89 [788]	178 [1576]	267 [2363]	356 [3151]	445 [3939]	534 [4727]	623 [5515]	668 [5909]	712 [6303]			
mm [in]													
Theoretical Torque - Nm [lb-in] Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]													

Flow - lpm [gpm]	Pressure - bar [psi]								Max. Cont.		Max. Inter.		Theoretical rpm
	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	190 [2750]	207 [3000]	242 [3500]	276 [4000]			
200 cm ³ [12.2 in ³] / rev													
Intermittent Ratings are below and to the right of the BOLD line. Intermittent Ratings - 10% of Operation													
2 [0.5]	28 [249]	72 [638]	157 [1388]									10	
4 [1]	33 [291]	81 [713]	170 [1508]	254 [2250]	335 [2961]	411 [3636]	454 [4019]	508 [4498]				19	
8 [2]	39 [343]	85 [757]	185 [1637]	280 [2474]	365 [3232]	446 [3948]	483 [4279]	521 [4609]	568 [5024]			38	
15 [4]	40 [354]	87 [773]	187 [1654]	289 [2554]	388 [3430]	481 [4254]	523 [4627]	564 [4995]	627 [5548]	696 [6156]		76	
23 [6]	38 [334]	89 [789]	184 [1624]	285 [2524]	387 [3425]	486 [4299]	533 [4721]	579 [5128]	654 [5790]	732 [6478]		113	
30 [8]	34 [298]	85 [752]	180 [1593]	281 [2488]	384 [3394]	484 [4285]	534 [4722]	582 [5149]	670 [5931]	755 [6685]		151	
38 [10]	29 [255]	80 [709]	174 [1544]	276 [2446]	378 [3345]	479 [4240]	529 [4683]	576 [5098]	674 [5965]	768 [6793]		188	
45 [12]	22 [197]	74 [651]	168 [1491]	270 [2385]	371 [3284]	473 [4190]	520 [4600]	572 [5064]	670 [5930]	767 [6789]		226	
53 [14]	16 [139]	67 [593]	163 [1439]	263 [2324]	363 [3216]	465 [4111]	513 [4537]	563 [4980]	664 [5880]	764 [6765]		263	
61 [16]	8 [70]	60 [530]	159 [1409]	255 [2260]	355 [3145]	454 [4022]	506 [4477]	557 [4929]	656 [5809]	756 [6688]		301	
68 [18]		50 [446]	153 [1358]	246 [2181]	347 [3067]	447 [3955]	493 [4363]	547 [4838]	648 [5731]	747 [6612]		338	
76 [20]		41 [363]	144 [1277]	237 [2100]	336 [2977]	437 [3868]	487 [4305]	537 [4754]	637 [5639]	740 [6546]		376	
83 [22]		31 [276]	134 [1186]	227 [2007]	326 [2888]	427 [3783]	478 [4230]	527 [4665]	628 [5555]	730 [6463]		413	
91 [24]				216 [1908]	315 [2790]	417 [3693]	467 [4137]	518 [4581]	618 [5466]	723 [6395]		451	
95 [25]				210 [1856]	309 [2737]	413 [3656]	464 [4107]	513 [4543]	614 [5436]	718 [6353]		470	
114 [30]				181 [1598]	281 [2486]	382 [3380]	433 [3831]	482 [4267]	580 [5136]	689 [6100]		563	
Rotor Width													
39.4 [1.552]	55 [490]	111 [980]	221 [1959]	332 [2939]	443 [3918]	553 [4898]	609 [5388]	664 [5878]	775 [6857]	886 [7837]			
mm [in]													
Theoretical Torque - Nm [lb-in] Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]													



WS (All Series)

For Medium Duty Applications

DISPLACEMENT PERFORMANCE

► Performance data is typical. Performance of production units varies slightly from one motor to another. See page 10.03 for additional information on product testing.

		Pressure - bar [psi]										Max. Cont.		Max. Inter.	
230		17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	190 [2750]	207 [3000]	242 [3500]	276 [4000]				
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]	90 [798]	189 [1673]											
	4 [1]	49 [435]	97 [856]	199 [1764]	293 [2592]	391 [3457]	483 [4272]	530 [4692]	576 [5094]						
	8 [2]	43 [378]	100 [889]	212 [1878]	316 [2798]	414 [3664]	507 [4491]	552 [4881]	596 [5271]						
	15 [4]	49 [433]	100 [884]	217 [1918]	333 [2943]	442 [3909]	542 [4801]	589 [5215]	642 [5685]	724 [6407]	806 [7135]				
	23 [6]	45 [402]	97 [861]	214 [1897]	331 [2929]	446 [3950]	556 [4925]	609 [5393]	651 [5762]	747 [6610]	833 [7371]				
	30 [8]	41 [360]	98 [871]	209 [1852]	327 [2896]	444 [3928]	557 [4933]	607 [5370]	662 [5863]	766 [6781]	858 [7595]				
	38 [10]	34 [302]	94 [829]	204 [1804]	321 [2841]	439 [3881]	550 [4868]	608 [5380]	665 [5882]	775 [6857]	875 [7743]				
	45 [12]	27 [235]	86 [763]	196 [1734]	313 [2772]	431 [3815]	545 [4819]	603 [5334]	660 [5837]	772 [6829]	882 [7803]				
	53 [14]	19 [167]	78 [690]	188 [1660]	305 [2698]	422 [3734]	538 [4757]	595 [5269]	653 [5778]	766 [6781]	878 [7772]				
	61 [16]	11 [100]	69 [612]	178 [1576]	295 [2614]	413 [3657]	528 [4677]	586 [5188]	644 [5697]	700 [6198]	815 [7214]				
	68 [18]		60 [527]	168 [1487]	286 [2514]	402 [3559]	519 [4592]	577 [5106]	634 [5611]	748 [6617]	862 [7632]				
	76 [20]		49 [430]	155 [1375]	272 [2408]	391 [3457]	506 [4482]	565 [5001]	623 [5514]	739 [6537]	850 [7525]				
	83 [22]		40 [352]	149 [1319]	262 [2321]	379 [3357]	495 [4382]	553 [4894]	611 [5409]	724 [6409]	839 [7423]				
	91 [24]		30 [268]	138 [1220]	251 [2217]	368 [3253]	482 [4268]	540 [4781]	598 [5295]	713 [6309]	829 [7333]				
95 [25]			131 [1161]	245 [2167]	362 [3202]	478 [4227]	537 [4755]	592 [5237]	708 [6263]	823 [7283]					
114 [30]			92 [816]	208 [1837]	325 [2876]	442 [3908]	499 [4419]	557 [4928]	617 [5942]	790 [6991]					
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]													

		Pressure - bar [psi]										Max. Cont.		Max. Inter.	
320		17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]	224 [3250]				
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]	135 [1196]	272 [2406]	398 [3524]										
	4 [1]	67 [595]	146 [1291]	290 [2568]	425 [3764]	558 [4937]	623 [5514]	689 [6101]	746 [6599]						
	8 [2]	67 [597]	150 [1328]	311 [2751]	461 [4083]	596 [5277]	659 [5834]	723 [6396]	788 [6977]	849 [7510]					
	15 [4]	64 [565]	147 [1299]	312 [2761]	474 [4197]	627 [5547]	698 [6173]	762 [6747]	821 [7261]	880 [7785]	942 [8337]				
	23 [6]	77 [677]	154 [1367]	320 [2834]	484 [4283]	642 [5679]	717 [6347]	791 [7004]	853 [7548]	917 [8116]	977 [8646]				
	30 [8]	72 [641]	147 [1299]	313 [2766]	477 [4221]	637 [5640]	715 [6329]	786 [6959]	861 [7617]	937 [8236]	996 [8816]				
	38 [10]	64 [566]	137 [1217]	303 [2683]	468 [4142]	629 [5568]	705 [6241]	784 [6935]	859 [7603]	934 [8265]	1005 [8895]				
	45 [12]	53 [473]	131 [1155]	292 [2587]	458 [4049]	619 [5479]	695 [6151]	774 [6850]	850 [7523]	926 [8197]	1001 [8861]				
	53 [14]	30 [262]	122 [1076]	281 [2483]	446 [3943]	606 [5367]	687 [6078]	764 [6764]	840 [7434]	915 [8099]	990 [8761]				
	61 [16]	18 [161]	112 [994]	267 [2359]	431 [3818]	594 [5253]	674 [5966]	753 [6660]	824 [7290]						
	68 [18]	18 [160]	113 [997]	265 [2344]	430 [3805]	593 [5244]	673 [5953]	751 [6649]	811 [7178]						
	76 [20]	3 [25]	97 [863]	248 [2198]	415 [3673]	578 [5114]	658 [5821]	736 [6515]	797 [7052]						
	83 [22]		84 [747]	236 [2091]	400 [3540]	562 [4973]	641 [5676]	720 [6368]	781 [6913]						
	91 [24]		75 [667]	215 [1900]	380 [3365]	543 [4804]	623 [5510]	701 [6202]	763 [6756]						
95 [25]		70 [616]	207 [1828]	370 [3272]	533 [4716]	613 [5423]	698 [6175]	758 [6711]							
114 [30]			153 [1353]	315 [2789]	478 [4230]	559 [4943]	639 [5653]	704 [6233]							
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]													



WS (All Series)

For Medium Duty Applications

DISPLACEMENT PERFORMANCE

► Performance data is typical. Performance of production units varies slightly from one motor to another. See page 10.03 for additional information on product testing.

