Hydraulics Industrial Hydraulics

Char-Lynn®

Spool Valve Hydraulic Motors

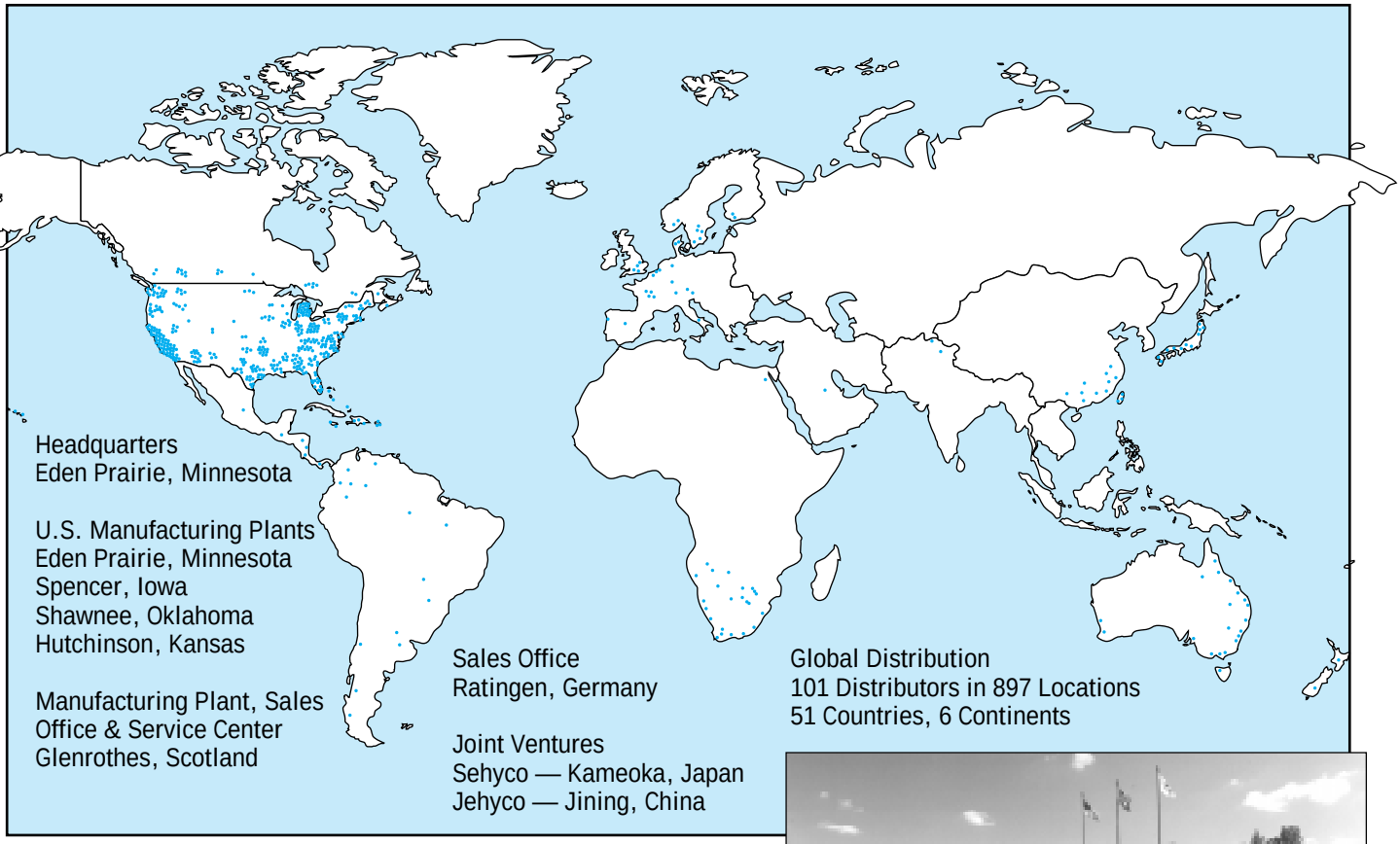
No. 11-111
April, 1999

EATON

W Series Geroler® Motors

We Manufacture Solutions

Serving Customers Worldwide



The Hydraulics Division of Eaton Corporation…

…is your one-stop source for all your hydraulic design and application needs. From world-class engineering capabilities in system design assistance to comprehensive service and technical support after the sale, we are committed to one clear objective — to help assure your complete satisfaction with our products.

Hydraulics Division Headquarters, Eden Prairie, Minnesota

The Hydraulics Division manufactures and globally markets a complete line of reliable, high-efficiency hydraulic components and systems, including:

- Hydrostatic Transmissions
- Electronic Controls and Systems
- Axial Piston Pumps and Axial Motors
- Radial Ball Piston Pumps
- Fully Fluid-Linked Hydrostatic Power Steering
- Char-Lynn® Gerotor and Geroler® Low Speed/ High Torque Motors
- Valves, Cylinders, Gear Pumps, and Gear Motors.

Backed by the most extensive distributor network in the fluid power industry, the Eaton Hydraulics Division has the resources to meet your needs. The Division has four manufacturing plants in the U.S., and one in Scotland. Joint ventures in Japan and China complete the global manufacturing network. All told, the Division currently employs more than 2,000 people with nearly 1,000,000 square feet of manufacturing space, all dedicated to quality, performance and timely response to your design and application needs.

Major Markets Served

- Agriculture
- Construction
- Fishing
- Lawn and Garden
- Mining
- Marine
- Industrial
- Lumber
- Food Processing

Eaton Corporation

Founded in 1911 to manufacture truck axles, Eaton now produces more than 40,000 different products, made in 24 countries on five continents. To serve your current and emerging business needs, Eaton Corporation has over 52,000 employees in 150 manufacturing sites worldwide.

Today, Eaton Corporation is one of the world's premier producers of electronic and electrical controls and vehicle components. With sales approaching $7 billion annually, Eaton is ranked among the top 100 industrial companies in the United States, as well as one of the top 150 worldwide.

