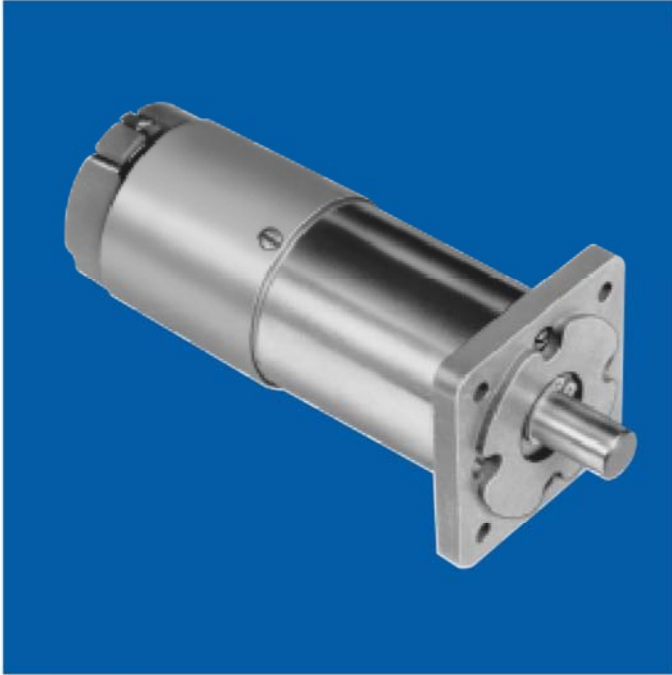


# CMM & CLL GEARMOTORS

DC Permanent Magnet Planetary Gearmotors



**torque rating:** 3.0 to 1,250 oz. in.

**weight:** 10 to 16 ounces depending on ratio

**gears:** Precision manufactured and heat treated for reliable performance and long life

**shaft:** Precision-ground No. 416 nitrided/stainless steel.  
Options: length, smaller diameter, flats, pinions, gears, holes (through or tapped), threaded ends and tapers. Shaft material may change depending upon options selected

**backlash:** Varies with ratio, but average backlash is 3°

**gear inertia:**  $1.2 \times 10^{-5}$  oz. in. sec.<sup>2</sup> @ input max

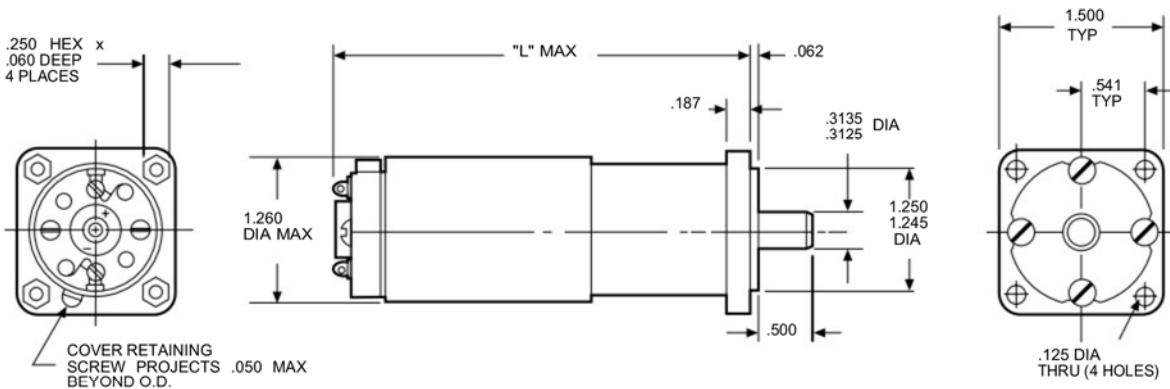
**bearings:** Motor output shaft is supported by life-lubricated ball bearings; gear train output shaft is supported by life-lubricated sleeve bearing