		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 cm ³ [25.0 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]	81 [717]	173 [1534]	356 [3148]								Theoretical lpm
	4 [1]	85 [752]	181 [1605]	369 [3263]	460 [4074]	550 [4865]	638 [5648]	724 [6404]	816 [7222]			
	8 [2]	86 [762]	187 [1654]	387 [3422]	483 [4274]	575 [5090]	662 [5861]	747 [6613]	826 [7310]			
	15 [4]	82 [724]	185 [1635]	391 [3460]	493 [4361]	592 [5240]	688 [6086]	776 [6871]	866 [7667]	942 [8337]		
	23 [6]	75 [663]	178 [1573]	383 [3393]	486 [4301]	588 [5201]	686 [6074]	783 [6926]	876 [7750]	963 [8524]	1056 [9345]	
	30 [8]	66 [585]	168 [1490]	374 [3306]	476 [4216]	578 [5119]	679 [6007]	776 [6868]	872 [7716]	966 [8545]	1055 [9341]	
	38 [10]	76 [668]	175 [1565]	373 [3294]	472 [4216]	575 [5119]	676 [6007]	773 [6868]	869 [7716]	963 [8524]	1056 [9345]	
	45 [12]	154 [1365]	361 [3197]	464 [4110]	567 [5015]	664 [5880]	764 [6764]	862 [7626]	956 [8463]	1050 [9289]		
	53 [14]	140 [1237]	346 [3066]	450 [3978]	551 [4880]	649 [5744]	750 [6638]	848 [7503]	945 [8361]	1039 [9195]		
	61 [16]	125 [1104]	330 [2924]	434 [3838]	536 [4745]	634 [5609]	735 [6504]	833 [7369]	929 [8217]	1024 [9058]		
	68 [18]	106 [934]	311 [2755]	415 [3672]	518 [4580]	617 [5456]	718 [6357]	817 [7228]	913 [8079]	1007 [8913]		
	76 [20]	291 [2578]	378 [3349]	498 [4405]	597 [5279]	699 [6185]	798 [7065]	896 [7931]	991 [8774]			
	83 [22]	269 [2379]	371 [3286]	475 [4205]	575 [5084]	678 [5997]	777 [6879]	876 [7754]	972 [8606]			
	91 [24]	246 [2174]	348 [3076]	451 [3987]	555 [4911]	654 [5789]	754 [6671]	852 [7543]	951 [8413]			
99 [26]	226 [2000]	322 [2850]	424 [3756]	528 [4668]	629 [5571]	728 [6446]	828 [7332]	926 [8197]				
114 [30]	197 [1739]	294 [2600]	397 [3515]	500 [4421]	602 [5323]	702 [6214]	801 [7093]	900 [7963]				
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
63.5 [2.501] mm [in]		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 cm ³ [31.0 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]	94 [832]	210 [1861]	323 [2859]	435 [3853]						Theoretical lpm
	4 [1]	98 [868]	197 [1743]	314 [2781]	430 [3802]	542 [4797]	652 [5766]	777 [6876]			
	8 [2]	100 [882]	205 [1812]	328 [2905]	447 [3959]	565 [5001]	677 [5990]	780 [6900]	879 [7779]		
	15 [4]	95 [843]	204 [1803]	332 [2938]	460 [4070]	584 [5170]	703 [6225]	815 [7212]	917 [8118]	1012 [8956]	
	23 [6]	89 [783]	196 [1737]	324 [2869]	453 [4009]	580 [5133]	705 [6237]	824 [7296]	930 [8234]	1033 [9141]	
	30 [8]	79 [696]	185 [1639]	314 [2778]	443 [3918]	570 [5047]	696 [6161]	814 [7205]	930 [8231]	1041 [9210]	
	38 [10]	68 [600]	172 [1523]	300 [2652]	429 [3800]	557 [4929]	684 [6052]	805 [7123]	924 [8175]	1037 [9175]	
	45 [12]	177 [1568]	262 [2318]	410 [3624]	519 [4593]	644 [5696]	770 [6811]	891 [7885]	1008 [8916]		
	53 [14]	157 [1389]	286 [2533]	415 [3673]	544 [4810]	669 [5918]	794 [7027]	914 [8092]	1031 [9122]		
	61 [16]	138 [1219]	265 [2347]	394 [3486]	523 [4630]	649 [5740]	775 [6861]	897 [7936]	1013 [8968]		
	68 [18]	114 [1004]	243 [2147]	370 [3277]	500 [4424]	626 [5536]	752 [6659]	876 [7753]	995 [8806]		
	76 [20]	96 [849]	217 [1919]	344 [3047]	473 [4190]	600 [5311]	728 [6446]	852 [7537]	972 [8606]		
	83 [22]	78 [688]	154 [1360]	276 [2439]	406 [3595]	534 [4724]	660 [5839]	784 [6938]	907 [8028]		
	91 [24]	160 [1416]	268 [2371]	397 [3512]	524 [4633]	650 [5755]	776 [6863]	898 [7950]			
99 [26]	129 [1138]	231 [2048]	321 [2844]	451 [3988]	576 [5097]	703 [6218]	827 [7320]				
114 [30]	186 [1647]	229 [2048]	383 [3387]	508 [4494]	636 [5631]	761 [6738]					
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>									
78.9 [3.105] mm [in]		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]									

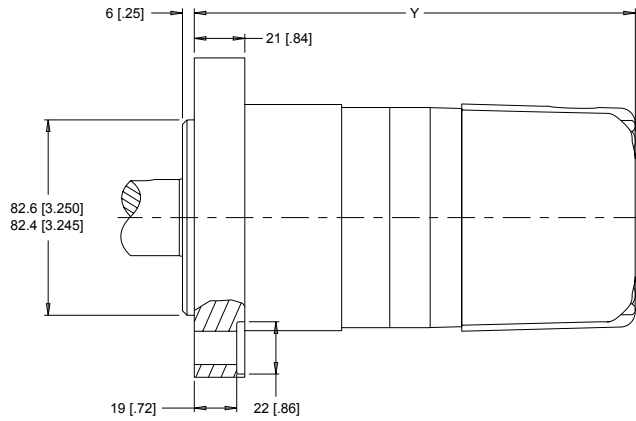
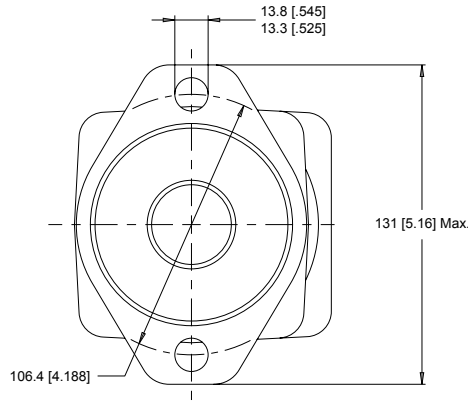
WS (350/351 Series) Medium Duty Hydraulic Motor

HOUSINGS

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

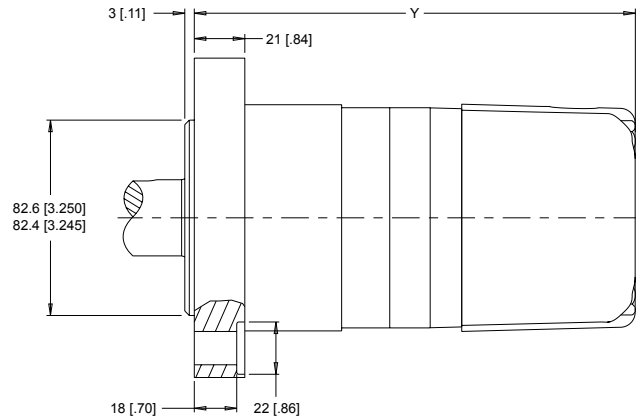
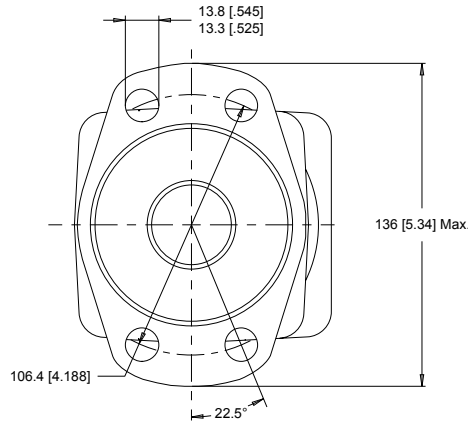
2-HOLE, SAE A MOUNT

A0 End Ports **A7** Side Ports



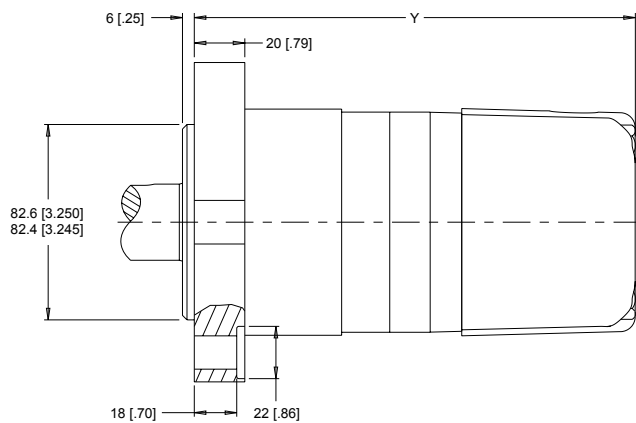
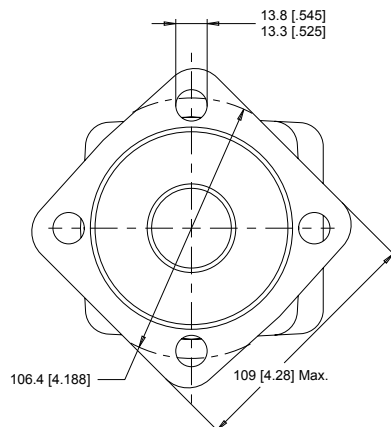
4-HOLE, MAGNETO MOUNT

A2 End Ports **A8** Side Ports



4-HOLE, SAE A MOUNT

AG End Ports **AH** Side Ports



► Dimension Y is charted on page 10.72. Porting options listed on pages 10.73-10.74.