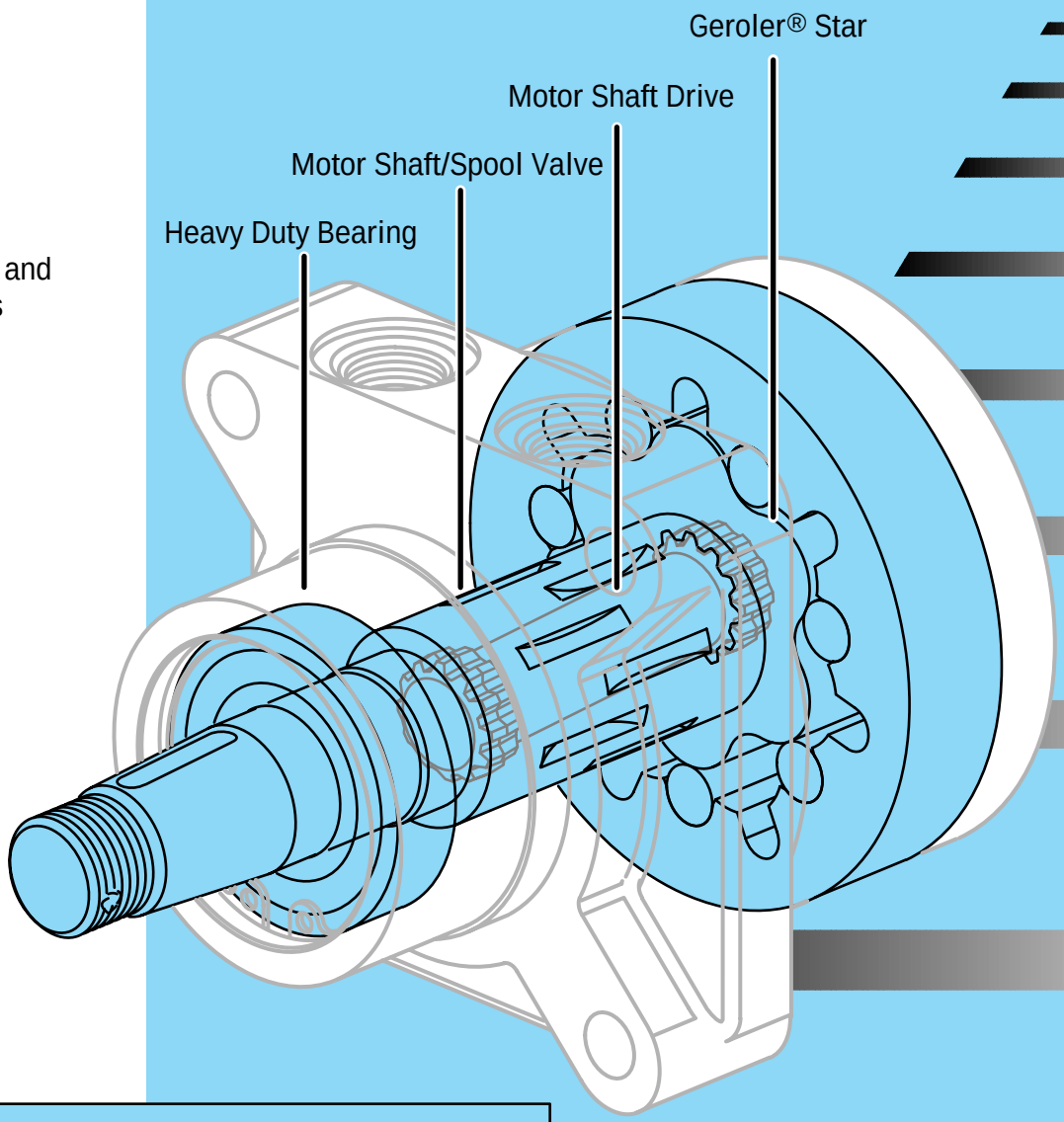
http://www.eaton.com

EATON

“W” Series Motors

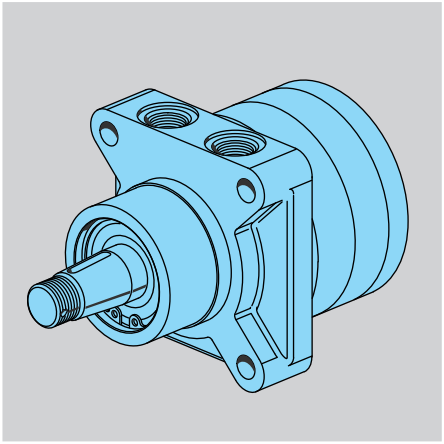
Features

- Compact Size
- High Efficiency
- Tailored to Turf Care and Scissors Lift Markets
- Great Value



This catalog information was current at date of printing, but may be subject to change.

W Series



W Series

Geroler Element ..... 7 Displacements
Flow l/min [GPM] ..... 68 [18] Continuous**
76 [20] Intermittent*
Speed ..... 200 RPM
Pressure bar [PSI] ... 165 [2400] Cont.
179 [2600] Inter.
Torque Nm [lb-in] ..... 410 [3624] Cont.
562 [4970] Inter.

Char-Lynn W Series motors with the Geroler displacement element offer the same low-friction and long-life advantages as the S and T Series. The W Series features the simplicity of Eaton's proven spool valve and a Geroler element that provides superior drive life and smooth performance. In addition, this motor has a rugged housing with an extra large capacity side load bearing.

W Series Displacement Size = cubic centimeter per shaft revolution (cm^3/r)
- 80 [4.9] = cubic inch per shaft revolution ([in^3/r])
- 126 [7.7]
- 154 [9.4]
- 195 [11.9]
- 251 [15.3]
- 303 [18.5]
- 374 [22.8]

Mounting Flange
- 4 Bolt (Wheel) 82,6 [3.25] Pilot Dia. and 13,59 [.535] Dia. Mounting Holes 147,6 [5.81] Dia. B.C., 27,0 [5.00] Dia. Rear Mount Pilot

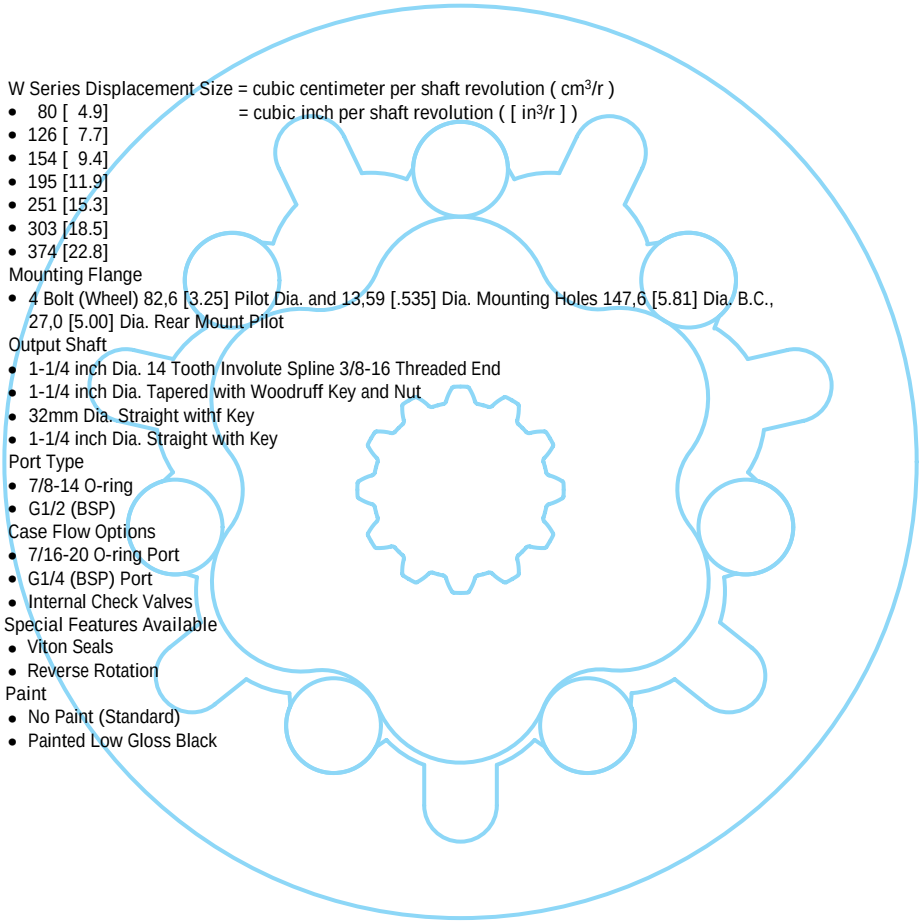
Output Shaft
- 1-1/4 inch Dia. 14 Tooth Involute Spline 3/8-16 Threaded End
- 1-1/4 inch Dia. Tapered with Woodruff Key and Nut
- 32mm Dia. Straight withf Key
- 1-1/4 inch Dia. Straight with Key

Port Type
- 7/8-14 O-ring
- G1/2 (BSP)

Case Flow Options
- 7/16-20 O-ring Port
- G1/4 (BSP) Port
- Internal Check Valves

Special Features Available
- Viton Seals
- Reverse Rotation

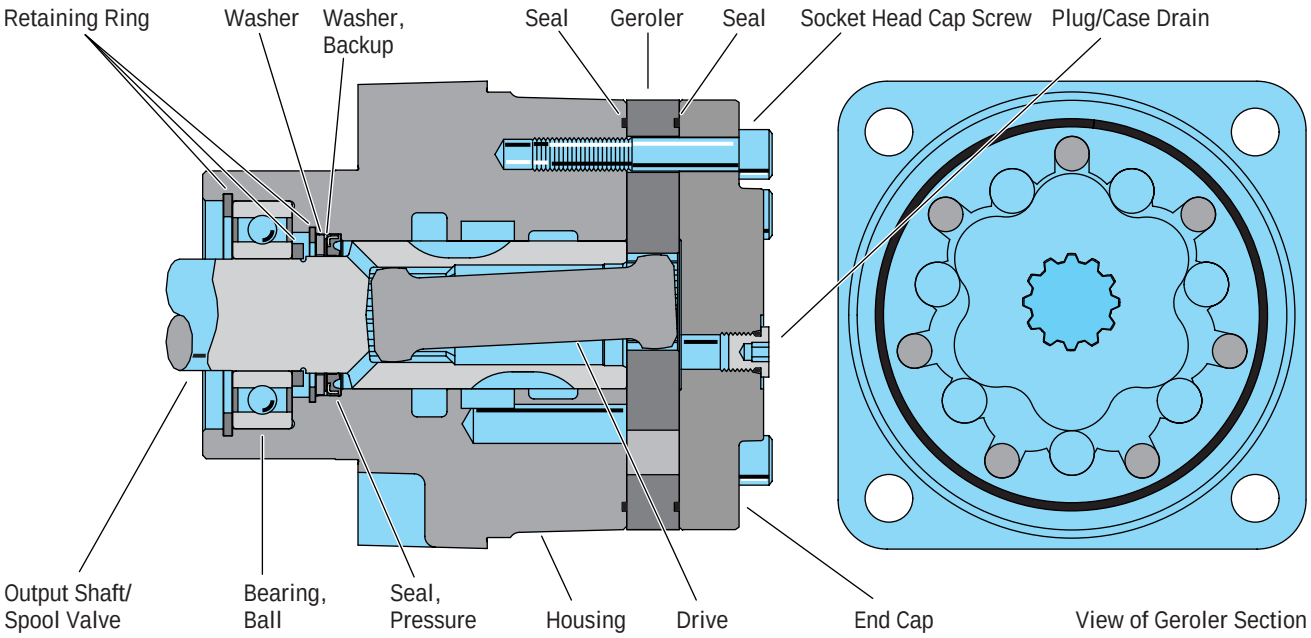
Paint
- No Paint (Standard)
- Painted Low Gloss Black