**gearbox housing:** Corrosion-resistant steel

**mounting flange:** Die-cast zinc

**marking:** Per MIL-STD-130

## Dimensions



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# E-2030

## Standard Part Numbers and Data

| SPEED<br>REDUCTION<br>RATIO | TORQUE<br>MULTIPLIER | MAX<br>CONT.<br>TORQUE<br>(oz. in.) | TYPE CMM GEARMOTOR |                                    | TYPE CLL GEARMOTOR |                                    |
|-----------------------------|----------------------|-------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|
|                             |                      |                                     | Dim. "L"<br>(in.)  | STANDARD<br>PART NUMBER<br>PREFIX* | Dim. "L"<br>(in.)  | STANDARD<br>PART NUMBER<br>PREFIX* |
| 4:1                         | 3.0                  | 5.1                                 | 2.86               | 317A102                            | 3.22               | 319A100                            |
| 5:1                         | 3.8                  | 6.5                                 | 2.86               | 317A103                            | 3.22               | 319A101                            |
| 6:1                         | 4.5                  | 7.7                                 | 2.86               | 317A104                            | 3.22               | 319A102                            |
| 16:1                        | 10.0                 | 17.0                                | 3.11               | 317A105                            | 3.45               | 319A103                            |
| 20:1                        | 13.0                 | 22.0                                | 3.11               | 317A106                            | 3.45               | 319A104                            |
| 24:1                        | 15.0                 | 26.0                                | 3.11               | 317A107                            | 3.45               | 319A105                            |
| 25:1                        | 16.0                 | 27.0                                | 3.11               | 317A108                            | 3.45               | 319A106                            |
| 30:1                        | 19.0                 | 32.0                                | 3.11               | 317A109                            | 3.45               | 319A107                            |
| 36:1                        | 23.0                 | 39.0                                | 3.11               | 317A110                            | 3.45               | 319A108                            |
| 64:1                        | 33.0                 | 56.0                                | 3.34               | 317A111                            | 3.69               | 319A109                            |
| 80:1                        | 41.0                 | 70.0                                | 3.34               | 317A112                            | 3.69               | 319A110                            |
| 96:1                        | 49.0                 | 83.0                                | 3.34               | 317A113                            | 3.69               | 319A111                            |
| 100:1                       | 51.0                 | 87.0                                | 3.34               | 317A114                            | 3.69               | 319A112                            |
| 120:1                       | 61.0                 | 104.0                               | 3.34               | 317A115                            | 3.69               | 319A113                            |
| 125:1                       | 64.0                 | 109.0                               | 3.34               | 317A116                            | 3.69               | 319A114                            |
| 144:1                       | 74.0                 | 126.0                               | 3.34               | 317A117                            | 3.69               | 319A115                            |
| 150:1                       | 77.0                 | 131.0                               | 3.34               | 317A118                            | 3.69               | 319A116                            |
| 180:1                       | 92.0                 | 156.0                               | 3.34               | 317A119                            | 3.69               | 319A117                            |
| 216:1                       | 110.0                | 187.0                               | 3.34               | 317A120                            | 3.69               | 319A118                            |
| 256:1                       | 105.0                | 179.0                               | 3.58               | 317A121                            | 3.92               | 319A119                            |
| 320:1                       | 130.0                | 221.0                               | 3.58               | 317A122                            | 3.92               | 319A120                            |
| 384:1                       | 157.0                | 167.0                               | 3.58               | 317A123                            | 3.92               | 319A121                            |
| 400:1                       | 164.0                | 279.0                               | 3.58               | 317A124                            | 3.92               | 319A122                            |
| 480:1                       | 197.0                | 335.0                               | 3.58               | 317A125                            | 3.92               | 319A123                            |
| 500:1                       | 205.0                | 349.0                               | 3.58               | 317A126                            | 3.92               | 319A124                            |
| 576:1                       | 235.0                | 401.0                               | 3.58               | 317A127                            | 3.92               | 319A125                            |