WS Series

Medium Duty Hydraulic Motor



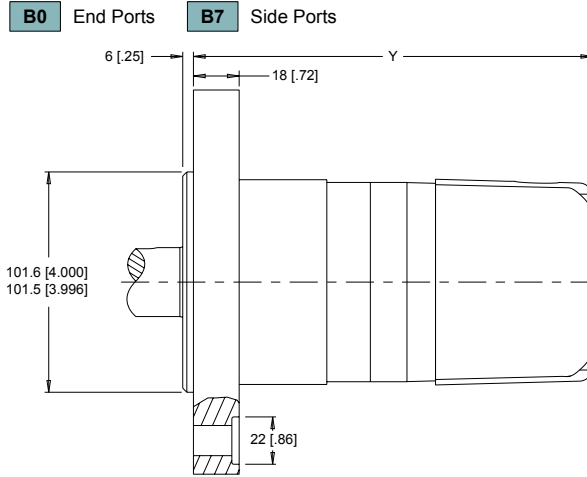
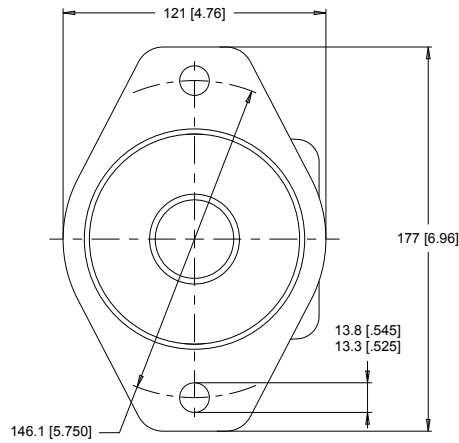
WS (350/351 Series)

Medium Duty Hydraulic Motor

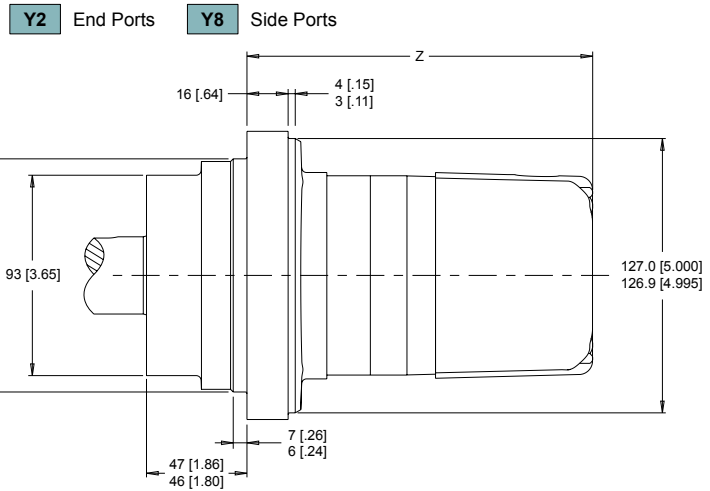
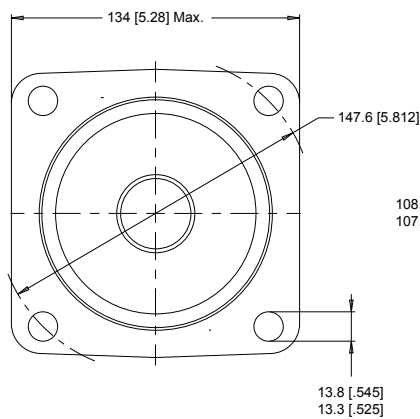
HOUSINGS

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [0.005].

2-HOLE, SAE B MOUNT



4-HOLE, 4.25" WHEEL MOUNT



► Dimensions Y & Z are charted on page 10.72. Porting options listed on pages 10.73-10.74.

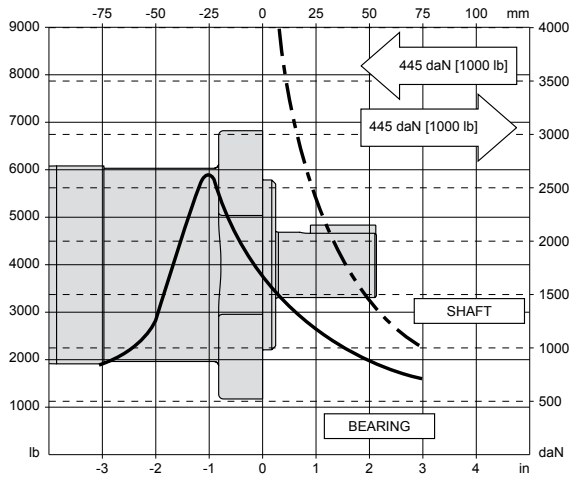
WS (350/351 Series) Medium Duty Hydraulic Motor

TECHNICAL INFORMATION

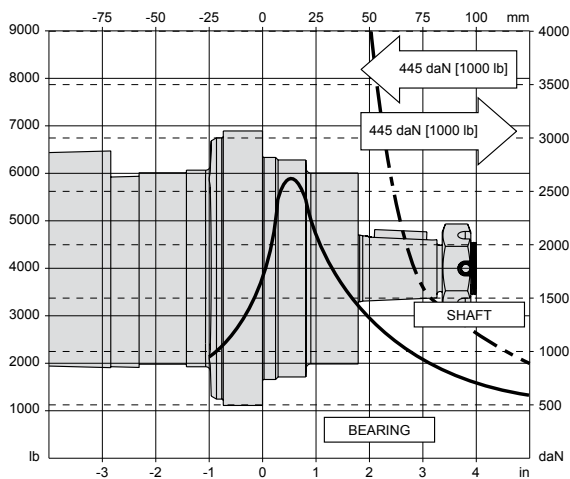
ALLOWABLE SHAFT LOAD / BEARING CURVE

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*. Radial loads for speeds other than 100 rpm may be calculated using the multiplication factor table below.

SAE A, SAE B & MAGNETO MOUNTS



4.25" WHEEL MOUNT



* 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].

► Permissible shaft seal pressure information is found on page 10.158.

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 10.70 & 10.71.

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 10.71.

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 \pm 1kg [2 lb] depending on model configurations such as housing, shaft, endcover, options etc.

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		

WS Series

Medium Duty Hydraulic Motor



WS (350/351 Series) Medium Duty Hydraulic Motor

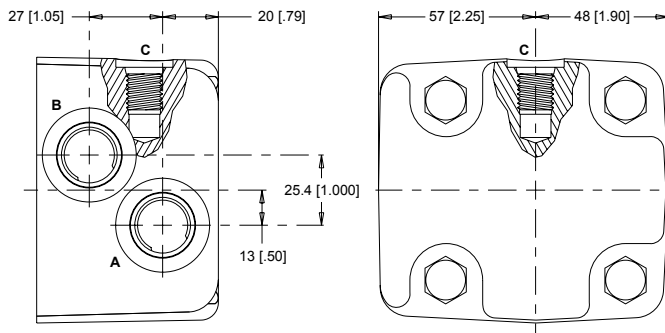
PORTING

SIDE PORTED - OFFSET

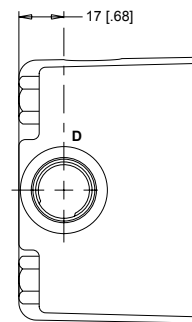
1 Main Ports **A, B:** 7/8-14 UNF
Drain Port **C:** 7/16-20 UNF