** Continuous— (Cont.) Continuous rating, motor may be run continuously at these ratings.

* Intermittent— (Inter.) Intermittent operation, 10% of every minute.

Specifications W Series



Specification Data—W Series

Displ. cm³/r [in³/r]		80 [4.9]	126 [7.7]	154 [9.4]	195 [11.9]	251 [15.3]	303 [18.5]	374 [22.8]
Max. Speed (RPM)*		267	288	214	200	200	200	200
Flow l/min [GPM]	Continuous	23 [6]	30 [8]	34 [9]	38 [10]	53 [14]	62 [16.5]	68 [18]
	Intermittent	23 [6]	30 [8]	34 [9]	38 [10]	53 [14]	62 [16.5]	76 [20]
Torque Nm [lb-in]	Continuous	176 [1555]	279 [2470]	318 [2813]	318 [2816]	375 [3319]	387 [3429]	410 [3624]
	Intermittent**	189 [1676]	298 [2640]	373 [3301]	439 [3882]	548 [4849]	539 [4769]	562 [4970]
Pressure Δ bar [Δ PSI]	Continuous*	165 [2400]	165 [2400]	152 [2200]	124 [1800]	110 [1600]	97 [1400]	83 [1200]
	Intermittent**	179 [2600]	179 [2600]	179 [2600]	179 [2600]	165 [2400]	138 [2000]	124 [1800]

Maximum Allowable Case Pressure — 103 bar [1500 PSI] without case drain.

*A simultaneous maximum torque and maximum speed NOT recommended. For permissible continuous and intermittent operating combinations of pressure and flow refer to performance data on pages 6 and 7.

**Maximum Inlet Pressure — 179 bar [2600 PSI]. Do not exceed Δ pressure rating (see chart above)

Return Pressure — Do not exceed Δ pressure rating (see chart above). Case drain required.

Note: Optional version can be used without case drain.

Δ bar [Δ PSI] — True pressure difference between inlet port and outlet port.

Continuous Rating — Motor may be run continuously at these ratings.

Intermittent Operation — 10% of every minute.

Peak Operation — 1% of every minute.

Recommended Fluids — Premium quality, anti-wear type hydraulic oil with a viscosity of not less than 70 SUS at operating temperature (see page 13).

Recommended Maximum System Operating Temp. — Is 82° C [180° F]

Recommended Filtration — per ISO Cleanliness Code, level 18/13

Low Speed Spool — Standard

Higher Speeds with Reduced Low Speed Performance — Available upon request.

To assure best motor life, run motor for approximately one hour at 30% of rated pressure before application to full load. Be sure motor is filled with fluid prior to any load applications.

Performance Data W Series

80 cm³/r [4.9 in³/r]

Δ Pressure bar [PSI]

Continuous

Flow l/min [GPM]	[400] 28	[600] 41	[800] 55	[1000] 69	[1200] 83	[1400] 97	[1600] 110	[1800] 124	[2000] 138	[2200] 152	[2400] 165	[2600] 179
[2] 7,6	[204] 23 **93**	[337] 38 **89**	[474] 54 **88**	[612] 69 **84**	[748] 85 **83**	[883] 100 **79**	[1019] 115 **73**	[1149] 130 **69**	[1281] 145 **69**	[1412] 160 **61**	[1540] 174 **56**	[1610] 182 **39**
[4] 15,1	[223] 25 **178**	[357] 40 **172**	[489] 55 **170**	[627] 71 **168**	[769] 87 **165**	[902] 102 **159**	[1035] 117 **157**	[1169] 132 **154**	[1295] 146 **146**	[1424] 161 **142**	[1555] 176 **131**	[1676] 189 **117**
[6] 22,7	[255] 29 **267**	[342] 39 **265**	[477] 54 **262**	[612] 69 **258**	[749] 85 **257**	[879] 99 **252**	[1014] 115 **248**	[1154] 130 **241**	[1286] 145 **235**	[1408] 159 **229**	[1533] 173 **219**	[1648] 186 **206**

126 cm³/r [7.7 in³/r]

Δ Pressure bar [PSI]

Continuous

Flow l/min [GPM]	[400] 28	[600] 41	[800] 55	[1000] 69	[1200] 83	[1400] 97	[1600] 110	[1800] 124	[2000] 138	[2200] 152	[2400] 165	[2600] 179
[2] 7,6	[390] 44 **58**	[605] 68 **56**	[817] 92 **55**	[1032] 117 **51**	[1248] 141 **49**	[1448] 164 **45**	[1656] 187 **43**	[1871] 211 **41**	[2069] 234 **33**	[2243] 253 **32**	[2414] 273 **26**	[2513] 284 **17**
[4] 15,1	[382] 43 **113**	[605] 68 **106**	[817] 92 **106**	[1036] 117 **104**	[1252] 141 **93**	[1463] 165 **97**	[1694] 191 **94**	[1908] 216 **88**	[2113] 239 **82**	[2306] 261 **79**	[2470] 279 **74**	[2640] 298 **60**
[6] 22,7	[367] 41 **172**	[587] 66 **167**	[802] 91 **164**	[1017] 115 **161**	[1236] 140 **156**	[1444] 163 **152**	[1668] 188 **147**	[1882] 213 **141**	[2091] 236 **134**	[2284] 258 **130**	[2459] 278 **120**	[2637] 298 **103**
[8] 30,3	[346] 39 **228**	[561] 63 **225**	[769] 87 **220**	[981] 111 **216**	[1203] 136 **213**	[1419] 160 **208**	[1634] 185 **201**	[1849] 209 **195**	[2039] 230 **188**	[2217] 250 **174**	[2432] 275 **163**	[2633] 297 **149**

154 cm³/r [9.4 in³/r]

Δ Pressure bar [PSI]

Continuous

Flow l/min [GPM]	[400] 28	[600] 41	[800] 55	[1000] 69	[1200] 83	[1400] 97	[1600] 110	[1800] 124	[2000] 138	[2200] 152	[2400] 165	[2600] 179
[2] 7,6	[450] 51 **47**	[723] 82 **47**	[989] 112 **46**	[1249] 141 **44**	[1512] 171 **40**	[1769] 200 **39**	[2021] 228 **36**	[2269] 256 **33**	[2502] 283 **30**	[2714] 307 **26**	[2904] 328 **19**	[3019] 341 **10**
[4] 15,1	[470] 53 **94**	[737] 83 **93**	[1009] 114 **90**	[1276] 144 **89**	[1540] 174 **87**	[1802] 204 **84**	[2064] 233 **81**	[2323] 262 **78**	[2570] 290 **73**	[2813] 318 **67**	[3019] 341 **65**	[3242] 366 **52**
[6] 22,7	[435] 49 **143**	[715] 81 **140**	[984] 111 **138**	[1252] 141 **137**	[1513] 171 **134**	[1787] 202 **131**	[2020] 228 **128**	[2274] 257 **124**	[2521] 285 **117**	[2812] 318 **112**	[3042] 344 **103**	[3301] 373 **91**
[8] 30,3	[407] 46 **190**	[677] 76 **188**	[945] 107 **186**	[1214] 137 **184**	[1477] 167 **182**	[1740] 197 **179**	[2005] 227 **176**	[2260] 255 **171**	[2503] 283 **166**	[2735] 309 **158**	[2964] 335 **148**	[3206] 362 **137**
[9] 34	[380] 43 **214**	[648] 73 **212**	[914] 103 **210**	[1183] 134 **207**	[1452] 164 **206**	[1714] 194 **202**	[1981] 224 **200**	[2243] 253 **196**	[2499] 282 **191**	[2733] 309 **182**	[2964] 335 **173**	[3195] 361 **162**