| 600:1                       | 246.0                | 418.0                               | 3.58               | 317A128                            | 3.92               | 319A126                            |
| 625:1                       | 256.0                | 435.0                               | 3.58               | 317A129                            | 3.92               | 319A127                            |
| 720:1                       | 295.0                | 502.0                               | 3.58               | 317A130                            | 3.92               | 319A128                            |
| 750:1                       | 306.0                | 520.0                               | 3.58               | 317A131                            | 3.92               | 319A129                            |
| 864:1                       | 352.0                | 598.0                               | 3.58               | 317A132                            | 3.92               | 319A130                            |
| 900:1                       | 370.0                | 629.0                               | 3.58               | 317A133                            | 3.92               | 319A131                            |
| 1,024:1                     | 334.0                | 568.0                               | 3.81               | 317A134                            | 4.16               | 319A132                            |
| 1,080:1                     | 442.0                | 757.0                               | 3.58               | 317A135                            | 3.92               | 319A133                            |
| 1,280:1                     | 416.0                | 707.0                               | 3.81               | 317A136                            | 4.16               | 319A134                            |
| 1,296:1                     | 530.0                | 901.0                               | 3.58               | 317A137                            | 3.92               | 319A135                            |
| 1,536:1                     | 500.0                | 850.0                               | 3.81               | 317A138                            | 4.16               | 319A136                            |
| 1,600:1                     | 522.0                | 887.0                               | 3.81               | 317A139                            | 4.16               | 319A137                            |
| 1,920:1                     | 625.0                | 1,063                               | 3.81               | 317A140                            | 4.16               | 319A138                            |
| 2,000:1                     | 652.0                | 1,108                               | 3.81               | 317A141                            | 4.16               | 319A139                            |
| 2,304:1                     | 750.0                | 1,250                               | 3.81               | 317A142                            | 4.16               | 319A140                            |
| 2,400:1                     | 780.0                | 1,250                               | 3.81               | 317A143                            | 4.16               | 319A141                            |
| 2,500:1                     | 815.0                | 1,250                               | 3.81               | 317A144                            | 4.16               | 319A142                            |
| 2,880:1                     | 940.0                | 1,250                               | 3.81               | 317A145                            | 4.16               | 319A143                            |
| 3,000:1                     | 980.0                | 1,250                               | 3.81               | 317A146                            | 4.16               | 319A144                            |
| 3,125:1                     | 1,020                | 1,250                               | 3.81               | 317A147                            | 4.16               | 319A145                            |
| 3,456:1                     | 1,130                | 1,250                               | 3.81               | 317A148                            | 4.16               | 319A146                            |
| 3,600:1                     | 1,170                | 1,250                               | 3.81               | 317A149                            | 4.16               | 319A147                            |
| 3,750:1                     | 1,220                | 1,250                               | 3.81               | 317A150                            | 4.16               | 319A148                            |
| 4,096:1                     | 1,070                | 1,250                               | 4.03               | 317A151                            | 4.39               | 319A149                            |
| 4,320:1                     | 1,410                | 1,250                               | 3.81               | 317A152                            | 4.16               | 319A150                            |
| 4,500:1                     | 1,470                | 1,250                               | 3.81               | 317A153                            | 4.16               | 319A151                            |
| 5,120:1                     | 1,340                | 1,250                               | 4.03               | 317A154                            | 4.39               | 319A152                            |
| 5,184:1                     | 1,690                | 1,250                               | 3.81               | 317A155                            | 4.16               | 319A153                            |
| 5,400:1                     | 1,760                | 1,250                               | 3.81               | 317A156                            | 4.16               | 319A154                            |