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

STANDARD



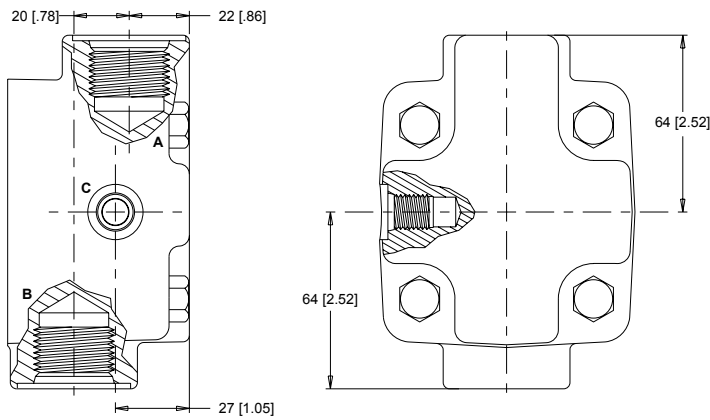
OPTIONAL



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

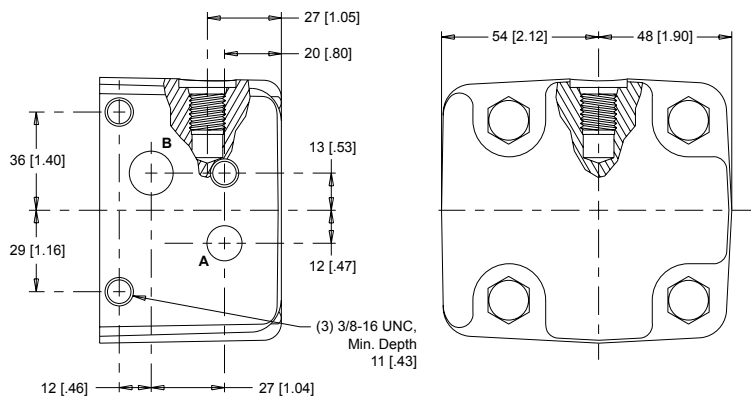
SIDE PORTED - 180° OPPOSED

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



WS (350/351 Series)

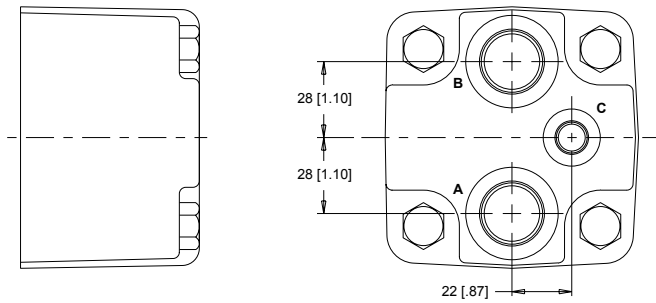
Medium Duty Hydraulic Motor

PORTING

END PORTED - ALIGNED

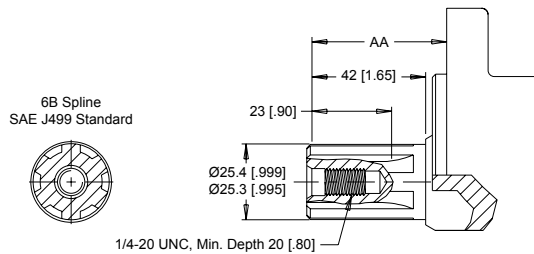
1 Main Ports **A, B:** 7/8-14 UNF
Drain Port **C:** 7/16-20 UNF

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



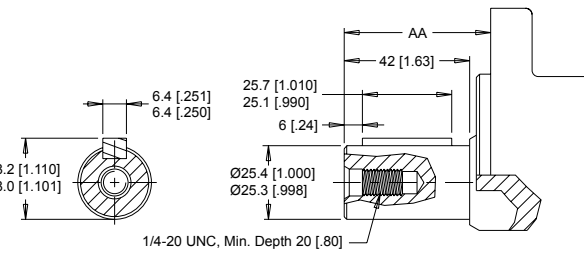
SHAFTS

02 1" 6B Spline



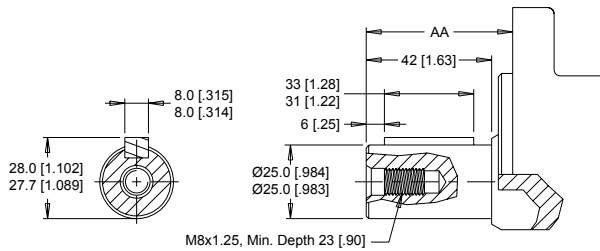
Max. Torque: 678 Nm [6000 lb-in]

10 1" Straight



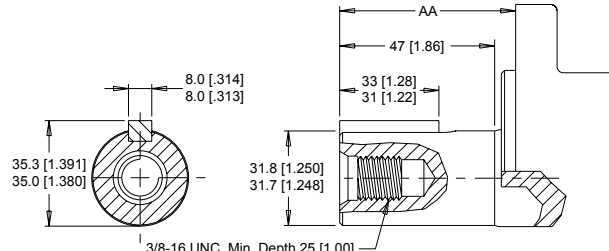
Max. Torque: 655 Nm [5800 lb-in]

12 25mm Straight



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

20 1-1/4" Straight



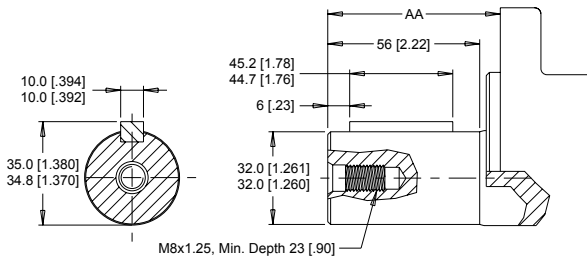
Max. Torque: 881 Nm [7800 lb-in]

► Dimension AA is charted on page 10.75.

WS (350/351 Series) Medium Duty Hydraulic Motor

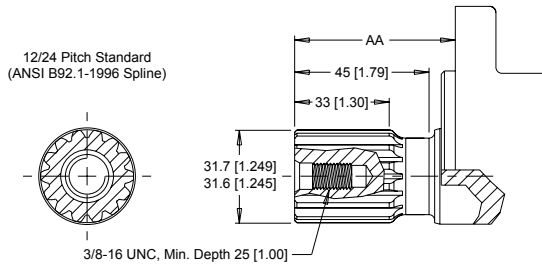
SHAFTS

21 32mm Straight



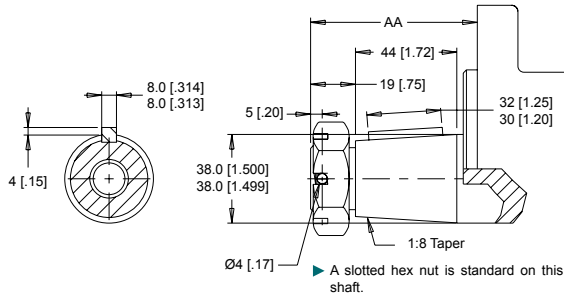
Max. Torque: 881 Nm [7800 lb-in]

23 14 Tooth Spline



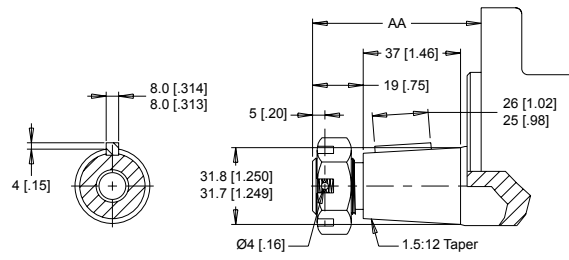
Max. Torque: 881 Nm [7800 lb-in]

31 1-1/2" Tapered



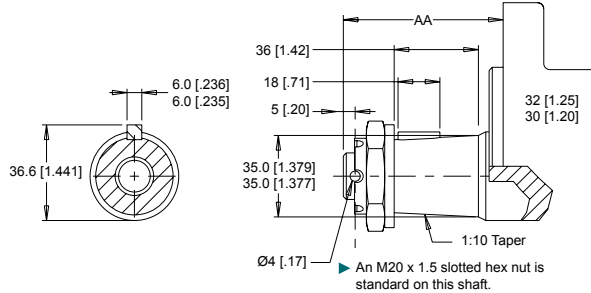
Max. Torque: 881 Nm [7800 lb-in]

22 1-1/4" Tapered



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

28 35mm Tapered



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

MOUNTING / SHAFT LENGTH CHART

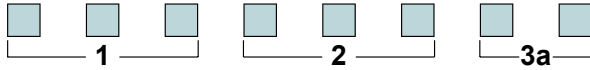
Dimension AA is the overall distance from the motor mounting surface to the end of the shaft and is referenced on detailed shaft drawings above as well as shafts on page 10.153.

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 [0.030 in.]