195 cm³/r [11.9 in³/r]

Δ Pressure bar [PSI]

Continuous

Flow l/min [GPM]	[400] 28	[600] 41	[800] 55	[1000] 69	[1200] 83	[1400] 97	[1600] 110	[1800] 124	[2000] 138	[2200] 152	[2400] 165	[2600] 179
[2] 7,6	[478] 54 **38**	[827] 93 **38**	[1171] 132 **37**	[1511] 171 **36**	[1839] 208 **35**	[2153] 243 **34**	[2452] 277 **34**	[2756] 311 **30**	[3027] 342 **29**	[3275] 370 **26**	[3513] 397 **22**	[3673] 415 **16**
[4] 15,1	[515] 58 **75**	[872] 99 **73**	[1220] 138 **73**	[1558] 176 **71**	[1886] 213 **70**	[2206] 249 **69**	[2518] 284 **66**	[2816] 318 **64**	[3107] 351 **62**	[3382] 382 **56**	[3647] 412 **52**	[3882] 439 **44**
[6] 22,7	[524] 59 **114**	[878] 99 **111**	[1214] 137 **111**	[1551] 175 **110**	[1875] 212 **108**	[2199] 248 **106**	[2518] 284 **105**	[2824] 319 **103**	[3113] 352 **99**	[3389] 383 **95**	[3666] 414 **91**	
[8] 30,3	[518] 59 **151**	[856] 97 **150**	[1187] 134 **150**	[1524] 172 **149**	[1861] 210 **147**	[2187] 247 **145**	[2499] 282 **144**	[2782] 314 **143**	[3064] 346 **141**	[3334] 377 **136**		
[10] 38	[462] 52 **190**	[797] 90 **188**	[1133] 128 **187**	[1468] 166 **186**	[1799] 203 **184**	[2118] 239 **184**	[2442] 276 **182**	[2739] 309 **179**	[3023] 342 **176**	[3281] 371 **160**		

[3673] 415 **16** } Torque [lb-in] Nm Speed RPM

Motors run with high efficiency in all areas designated with a number for torque and speed. However, for best motor life, select a motor to run with a torque and speed range shown in the light blue area.

Continuous

Intermittent

Performance data is typical at 120 SUS. Actual data may vary slightly from unit to unit in production.

Performance Data W Series

251 cm³/r [15.3 in³/r]
Δ Pressure bar [PSI]
Continuous

Flow l/min [GPM]	[400] 28	[600] 41	[800] 55	[1000] 69	[1200] 83	[1400] 97	[1600] 110	[1800] 124	[2000] 140	[2200] 152	[2400] 165
[2] **7,6**	[759] 86 **30**	[1194] 135 **29**	[1683] 190 **29**	[2122] 240 **28**	[2535] 286 **27**	[2928] 331 **27**	[3319] 375 **25**	[3634] 411 **22**	[3946] 446 **17**	[4242] 479 **15**	[4553] 514 **14**
[4] **15,1**	[806] 91 **59**	[1257] 142 **58**	[1691] 191 **58**	[2130] 241 **56**	[2563] 290 **55**	[2988] 338 **55**	[3381] 382 **52**	[3799] 429 **48**	[4147] 469 **47**	[4515] 510 **41**	[4849] 548 **40**
[6] **22,7**	[780] 88 **90**	[1219] 138 **88**	[1646] 186 **87**	[2084] 235 **86**	[2515] 284 **85**	[2933] 331 **83**	[3336] 377 **83**	[3716] 420 **79**			
[8] **30,3**	[720] 81 **120**	[1148] 130 **118**	[1590] 180 **117**	[2029] 229 **117**	[2449] 277 **114**	[2861] 323 **112**	[3236] 366 **111**	[3627] 410 **108**			
[10] **37,9**	[645] 73 **148**	[1080] 122 **147**	[1513] 171 **147**	[1947] 220 **145**	[2371] 268 **145**	[2779] 314 **143**	[3151] 356 **141**	[3515] 397 **137**			
[12] **45,4**	[557] 63 **178**	[992] 112 **177**	[1428] 161 **176**	[1864] 211 **174**	[2292] 259 **174**	[2697] 305 **172**	[3087] 349 **169**				
[14] **53,0**	[460] 52 **208**	[888] 100 **206**	[1330] 150 **206**	[1761] 199 **203**	[2191] 248 **202**	[2615] 295 **200**	[3035] 343 **197**				

303 cm³/r [18.5 in³/r]
Δ Pressure bar [PSI]
Continuous

Flow l/min [GPM]	[400] 28	[600] 41	[800] 55	[1000] 69	[1200] 83	[1400] 97	[1600] 110	[1800] 124	[2000] 140
[2] **7,6**	[920] 104 **24**	[1454] 164 **24**	[1974] 223 **24**	[2480] 280 **23**	[2969] 335 **22**	[3429] 387 **22**	[3859] 436 **20**	[4230] 478 **18**	[4583] 518 **16**
[4] **15,1**	[960] 108 **49**	[1487] 168 **49**	[2007] 227 **47**	[2513] 284 **47**	[3006] 340 **46**	[3457] 391 **45**	[3905] 441 **44**	[4338] 490 **41**	[4769] 539 **39**
[6] **22,7**	[911] 103 **73**	[1445] 163 **73**	[1961] 222 **72**	[2473] 279 **72**	[2952] 334 **71**	[3411] 385 **69**	[3842] 434 **68**	[4276] 483 **66**	
[8] **30,3**	[843] 95 **99**	[1375] 155 **98**	[1888] 213 **97**	[2393] 270 **96**	[2886] 326 **95**	[3350] 379 **94**	[3763] 425 **93**		
[10] **37,9**	[752] 85 **123**	[1274] 144 **122**	[1789] 202 **122**	[2303] 260 **120**	[2792] 316 **119**	[3274] 370 **119**	[3650] 412 **118**		
[12] **45**	[652] 74 **148**	[1170] 132 **147**	[1691] 191 **146**	[2199] 248 **145**	[2691] 304 **145**	[3123] 353 **144**			
[14] **53**	[526] 59 **172**	[1039] 117 **172**	[1560] 176 **171**	[2064] 233 **170**	[2548] 288 **169**	[2999] 339 **168**			
[16.5] **62**	[353] 40 **203**	[864] 98 **203**	[1367] 154 **201**	[1876] 212 **200**	[2369] 268 **200**				