\*NOTE: Standard part numbers and data continued on page 12 and 13

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# CMM & CLL GEARMOTORS

DC Permanent Magnet Planetary Gearmotors

# E-2030

## Standard Part Numbers and Data

| SPEED<br>REDUCTION<br>RATIO | TORQUE<br>MULTIPLIER | MAX<br>CONT.<br>TORQUE<br>(oz. in.) | TYPE CMM GEARMOTOR |                                    | TYPE CLL GEARMOTOR |                                    |
|-----------------------------|----------------------|-------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|
|                             |                      |                                     | Dim. "L"<br>(in.)  | STANDARD<br>PART NUMBER<br>PREFIX* | Dim. "L"<br>(in.)  | STANDARD<br>PART NUMBER<br>PREFIX* |
| 6,144:1                     | 1,610                | 1,250                               | 4.03               | 317A157                            | 4.39               | 319A155                            |
| 6,400:1                     | 1,680                | 1,250                               | 4.03               | 317A158                            | 4.39               | 319A156                            |
| 6,480:1                     | 2,110                | 1,250                               | 3.81               | 317A159                            | 4.16               | 319A157                            |
| 7,680:1                     | 2,010                | 1,250                               | 4.03               | 317A160                            | 4.39               | 319A158                            |
| 7,776:1                     | 2,530                | 1,250                               | 3.81               | 317A161                            | 4.16               | 319A159                            |
| 8,000:1                     | 2,100                | 1,250                               | 4.03               | 317A162                            | 4.39               | 319A160                            |
| 9,216:1                     | 2,390                | 1,250                               | 4.03               | 317A163                            | 4.39               | 319A161                            |
| 9,600:1                     | 2,520                | 1,250                               | 4.03               | 317A164                            | 4.39               | 319A162                            |
| 10,000:1                    | 2,620                | 1,250                               | 4.03               | 317A165                            | 4.39               | 319A163                            |
| 11,520:1                    | 3,010                | 1,250                               | 4.03               | 317A166                            | 4.39               | 319A164                            |
| 12,000:1                    | 3,140                | 1,250                               | 4.03               | 317A167                            | 4.39               | 319A165                            |
| 12,500:1                    | 3,280                | 1,250                               | 4.03               | 317A168                            | 4.39               | 319A166                            |
| 13,824:1                    | 3,620                | 1,250                               | 4.03               | 317A169                            | 4.39               | 319A167                            |
| 14,400:1                    | 3,780                | 1,250                               | 4.03               | 317A170                            | 4.39               | 319A168                            |
| 15,000:1                    | 3,940                | 1,250                               | 4.03               | 317A171                            | 4.39               | 319A169                            |
| 15,625:1                    | 4,100                | 1,250                               | 4.03               | 317A172                            | 4.39               | 319A170                            |
| 17,280:1                    | 4,520                | 1,250                               | 4.03               | 317A173                            | 4.39               | 319A171                            |
| 18,000:1                    | 4,710                | 1,250                               | 4.03               | 317A174                            | 4.39               | 319A172                            |
| 18,750:1                    | 4,910                | 1,250                               | 4.03               | 317A175                            | 4.39               | 319A173                            |
| 20,736:1                    | 5,430                | 1,250                               | 4.03               | 317A176                            | 4.39               | 319A174                            |
| 21,600:1                    | 5,660                | 1,250                               | 4.03               | 317A177                            | 4.39               | 319A175                            |
| 22,500:1                    | 4,900                | 1,250                               | 4.03               | 317A178                            | 4.39               | 319A176                            |
| 25,920:1                    | 6,790                | 1,250                               | 4.03               | 317A179                            | 4.39               | 319A177                            |
| 27,000:1                    | 7,070                | 1,250                               | 4.03               | 317A180                            | 4.39               | 319A178                            |
| 31,104:1                    | 8,150                | 1,250                               | 4.03               | 317A181                            | 4.39               | 319A179                            |
| 32,400:1                    | 8,500                | 1,250                               | 4.03               | 317A182                            | 4.39               | 319A180                            |
| 38,880:1                    | 10,200               | 1,250                               | 4.03               | 317A183                            | 4.39               | 319A181                            |
| 46,656:1                    | 12,200               | 1,250                               | 4.03               | 317A184                            | 4.39               | 319A182                            |

Maximum continuous rated torque values are based upon motor temperature rise considerations. Starting or impact loads greater than 10 times the rated maximum continuous torque (1,500 oz. in. maximum) could result in gear or shaft damage

### \*When You Order

Each of the basic motor armature windings (see chart, next page) can be used with any of the gear ratios listed in the two preceding charts. To order, state the gear train standard part number prefix, plus a motor armature winding dash number. EXAMPLE: 317A112-24 is a 80:1 CMM gear train with a "-24" armature winding, 12 volts, 18,000 rpm, .50 oz. in. torque, etc.

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# E-2030

## Basic Motor Data

| VOLTAGE<br>(VDC) | SPEED<br>no load<br>(rpm) | TORQUE                    |   | CURRENT                  |                             |                                  | CONSTANTS                           |             | STANDARD<br>PART<br>NUMBERS* |
|------------------|---------------------------|---------------------------|---|--------------------------|-----------------------------|----------------------------------|-------------------------------------|-------------|------------------------------|
|                  |                           | max<br>rated<br>(oz. in.) | **<br>theoretical<br>stall<br>(oz. in.) | max<br>no load<br>(amps) | max<br>rated load<br>(amps) | **<br>nominal<br>stall<br>(amps) | K <sub>T</sub><br>(oz. in./<br>amp) | R<br>(ohms) |                              |