WS (350/351 Series) Medium Duty Hydraulic Motor

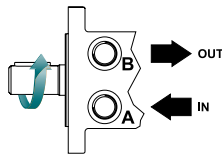
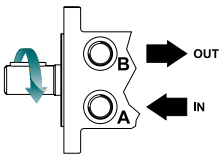
ORDERING INFORMATION



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 cm³/rev [4.8 in³/rev]

100 100 cm³/rev [6.1 in³/rev]

110 112 cm³/rev [6.9 in³/rev]

130 129 cm³/rev [7.9 in³/rev]

160 162 cm³/rev [9.9 in³/rev]

200 202 cm³/rev [12.3 in³/rev]

230 228 cm³/rev [13.9 in³/rev]

320 325 cm³/rev [19.8 in³/rev]

400 399 cm³/rev [24.4 in³/rev]

500 496 cm³/rev [30.3 in³/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

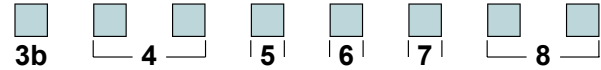
▼ SIDE PORT OPTIONS

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

10 1" Straight

12 25mm Straight

20 1-1/4" Straight

21 32mm Straight

22 1-1/4" Tapered

23 14 Tooth Spline

28 35mm Tapered

31 1-1/2" Tapered

► 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

B Valve Cavity Only

C 69 bar [1000 psi] Relief

D 86 bar [1250 psi] Relief

E 104 bar [1500 psi] Relief

F 121 bar [1750 psi] Relief

G 138 bar [2000 psi] Relief

J 173 bar [2500 psi] Relief

L 207 bar [3000 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]

WS Series

Medium Duty Hydraulic Motor



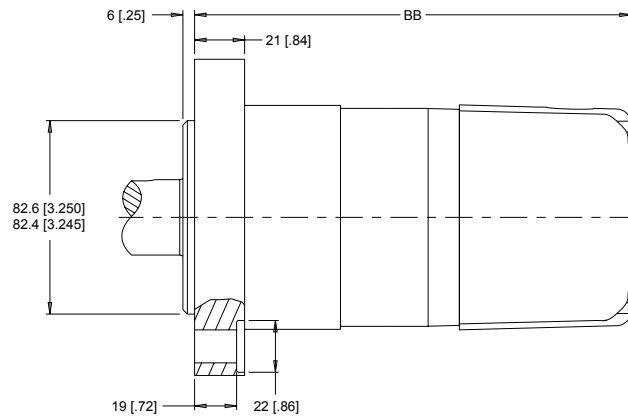
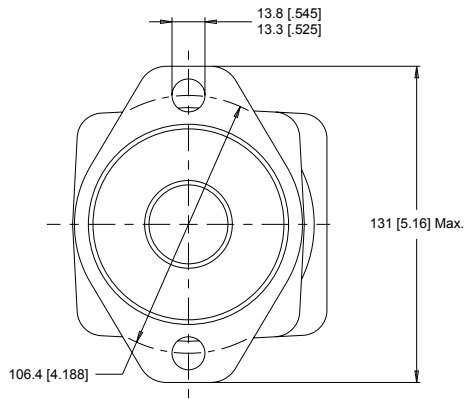
WS (355/356 Series) Medium Duty Hydraulic Motor

HOUSINGS

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

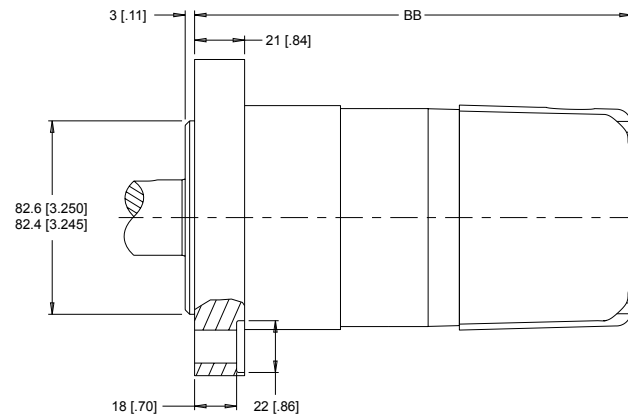
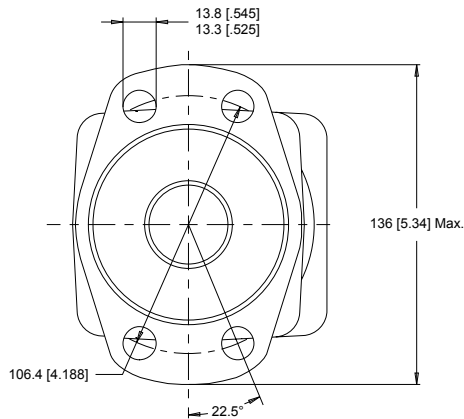
2-HOLE, SAE A MOUNT

A0 End Ports **A7** Side Ports



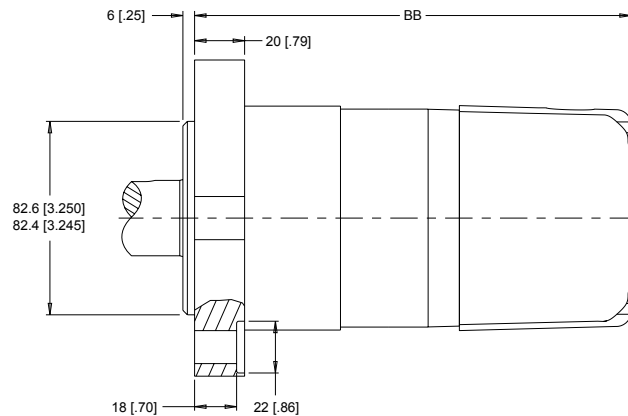
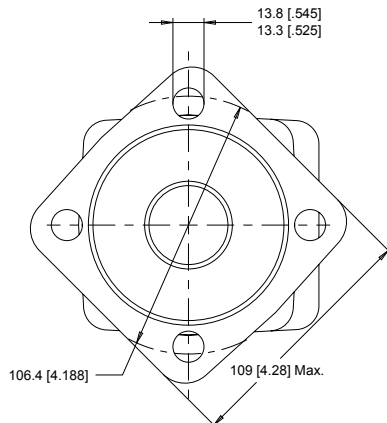
4-HOLE, MAGNETO MOUNT

A2 End Ports **A8** Side Ports



4-HOLE, SAE A MOUNT

AG End Ports **AH** Side Ports



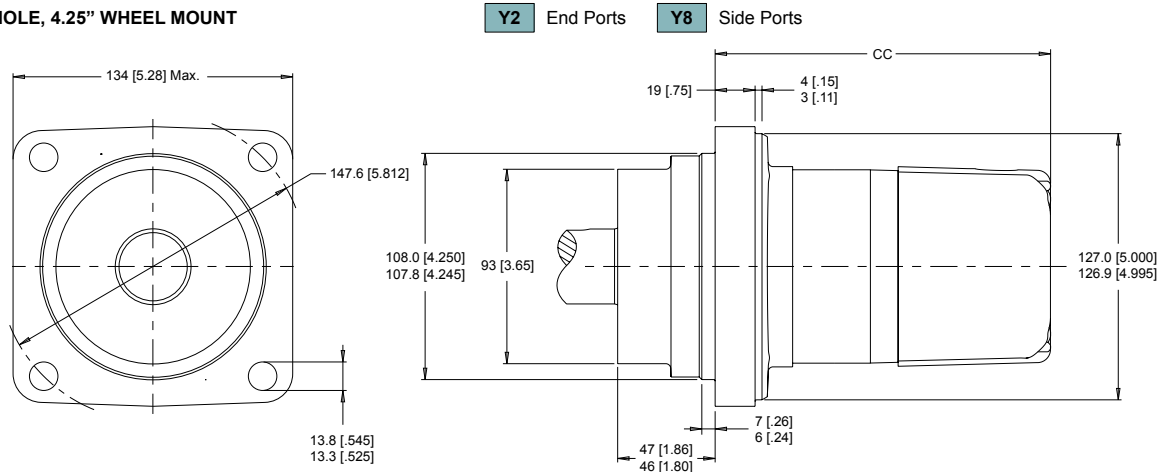
► Dimension BB is charted on page 10.157. Porting options listed on pages 10.78.

WS (355/356 Series) Medium Duty Hydraulic Motor

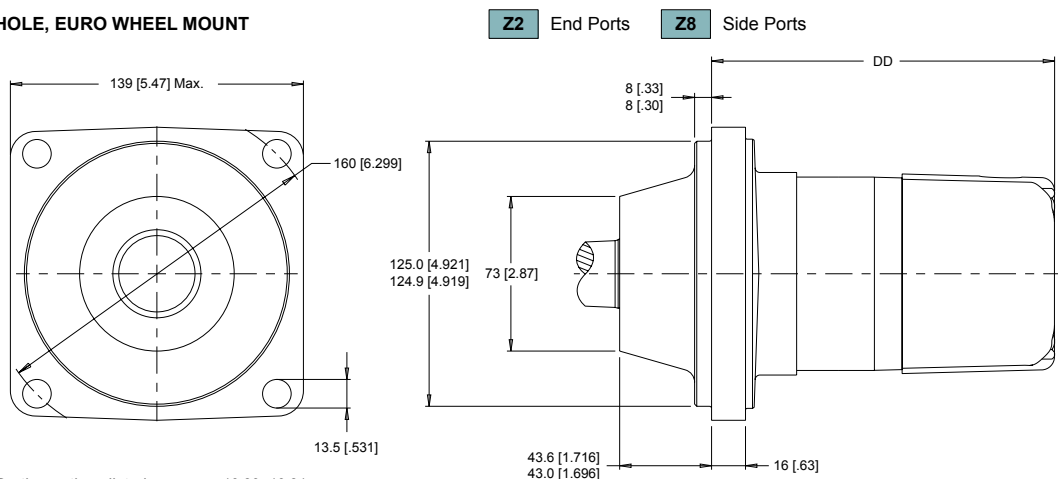
HOUSINGS

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [0.005].