[4583] 518 **16** } Torque [lb-in] Nm / Speed RPM

Continuous
Intermittent

374 cm³/r [22.8 in³/r]
Δ Pressure bar [PSI]
Continuous

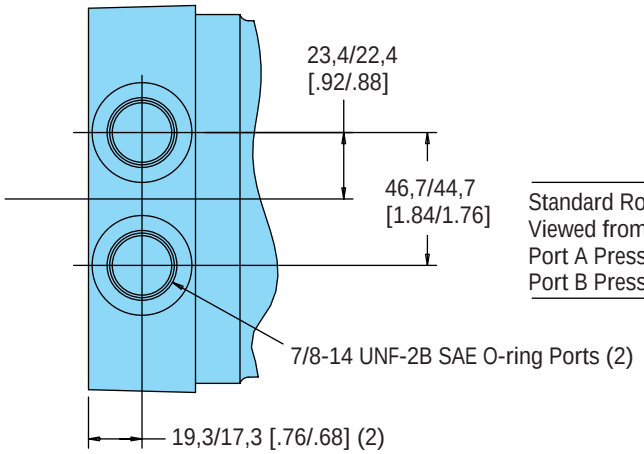
Flow l/min [GPM]	[400] 28	[600] 41	[800] 55	[1000] 69	[1200] 83	[1400] 97	[1600] 110	[1800] 124
[2] **7,6**	[1086] 123 **20**	[1753] 198 **19**	[2365] 267 **17**	[2960] 334 **16**	[3533] 399 **14**	[4025] 455 **12**	[4484] 507 **12**	[4970] 562 **11**
[4] **15,1**	[1152] 130 **39**	[1797] 203 **39**	[2431] 275 **38**	[3048] 344 **36**	[3624] 409 **34**	[4129] 467 **33**	[4599] 520 **31**	
[6] **22,7**	[1099] 124 **60**	[1749] 198 **58**	[2377] 269 **57**	[2996] 339 **56**	[3557] 402 **54**	[4077] 461 **53**		
[8] **30,3**	[1018] 115 **80**	[1662] 188 **79**	[2290] 259 **78**	[2894] 327 **76**	[3440] 389 **75**	[3952] 447 **74**		
[10] **37,9**	[940] 106 **100**	[1582] 179 **99**	[2210] 250 **97**	[2812] 318 **96**	[3346] 378 **95**	[3816] 431 **95**		
[12] **45,4**	[809] 91 **120**	[1454] 164 **119**	[2077] 235 **117**	[2677] 302 **116**	[3216] 363 **115**			
[14] **53,0**	[648] 73 **141**	[1284] 145 **139**	[1907] 215 **138**	[2506] 283 **137**	[3033] 343 **137**			
[16] **60,6**	[485] 55 **160**	[1107] 125 **159**	[1722] 195 **157**	[2315] 262 **157**	[2838] 321 **157**			
[18] **68,1**	[307] 35 **180**	[930] 105 **179**	[1543] 174 **178**	[2133] 241 **178**				
[20] **75,7**	[111] 13 **201**	[730] 82 **199**	[1342] 152 **198**	[1939] 219 **197**				

Motors run with high efficiency in all areas designated with a number for torque and speed. However, for best motor life, select a motor to run with a torque and speed range shown in the light blue area.

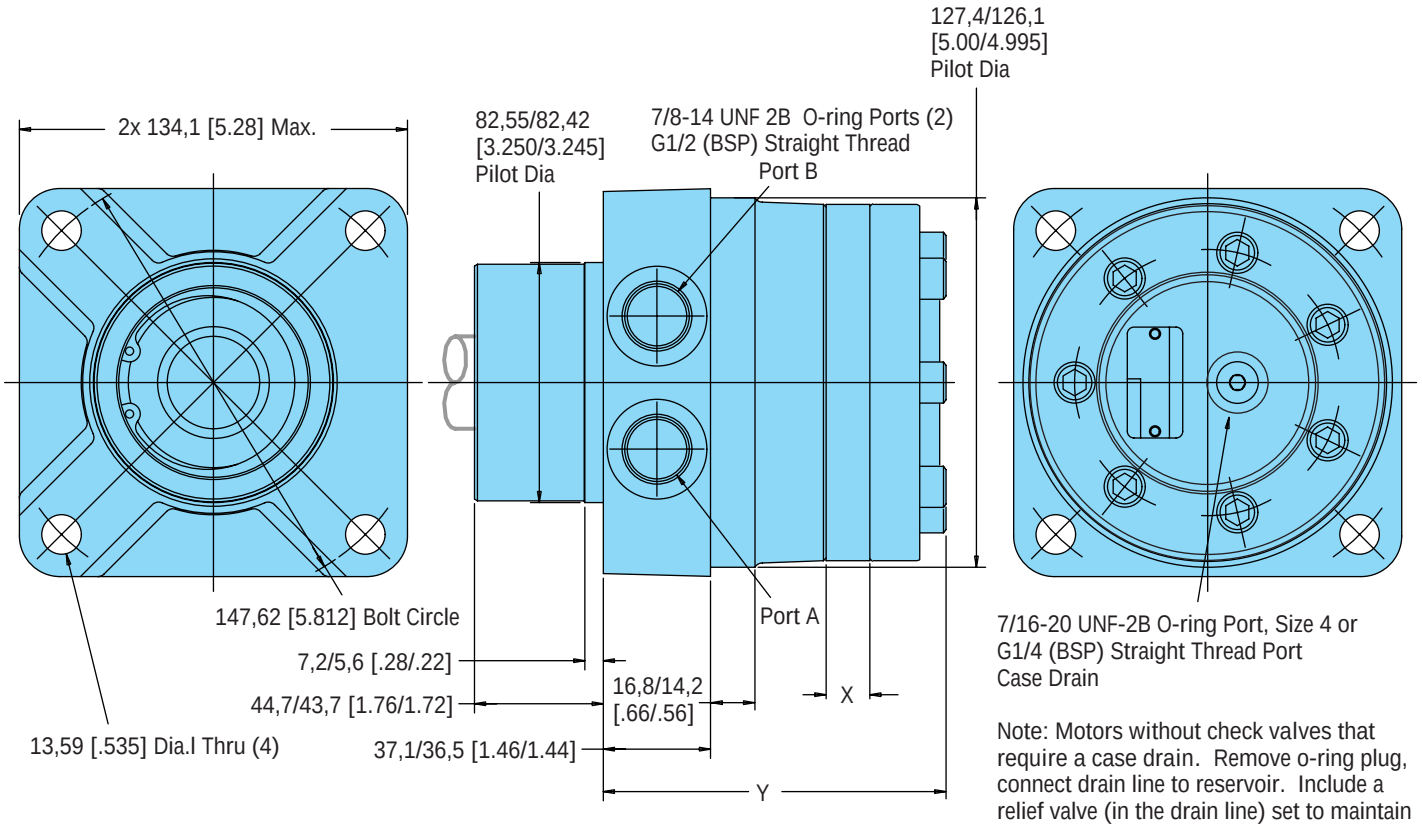
Performance data is typical at 120 SUS. Actual data may vary slightly from unit to unit in production.

Dimensions W Series

Displ. cm³/r [in³/r]	X Dim. Max.	Y Dim. Max.
80 [4.9]	9,1 [.36]	116,6 [4.59]
126 [7.7]	11,9 [.47]	119,6 [4.71]
154 [9.4]	14,7 [.58]	122,2 [4.81]
195 [11.9]	18,5 [.73]	126,2 [4.97]
251 [15.3]	23,9 [.94]	131,6 [5.18]
303 [18.5]	29,0 [1.14]	136,4 [5.37]
374 [22.8]	35,6 [1.40]	143,3 [5.64]



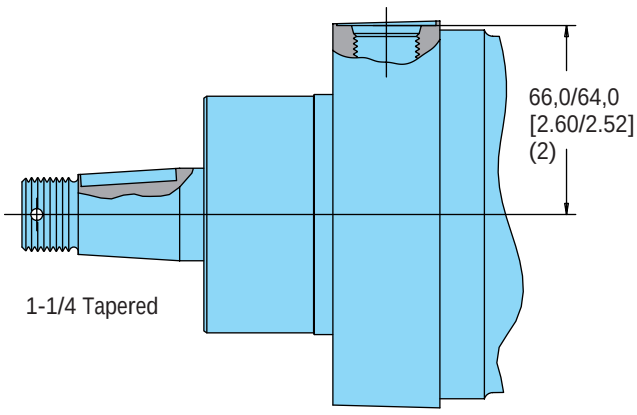
Standard Rotation
Viewed from Shaft End
Port A Pressurized — CW
Port B Pressurized — CCW