### Type CMM Motors

|    |               |      |     |       |      |      |       |        |     |
|----|---------------|------|-----|-------|------|------|-------|--------|-----|
| 6  | 12,000-14,000 | .75  | 4.5 | 1.120 | 2.00 | 9.9  | .58   | .66    | -5  |
| 12 | 18,000-21,400 | .50  | 6.8 | .820  | 1.20 | 11.8 | .77   | 1.11   | -24 |
| 12 | 14,500-17,000 | .70  | 4.0 | .700  | 1.20 | 7.5  | .97   | 1.75   | -3  |
| 12 | 12,400-14,700 | .75  | 4.7 | .610  | 1.20 | 5.1  | 1.12  | 2.56   | -21 |
| 12 | 11,000-13,000 | 1.00 | 4.0 | .520  | 1.20 | 4.6  | 1.26  | 2.87   | -4  |
| 24 | 19,200-22,800 | .35  | 7.3 | .470  | .60  | 6.3  | 1.45  | 4.17   | -7  |
| 24 | 16,000-19,000 | .60  | 4.8 | .370  | .60  | 3.8  | 1.74  | 6.30   | -1  |
| 24 | 11,500-14,000 | 1.00 | 4.0 | .260  | .60  | 2.1  | 2.42  | 11.02  | -2  |
| 24 | 10,700-12,700 | 1.00 | 4.1 | .225  | .60  | 1.6  | 2.60  | 15.00  | -8  |
| 24 | 9,600-11,400  | 1.00 | 3.6 | .220  | .50  | 1.1  | 2.90  | 21.00  | -22 |
| 24 | 8,000-10,000  | 1.00 | 3.0 | .190  | .45  | .93  | 3.48  | 25.20  | -10 |
| 24 | 6,000-7,000   | .80  | 2.4 | .140  | .30  | .55  | 4.65  | 42.30  | -11 |
| 50 | 14,300-17,000 | .70  | 5.4 | .160  | .30  | 1.30 | 4.06  | 37.00  | -25 |
| 50 | 9,500-11,500  | 1.00 | 3.5 | .120  | .30  | .71  | 6.00  | 69.00  | -16 |
| 50 | 8,000-10,000  | 1.00 | 2.8 | .100  | .20  | .50  | 6.77  | 98.00  | -12 |
| 50 | 6,700-8,000   | .80  | 2.5 | .080  | .16  | .30  | 8.71  | 159.00 | -15 |
| 50 | 4,600-5,500   | .80  | 1.7 | .060  | .12  | .20  | 10.83 | 249.00 | -13 |

### Type CLL Motors

|    |               |      |     |      |      |      |       |        |     |
|----|---------------|------|-----|------|------|------|-------|--------|-----|
| 6  | 7,600-9,400   | 1.60 | 6.0 | .860 | 2.00 | 7.00 | .90   | .80    | -5  |
| 12 | 11,500-14,000 | 1.10 | 8.0 | .730 | 1.70 | 8.40 | 1.20  | 1.35   | -24 |
| 12 | 9,000-11,000  | 1.70 | 5.2 | .510 | 1.20 | 5.30 | 1.51  | 2.13   | -3  |
| 24 | 16,000-19,000 | .75  | 8.8 | .530 | 1.00 | 7.30 | 1.74  | 3.12   | -21 |
| 24 | 14,000-17,000 | .85  | 7.8 | .440 | .85  | 6.50 | 1.96  | 3.50   | -4  |
| 24 | 12,000-14,500 | 1.00 | 7.5 | .380 | .80  | 4.50 | 2.26  | 5.08   | -7  |
| 24 | 10,400-12,300 | 1.10 | 6.2 | .320 | .75  | 3.30 | 2.71  | 7.68   | -1  |
| 24 | 7,400-8,900   | 1.60 | 5.5 | .240 | .70  | 1.70 | 3.77  | 13.43  | -2  |
| 24 | 6,900-8,200   | 1.80 | 3.8 | .210 | .65  | 1.20 | 4.05  | 18.28  | -8  |
| 24 | 6,200-7,400   | 1.80 | 3.4 | .190 | .60  | .89  | 4.52  | 25.59  | -22 |
| 24 | 5,200-6,200   | 1.20 | 4.8 | .170 | .45  | .74  | 5.42  | 30.70  | -10 |
| 50 | 7,600-9,400   | 1.50 | 7.5 | .110 | .25  | .92  | 7.25  | 51.55  | -11 |
| 75 | 14,000-17,000 | 1.00 | 8.6 | .10  | .29  | 1.60 | 6.33  | 45.10  | -25 |
| 75 | 9,000-11,000  | 1.70 | 6.8 | .07  | .29  | .85  | 9.36  | 84.10  | -16 |
| 75 | 8,000-10,000  | 1.80 | 5.4 | .06  | .26  | .60  | 10.56 | 119.40 | -12 |
| 75 | 6,500-8,000   | 1.20 | 4.3 | .05  | .20  | .37  | 13.58 | 194.00 | -15 |
| 75 | 4,500-5,300   | 1.00 | 3.4 | .04  | .10  | .23  | 16.89 | 303.00 | -13 |

\*\*Because of brush drop and field distortion, current and torque indicated will not always be attainable

### \*When You Order

Each of the basic motor armature windings can be used with any of the gear ratios listed in the preceding charts. To order, state the gear train standard part number prefix, plus a motor armature winding dash number. EXAMPLE: 317A112-24 is a 80:1 CMM gear train with a "-24" armature winding, 12 volts, 18,000 rpm, .50 oz. in. torque, etc.

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