4-HOLE, 4.25" WHEEL MOUNT



4-HOLE, EURO WHEEL MOUNT



► Porting options listed on pages 10.80 -10.81.

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 10.77.

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.

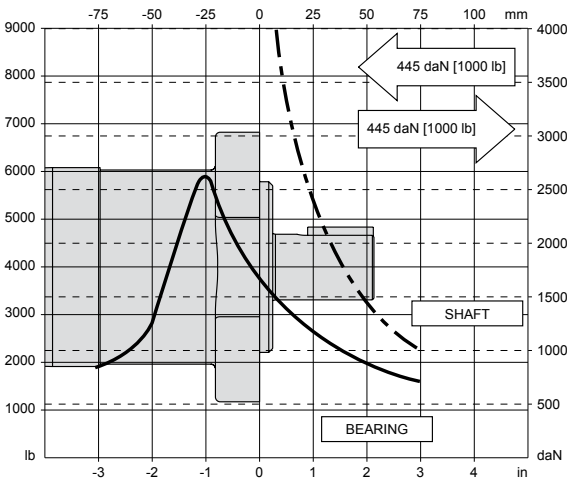
WS (355/356 Series)
Medium Duty Hydraulic Motor

TECHNICAL INFORMATION

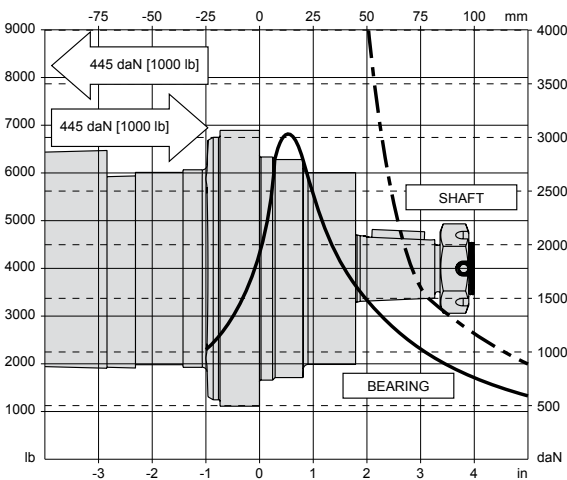
ALLOWABLE SHAFT LOAD / BEARING CURVE

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 10.114). Radial loads for speeds other than 100 rpm may be calculated using the multiplication factor table on page 10.04.

SAE A & MAGNETO MOUNTS

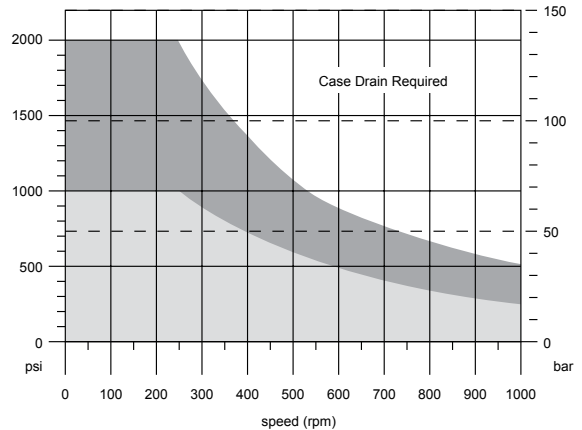


WHEEL MOUNTS



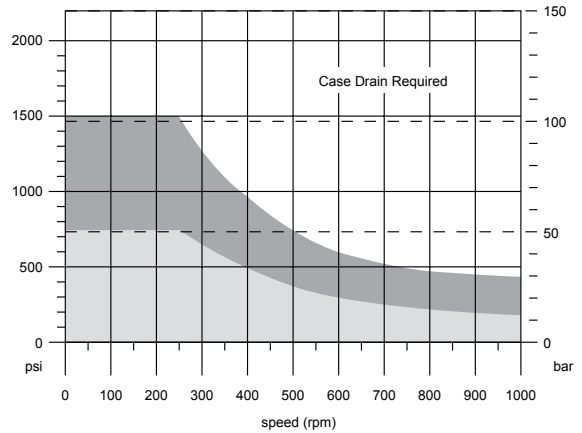
PERMISSIBLE SHAFT SEAL PRESSURE

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



■ Intermittent - Case Drain Optional ■ Continuous - Case Drain Optional

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



■ Intermittent - Case Drain Optional ■ Continuous - Case Drain Optional

WS (355/356 Series) Medium Duty Hydraulic Motor

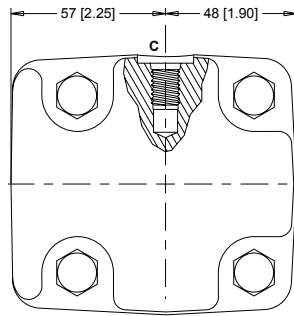
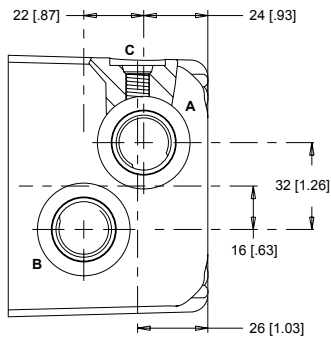
PORTING

SIDE PORTED - OFFSET

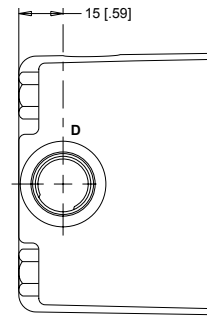
1 Main Ports **A, B:** 7/8-14 UNF
Drain Port **C:** 7/16-20 UNF

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

STANDARD



OPTIONAL

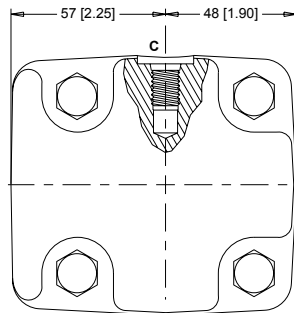
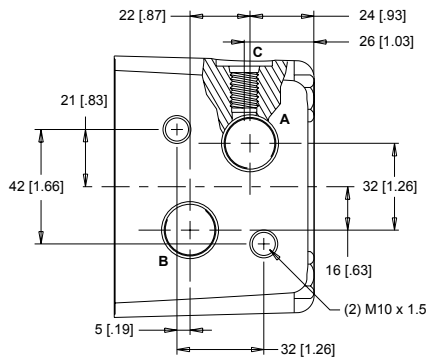


D: 10 Series/2-Way Valve Cavity 7/8-14 UNF

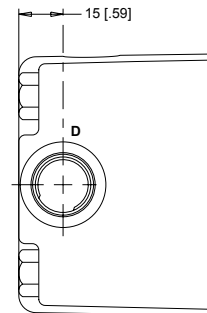
SIDE PORTED - OFFSET MANIFOLD

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

STANDARD



OPTIONAL

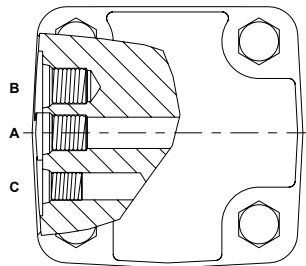
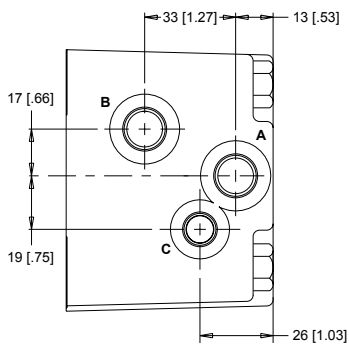


D: 10 Series/2-Way Valve Cavity 7/8-14 UNF

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



WS Series

Medium Duty Hydraulic Motor



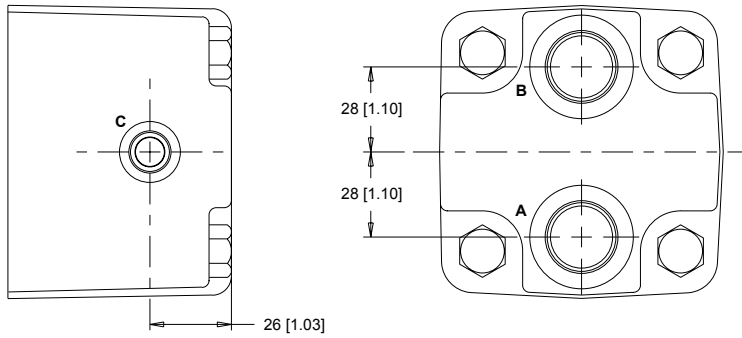
WS (355/356 Series) Medium Duty Hydraulic Motor

PORTING

END PORTED - ALIGNED

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

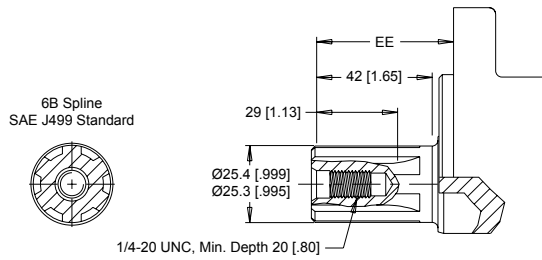
2 Main Ports **A, B:** G 1/2
Drain Port **C:** G 1/4