7/16-20 UNF-2B O-ring Port, Size 4 or
G1/4 (BSP) Straight Thread Port
Case Drain

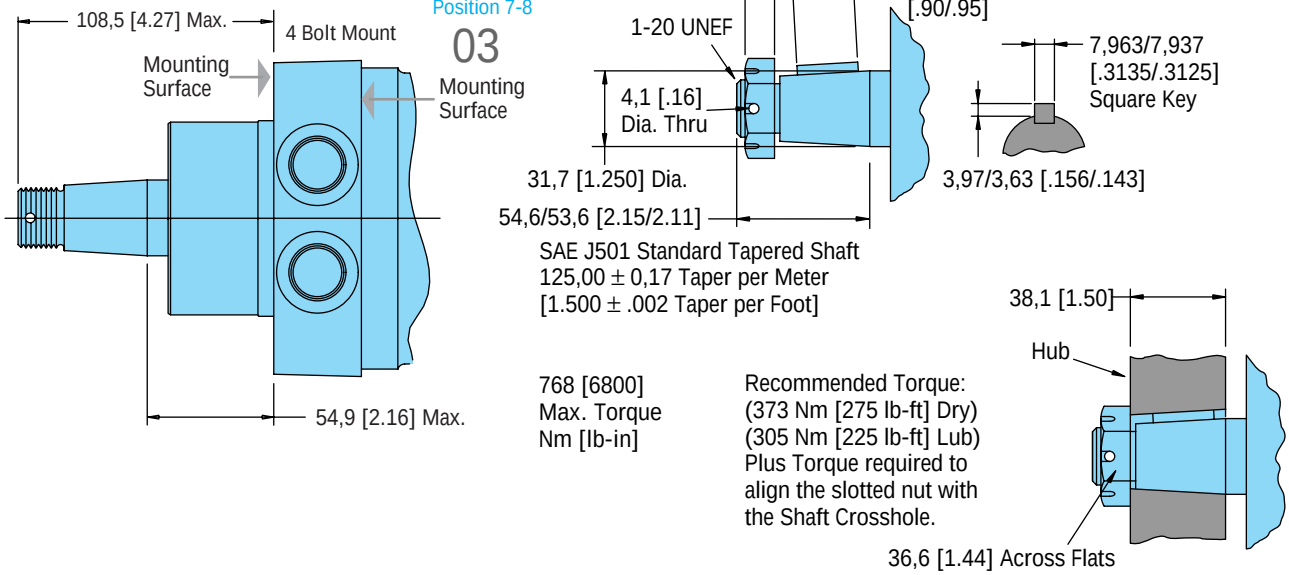
Note: Motors without check valves that require a case drain. Remove o-ring plug, connect drain line to reservoir. Include a relief valve (in the drain line) set to maintain 3,4 bar [50 PSI] motor case pressure.

Shaft Dimensions —
see page 8 and 9
1-1/4 Inch Tapered
1-1/4 Inch Straight
32 mm Straight
1-1/4 Inch 14 Tooth Splined

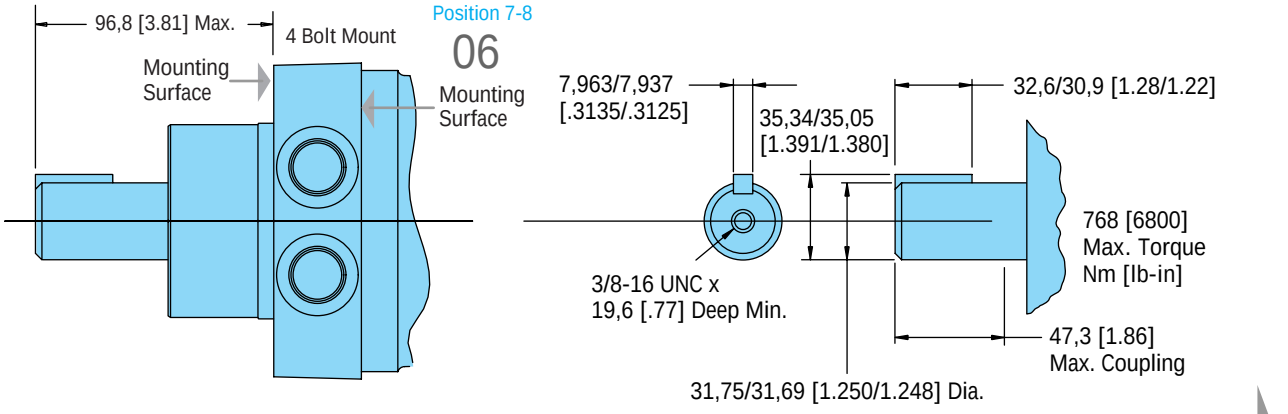


Shaft Dimensions W Series

1-1/4 Tapered



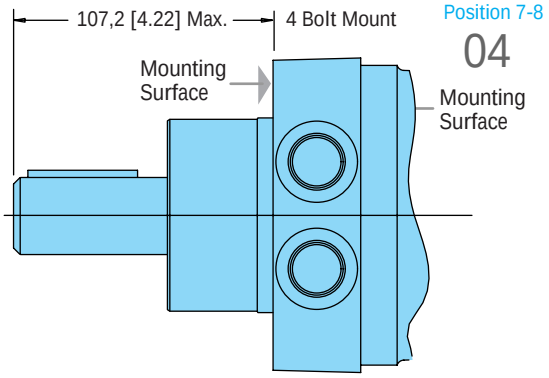
1-1/4 Inch Straight

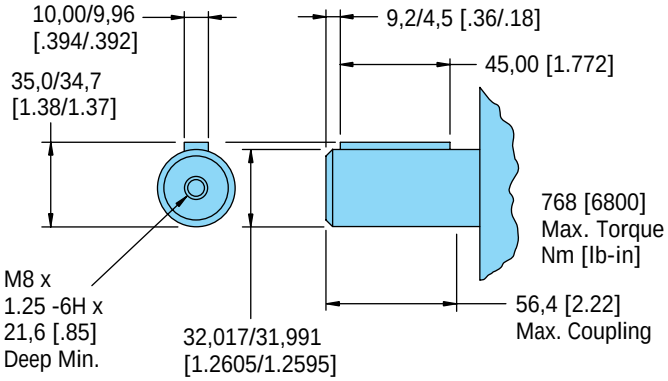


Shaft Information Continued

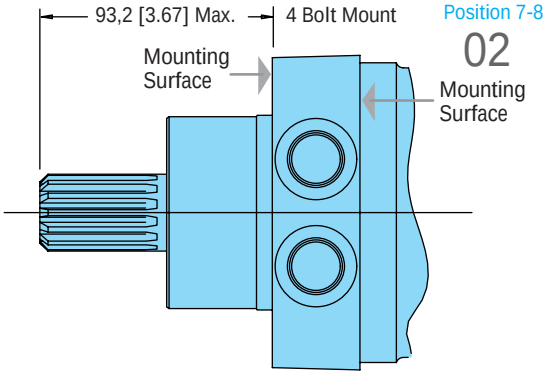
Shaft Dimensions W Series

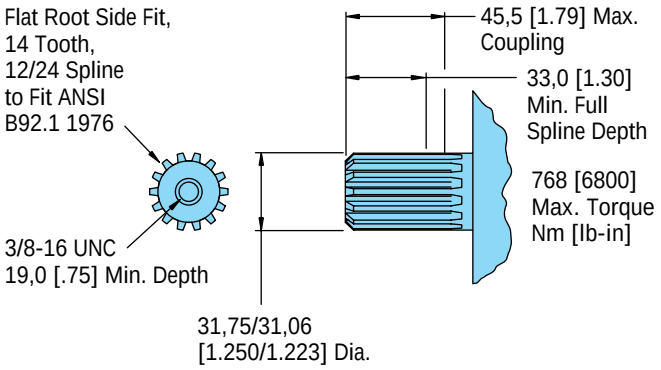
32 mm Straight





1-1/4 14 Tooth Splined





Shaft Side Load Capacity W Series

Chart A — Expected B10 Life (hrs) of Bearing Under Various Loads

Axial Thrust N [lbf]	Radial Load at Centerline of keyway at 100 RPM									
	1110 [250]	2225 [500]	3335 [750]	4450 [1000]	4560 [1250]	6670 [1500]	7785 [1750]	8895 [2000]	11120 N [2500lbf]	13345 N [3000lbf]
445 [100]	410 600	66 000	19 600	8 300	4 200	2 400	1 500	1 000	530	310
1335 [300]	92 700	40 900	19 600	8 300	4 200	2 400	1 500	1 000	530	310
2225 [500]	39 400	20 900	12 400	7 900	4 200	2 400	1 500	1 000	530	310
3115 [700]	21 400	12 600	8 100	5 500	3 900	2 400	1 500	1 000	530	
4005 [900]	13 300	8 400	5 700	4 000	2 900	2 200	1 500	1 000	530	
4895 [1100]	9 000	6 000	4 200	3 100	2 300	1 800	1 400	1 000		
5785 [1300]	6 500	4 500	3 200	2 400	1 900	1 500	1 200	900		
6670 [1500]	4 800	3 500	2 600	2 000	1 500	1 200	1 000			
7560 [1700]	3 700	2 800	2 100	1 600	1 300					
8450 [1900]	3 000	2 200								