WS (355/356 Series) Medium Duty Hydraulic Motor

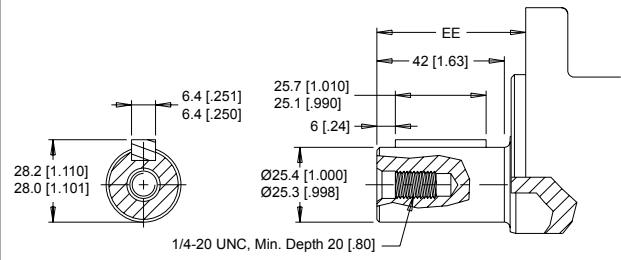
SHAFTS

02 1" 6B Spline



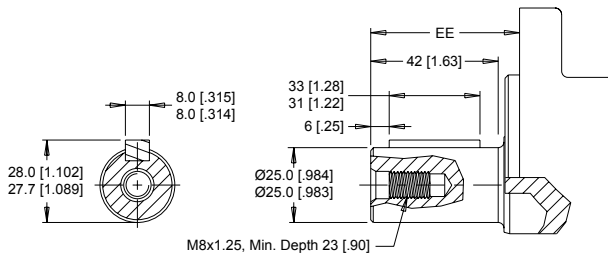
Max. Torque: 678 Nm [6000 lb-in]

10 1" Straight



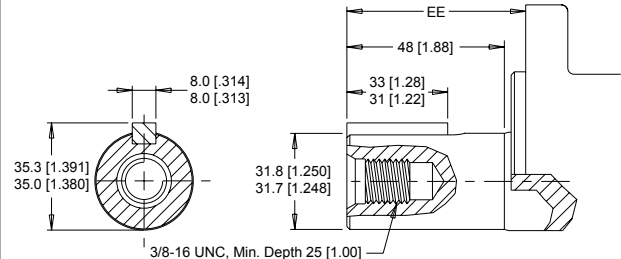
Max. Torque: 655 Nm [5800 lb-in]

12 25mm Straight



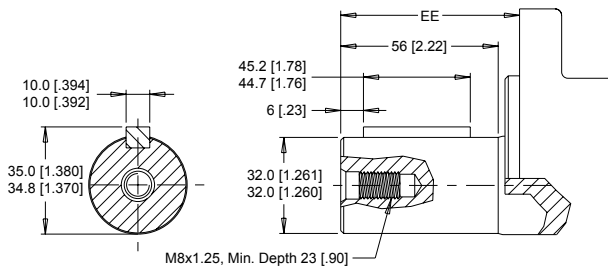
Max. Torque: 678 Nm [6000 lb-in]

20 1-1/4" Straight



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

21 32mm Straight



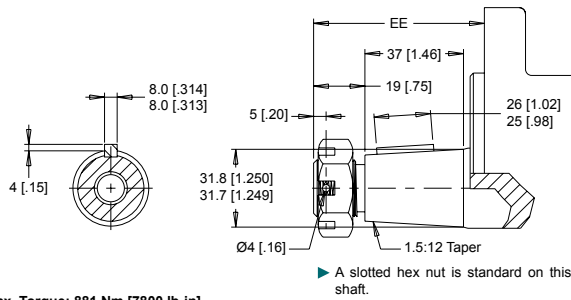
Max. Torque: 881 Nm [7800 lb-in]

► Dimension EE is charted on page 10.83.

WS (355/356 Series) Medium Duty Hydraulic Motor

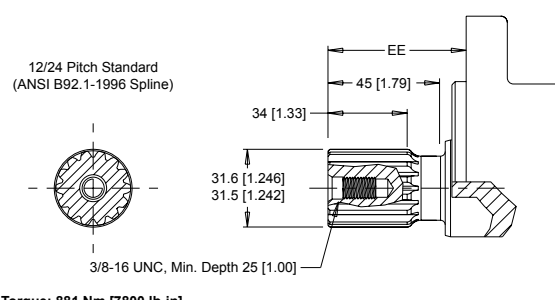
SHAFTS

22 1-1/4" Tapered

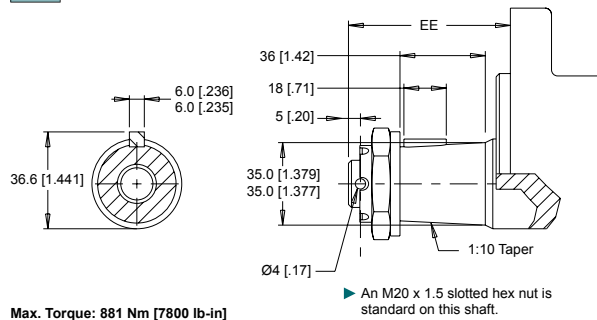


Max. Torque: 881 Nm [7800 lb-in]

23 14 Tooth Spline

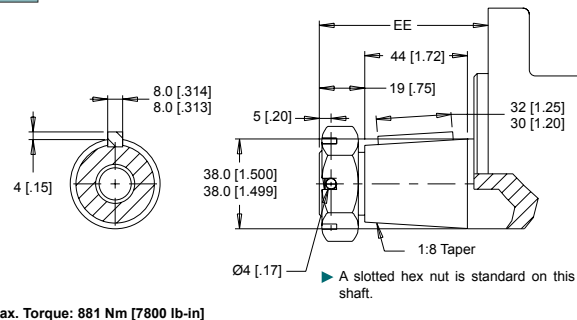


28 35mm Tapered



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 10.82.

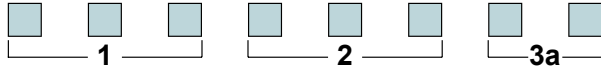
EE	SAE A* Mounts	Euro Wheel Mounts	4.25" Wheel Mounts
#	mm [in]	mm [in]	mm [in]
02	51 [2.00]	88 [3.45]	91 [3.58]
10	51 [2.00]	88 [3.45]	91 [3.58]
12	51 [2.00]	88 [3.45]	91 [3.58]
20	55 [2.18]	92 [3.63]	96 [3.76]
21	65 [2.54]	101 [3.99]	105 [4.12]
22	64 [2.51]	101 [3.96]	104 [4.09]
23	55 [2.18]	92 [3.63]	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.]

WS (355/356 Series)

Medium Duty Hydraulic Motor

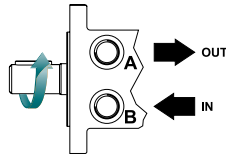
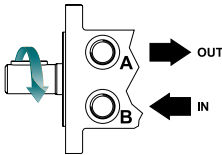
ORDERING INFORMATION



1. CHOOSE SERIES DESIGNATION

355 Clockwise Rotation

356 Counterclockwise Rotation



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

2. SELECT A DISPLACEMENT OPTION

080 78 cm³/rev [4.8 in³/rev]

100 100 cm³/rev [6.1 in³/rev]

110 112 cm³/rev [6.9 in³/rev]

130 129 cm³/rev [7.9 in³/rev]

160 162 cm³/rev [9.9 in³/rev]

200 202 cm³/rev [12.3 in³/rev]

230 228 cm³/rev [13.9 in³/rev]

320 325 cm³/rev [19.8 in³/rev]

400 399 cm³/rev [24.4 in³/rev]

500 496 cm³/rev [30.3 in³/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

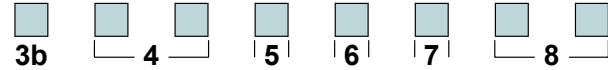
1 7/8-14 UNF, Offset

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

10 1" Straight

12 25mm Straight

20 1-1/4" Straight

21 32mm Straight

22 1-1/4" Tapered

23 14 Tooth Spline

28 35mm Tapered

31 1-1/2" Tapered

► 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

B Valve Cavity Only

C 69 bar [1000 psi] Relief

D 86 bar [1250 psi] Relief

E 104 bar [1500 psi] Relief

F 121 bar [1750 psi] Relief

G 138 bar [2000 psi] Relief

J 173 bar [2500 psi] Relief

L 207 bar [3000 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°

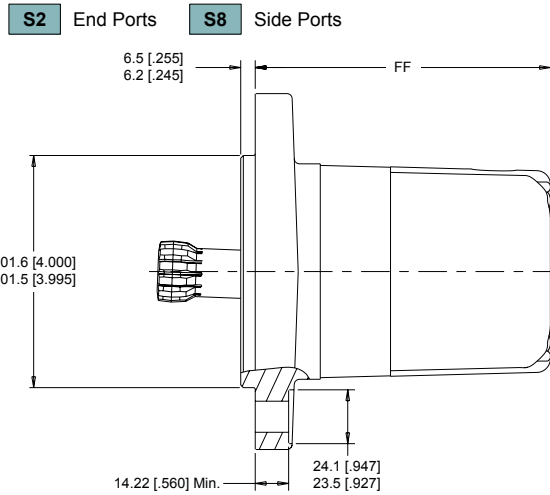
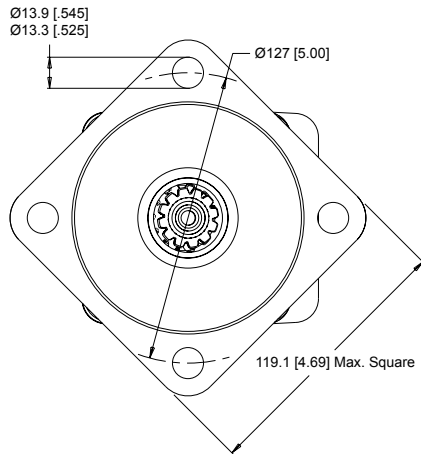
MB Freeturning Rotor With Mounting Rotated 90°