8895 [2000] Max. Thrust

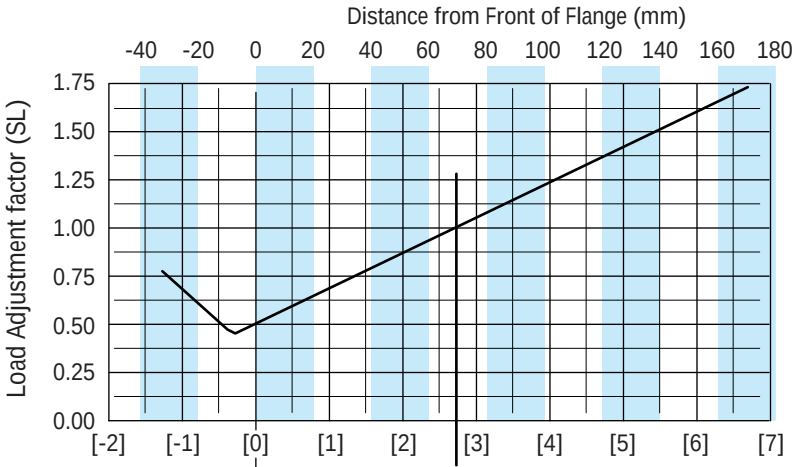
Note: 1) Case pressure needs to be added to the outward axial thrust load and subtracted from inward axial thrust load — Case Pressure bar x 87,1
[PSI x 1.35]

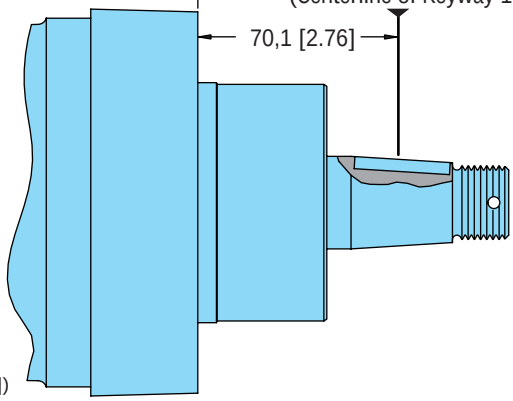
2) Life values in Chart A can be adjusted for speeds up to 200 rpm. $\frac{\text{Life value x 100 rpm}}{\text{application rpm}}$

3) Shaded areas are intermittent loading.

4) To convert application radial load at any load location to sideload at the center of keyway multiply load by the application factor from Chart B.

Chart B — Load Adjustment factor





Example:

Side Load: 4849 N @ 120 mm [1090 lbf @ 4.75 inch] from flange.

Average Thrust Load: 890 N [200 lbf] inward (toward motor).

Case Pressure: 66 bar [960 PSI].

Average Speed: 150 rpm.

Expected Life Caculation:
Adjust side load value (due to load variation): from Chart B look at 120mm [4.75 inch] read at angled curve for load adjustment factor of 1.38. Adjusted load is:
(4849 N [1090 lbf]) x (1.38) = 6690 N [1504 lbf]

Thrust Load Value (due to case pressure):

(960 PSI) x (1.35) = [1296 lbf]

(66 bar) x (87,1) = 5750 N

Average thrust load found to be 890 N [200 lbf] inwards so subtract from thrust load due from case pressure.

5750 N - 890 N = 4860 N or [1296 lbf] - 200 lbf = [1096 lbf]

Read Life Expectancy from Chart A: Value from chart reading across top to 6672 [1500] (6090 N [1504 lbf]) and down left side to 4895 [1100] (4875 N [1096 lbf])

Life = 1800 Hours

Speed Adjustment for over 100 rpm:

$\frac{\text{(1800 hrs) x (100 rpm)}}{\text{150 rpm}}$ = 1200 Hours

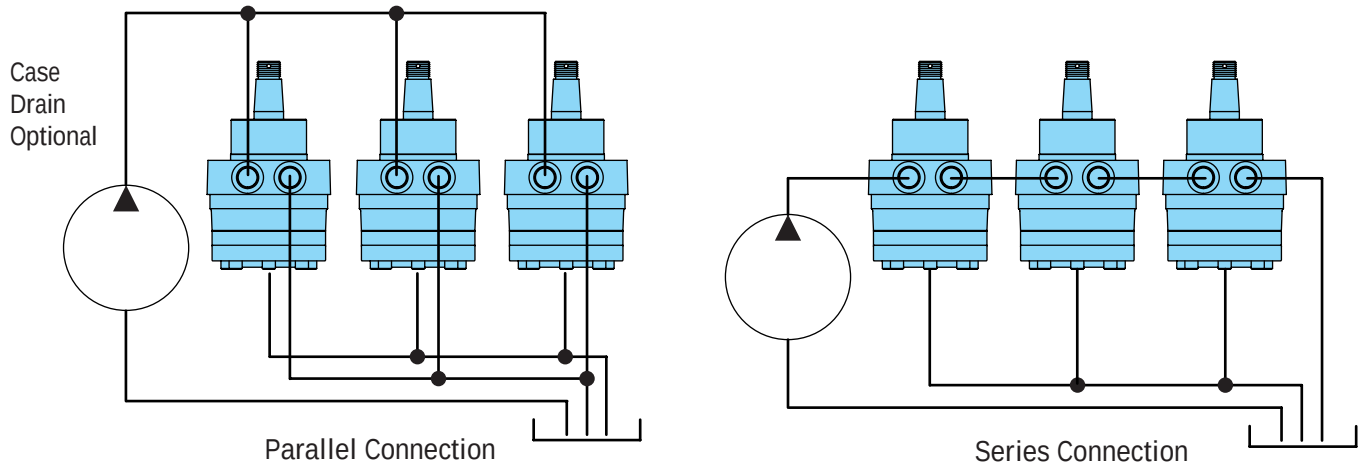
Case Drain W Series

Parallel or Series Connection

Hydraulic lines bringing pressurized fluid from the pump to the motor and return flow from the motor back to tank can be flexible or rigid. One power source and one pump can be sized to supply one motor or many motors. Furthermore, one pump and multiple motors can be connected in series or in parallel (see illustration below). When connecting the pump to the motors in series, excess internal case pressure is created in the motor. This excess pressure in each motor must be ported back to tank. However, when making a parallel connection from the pump to the motors, no excess case pressure will be added. Hence, using the case drain ports are not necessary. Meanwhile, check the application to see if this optional case drain port can be connected to your advantage, whether it be a single motor to pump connection, multiple motors connected to pump in parallel, as well as multiple motors connected to pump in series...

…Case Drain Advantage — In addition to providing lower case pressures for motors connected in series, there are advantages for adding an external case drain line to motors with normal case pressures as well. These advantages are: Contamination Control — flushing the motor case. Cooler Systems — exiting oil draws motor heat away. Extend Motor Seal Life — maintain low case pressure with a preset restriction installed in the case drain line.

Motors ordered with case drain port will be shipped with steel hex socket plug installed in that end cap drain port.



Fluid Recommendations
W Series

Introduction
The ability of Eaton hydraulic components to provide the desired performance and life expectancy depends largely on the fluid used. The purpose of this section is to provide readers with the knowledge required to select the appropriate fluids for use in systems that employ Eaton hydraulic components.

One of the most important characteristics to consider when choosing a fluid to be used in a hydraulic system is viscosity. Viscosity choice is always a compromise; the fluid must be thin enough to flow easily but thick enough to seal and maintain a lubricating film between bearing and sealing surfaces. Viscosity requirements, see chart below.

Viscosity and Temperature
Fluid temperature affects viscosity. In general, as the fluid warms it gets thinner and its viscosity decreases. The opposite is true when fluid cools. When choosing a fluid, it is important to consider the start-up and operating temperatures of the hydraulic system. Generally, the fluid is thick when the hydraulic system is started. With movement, the fluid warms to a point where a cooling system begins to operate.
From then on, the fluid is maintained at the temperature for which the hydraulic system was designed. In actual applications this sequence varies; hydraulic systems are used in many environments from very cold to very hot. Cooling systems also vary from very elaborate to very simple, so ambient temperature may affect operating temperature. Equipment manufacturers who use Eaton hydraulic components in their products should anticipate temperature in their designs and make the appropriate fluid recommendations to their customers.

Cleanliness
Cleanliness of the fluid in a hydraulic system is extremely important. Eaton recommends that the fluid used in its hydraulic components be maintained at ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5 µm and a maximum of 80 particles per milliliter greater than 15 µm. Cleanliness requirements for specific products are given in the table below.
OEM's and distributors who use Eaton hydraulic components in their products should provide for these requirements in their designs.

A reputable filter supplier can supply filter information.

Fluid Maintenance
Maintaining correct fluid viscosity and cleanliness level is essential for all hydraulic systems. Since Eaton hydraulic components are used in a wide variety of applications it is impossible for Eaton to publish a fluid maintenance schedule that would cover every situation. Field testing and monitoring are the only ways to get accurate measurements of system cleanliness. OEM's and distributors who use Eaton hydraulic components should test and establish fluid maintenance schedules for their products. These maintenance schedules should be designed to meet the viscosity and cleanliness requirements laid out in this document.

Fluid Selection
Premium grade petroleum based hydraulic fluids will provide the best performance in Eaton hydraulic components. These fluids typically contain additives that are beneficial to hydraulic systems.
Eaton recommends fluids that contain anti-wear agents, rust inhibitors, anti-foaming agents, and oxidation inhibitors.
Premium grade petroleum based hydraulic fluids carry an ISO VG rating.

SAE grade crankcase oils may be used in systems that employ Eaton hydraulic components, but it should be noted that these oils may not contain all of the recommended additives. This means using crankcase oils may increase fluid maintenance requirements.

Hydraulic fluids that contain V.I. (viscosity index) improvers, sometimes called multi-viscosity oils, may be used in systems that employ Eaton hydraulic components. These V.I. improved fluids are known to "shear-down" with use. This means that their actual viscosity drops below the rated value. Fluid maintenance must be increased if V.I. improved
fluids are used. Automotive automatic transmission fluids contain V.I. improvers.

Synthetic fluids may be used in Eaton hydraulic components.
A reputable fluid supplier can provide information on synthetic fluids. Review applications that require the use of synthetic fluids with your Eaton representative.

Product Line	Viscosity		ISO Cleanliness Requirements
	Minimum	Best Range	
W Series	70 SUS 13 cSt	100-200 SUS 20-43 cSt	18/13

Additional Notes:
- Fluids too thick to flow in cold weather start-ups will cause pump cavitation and possible damage. Motor cavitation is not a problem during cold start-ups.
- When choosing a hydraulic fluid, all the components in the system must be considered and the best viscosity range adjusted accordingly. For example, when a medium duty piston pump is combined with a Geroler motor the best viscosity range becomes 100 - 150 SUS [20 - 32 cSt] and viscosity should never fall below 70 SUS [13 cSt].
- If the natural color of the fluid has become black it is possible that an overheating problem exists.
- If the fluid becomes milky a water contamination problem may exist.
- Take fluid level reading when the system is cold.
- Contact your Eaton representative if you have specific questions about the fluid requirements of Eaton hydraulic components.

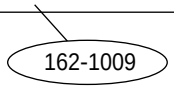
Product Numbers and Model Code for W Series Motors

Product Numbers—W Series

Add three digit prefix —162-to four digit number from chart for complete product number — Example 162-1009.
Orders will not be accepted without three digit prefix.

Displ. cm^3/r [in^3/r]	80 [4.9]	126 [7.7]	154 [9.4]	195 [11.9]	251 [15.3]	303 [18.5]	374 [22.8]
Standard	162-1016	-1017	-1018	-1019	-1020	-1021	-1022
w/Case Drain	162-1023	-1024	-1025	-1009	-1008	-1026	-1027

Note: All above motors have 1-1/4 inch tapered output shaft, 7/8 inch o-ring ports.



For W Series motors with a configuration not shown in the charts above: Use the model code number system to specify the product in detail.

Model Code for W Series

The following 16-digit coding system has been developed to identify all of the configuration options for the W Series motor. Use this model code to specify a motor with the desired features. All 16-digits of the code must be present when ordering. You may want to photocopy the matrix below to ensure that each number is entered in the correct box.

Model Code — W Series Spool Valve Motors

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
M	0	W											3	0	0

Position 1 Product Series

M ..... Motor

Position 2, 3 W Series

OW ..... W Series

Position 4, 5 Displacement cm^3/r [in^3/r]

05 ..... 30 [4.9]

08 ..... 126 [7.7]

09 ..... 154 [9.4]

12 ..... 195 [11.9]

15 ..... 251 [15.3]

19 ..... 303 [18.5]

23 ..... 374 [22.8]

Position 6 Mounting Flange

B ..... 4 Bolt (Wheel) 82,6 [3.25] Pilot Dia. and 13,59 [.535] Dia. Mounting Holes 147,6 [5.81] Dia., B.C., 127,0 [5.00] Dia. Rear Mount Pilot

Position 7, 8 Output Shaft

02 ..... 1-1/4 inch Dia. Flat Root Side Fit, 14 Tooth, 12/24 DP 30° Involute Spline with 3/8-16 UNC-2B Thread in End, 33,0 [1.30] Min. Full Spline

03 ..... 1-1/4 inch Dia. .125:1 Tapered Shaft Per SAE J501 with 1– 20 UNEF -2A Threaded Shaft End and Slotted Hex Nut, 7,938 [.3125] Square x 22,22 [.875] Straight Key

04 ..... 32mm Dia. Straight Shaft with M8 x 1, 25-6H Thread in End, 9,982 [.3930] Wide x 7,995 [.3132] High x 45,00 [1.772] Long Key

06 ..... 1-1/4 inch Dia. Straight Shaft with 3/8 – 16 UNC 2B Thread in End, 7.938 [.3125] Square x 34,92 [1.375] Straight Key

Position 9 Port Type

A ..... 7/8 – 14 UNF - 2B SAE O-ring Port

B ..... G 1/2 (BSP) Stright Thread Port

Position 10 Case Flow Options

A ..... 7/16 - 20 UNF - 2B SAE O-ring Port

B ..... G 1/4 (BSP) Straight Thread Port

C ..... Internal Check Valve

Position 11, 12 Special Features (Hardware)

00 ..... None

01 ..... Viton Seals

Position 13 Special Features (Assembly)

0 ..... None

1 ..... Reverse Rotation

Position 14 Paint/Special Packaging

0 ..... No Paint (Standard)

A ..... Painted Low Gloss Black

Position 15 Eaton Assigned Code when Applicable

0 ..... Assigned Code

Position 16 Eaton Assigned Design Code

0 ..... Assigned Design Code

W Series

Eaton Corporation is a global manufacturer of highly engineered products that serve industrial, vehicle, construction, commercial and semiconductor markets. Principal products include electrical power distribution and control equipment, truck drivetrain systems, engine components, hydraulic products, ion implanters and a wide variety of controls. Headquartered in Cleveland, the company has 49,000 employees and 143 manufacturing sites in 26 countries around the world. Sales for 1997 were $7.6 billion.

Eaton Corporation
Hydraulics Division
15151 Hwy. 5
Eden Prairie, MN 55344
Telephone: 612/937-7254
Fax: 612/937-7130

Eaton Ltd.
Hydraulics Division
Glenrothes, Fife
Scotland, KY7 4NW
Telephone: [+44] (0)1592-771-771
Fax: [+44] (0)1592-773-184

Eaton B.V.
Boeing Avenue 11
1119 PC Schiphol-Rijk
The Netherlands
Telephone: [+31] (0)20-655 6776
Fax: [+31] (0)20-655 6800

Sumitomo Eaton Hydraulic Co.
8 Temasek Blvd.
42-01 Suntec Tower Three
Singapore 03988
Telephone: [+65] 832-7727
Fax: [+65] 832-7733

Sumitomo Eaton
Hydraulic Company Ltd.
Ooi-Cho Kameoka-Shi
621-0017 Kyoto
Japan
Telephone: [+81] 771-22-9601
Fax: [+81] 771-29-2020

Eaton Ltd.
7th Floor, Woo Duk Building
832-2 Yeoksam-Dong, Kangnam-Ku
Soeul 135-750
Korea
Telephone: [+82] 2-557-0595
Fax: [+82] 2-557-1634

Eaton Hydraulics (Shanghai) Co. Ltd.
388 Aidu Road, Waigaogiao FTZ
Pudong New Area
Shanghai 200137
Peoples Republic of China
Telephone: [+86] 21-5046 0758
Fax: [+86] 21-5046 0767

Jining Eaton Hydraulic Co. Ltd.
6 Ji Da Road
Jining City
Shandong Province 272131
Peoples Republic of China
Telephone: [+86] 537-2221288
Fax: [+86] 537-2221557

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