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

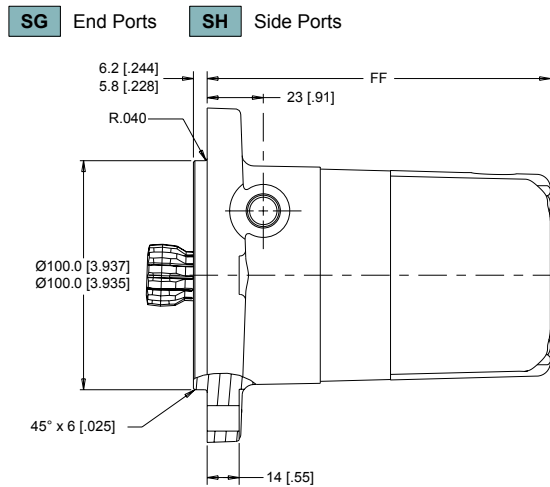
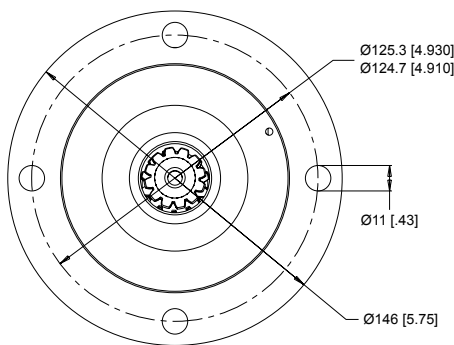
WS (357/358 Series) Medium Duty Hydraulic Short Motor

HOUSINGS

4-HOLE, 4.00" PILOT MOUNT



4-HOLE, 100mm PILOT MOUNT



► Porting options listed on pages 10.115-10.116.

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.

► 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].

FF #	4.00" Pilot Mounts mm [in]	100mm Pilot Mounts mm [in]	Weight* 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]

WS (357/358 Series)

Medium Duty Hydraulic Short Motor

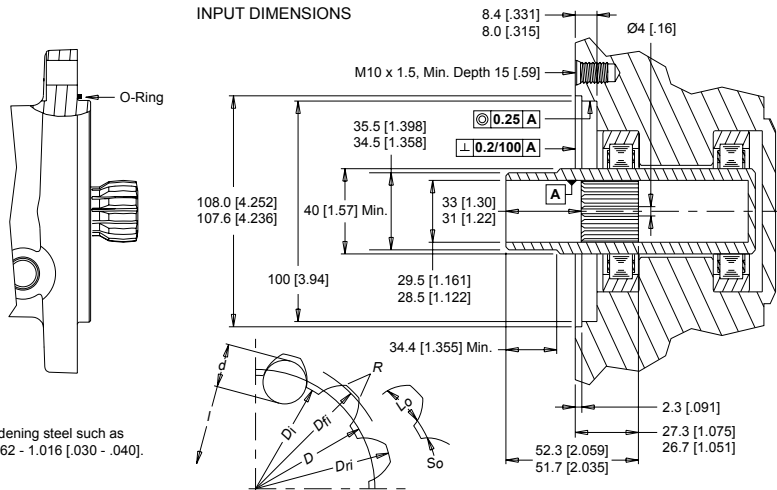
SHAFTS

00 Cardan (For Use With SG & SH Mounts)

Fillet Root Side Fit	
Number of Teeth	12
Pitch	12/24
Pressure Angle	30°
Pitch Diameter <i>D</i>	25.4 [1.000]
Major Diameter <i>D_{ri}</i>	28.0 [1.10] - 27.9 [1.096]
Form Diameter (Min.) <i>D_{fi}</i>	27.6 [1.09]
Minor Diameter <i>D_j</i>	23.033 [9068] - 23.0 [9055]
Space Width (Circular) <i>L_o</i> *	4.328 [1704] - 4.288 [1688]
Tooth Thickness (Circular) <i>S_o</i>	2.341 [09217]
Fillet Radius <i>R</i> min	0.2 [008]
Max. Distance Between Pins <i>l</i>	17.77 [700] - 17.62 [694]
Pin Diameter <i>d</i>	4.836 [19034] - 4.834 [19026]

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.

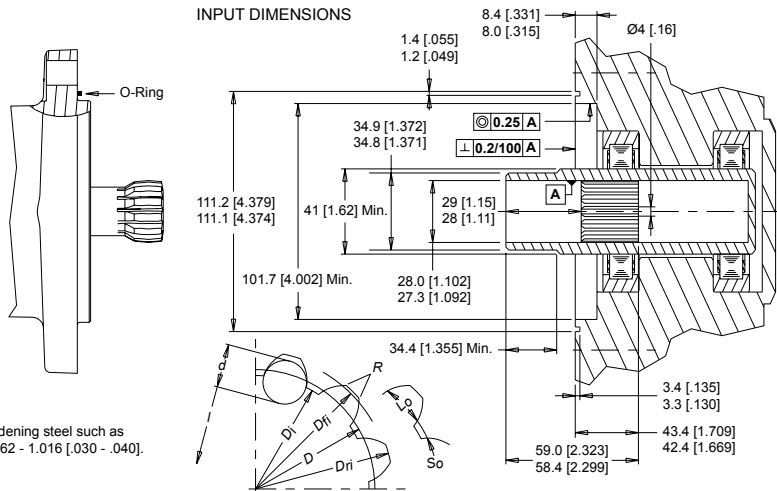


0B Cardan (For Use With S2 & S8 Mounts)

Fillet Root Side Fit	
Number of Teeth	12
Pitch	12/24
Pressure Angle	30°
Pitch Diameter <i>D</i>	25.4 [1.000]
Base Diameter	21.997 [8660]
Major Diameter <i>D_{ri}</i>	27.74 [1.092] - 27.59 [1.086]
Form Diameter (Min.) <i>D_{fi}</i>	26.93 [1.060]
Minor Diameter <i>D_j</i>	23.224 [9143] - 23.097 [9093]
Space Width (Circular) <i>L_o</i> *	
Max. Actual	4.318 [1700]
Min. Effective	4.216 [1660]
Fillet Radius <i>R</i>	0.76 [030] - 0.64 [025]
Max. Distance Between Pins <i>l</i>	19.190 [7555] - 19.020 [7488]
Pin Diameter <i>d</i>	4.496 [1770]

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.



SPECIFICATIONS (REDUCED TORQUE & PRESSURE RATINGS)*

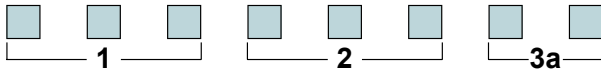
CODE	Displacement cm ³ [in ³ /rev]	Max. Speed rpm		Max. Flow lpm [gpm]		Max. Torque Nm [lb-in]		Max. Pressure bar [psi]		
		cont.	inter.	cont.	inter.	cont.	inter.	cont.	inter.	peak
080	79 [4.78]	870	1060	61 [16]	68 [18]	207 [1832]	274 [2425]	207 [3000]	275 [3990]	276 [4000]
100	100 [6.10]	745	880	76 [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.

WS (357/358 Series)

Medium Duty Hydraulic Short Motor

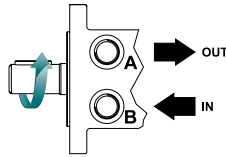
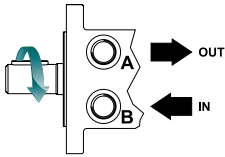
ORDERING INFORMATION



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 cm³/rev [4.8 in³/rev]

100 100 cm³/rev [6.1 in³/rev]

110 112 cm³/rev [6.9 in³/rev]

130 129 cm³/rev [7.9 in³/rev]

160 162 cm³/rev [9.9 in³/rev]

200 202 cm³/rev [12.3 in³/rev]

230 228 cm³/rev [13.9 in³/rev]

320 325 cm³/rev [19.8 in³/rev]

400 399 cm³/rev [24.4 in³/rev]

500 496 cm³/rev [30.3 in³/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

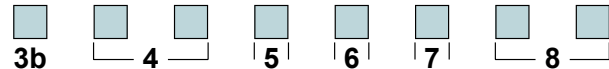
2 G 1/2, Offset

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

B Valve Cavity Only

C 69 bar [1000 psi] Relief

D 86 bar [1250 psi] Relief

E 104 bar [1500 psi] Relief

F 121 bar [1750 psi] Relief

G 138 bar [2000 psi] Relief

J 173 bar [2500 psi] Relief

L 207 bar [3000 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