# CONIC SYSTEMS

## *HD Series*

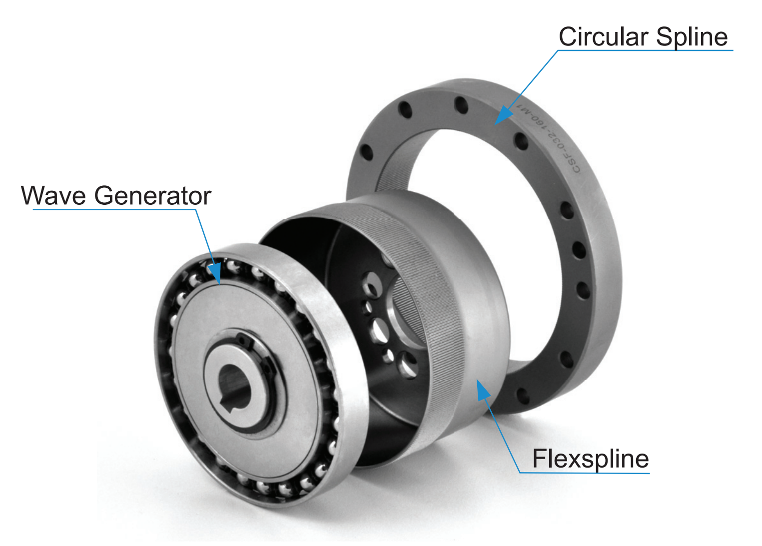
# Harmonic Gearing
## Component Sets

- HDC Zero Backlash Cup Series
- HDF Compact Pancake Series
- HDA Heavy Duty Pancake w/ Hubs
- HDR Heavy Duty Pancake
- HDB Back-to-Back 1:1 Pancake

# Table of Contents

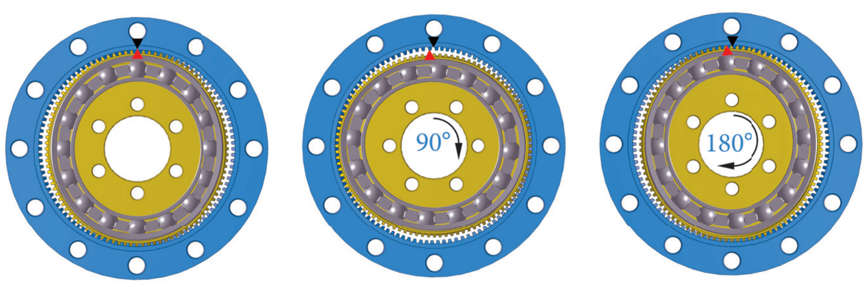
# Harmonic Gearing Features and Benefits

- Zero tooth backlash maintained for the life of the unit for cup styles and low backlash for pancake styles
- Positional accuracy of +/- 1.5 arc-min and +/- 0.5 arc-min by request
- Repeatability typically within a few arc-sec
- Single stage, high reduction ratios of 50:1 to 160:1
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio
- High torque capacity with a large number of teeth sharing load

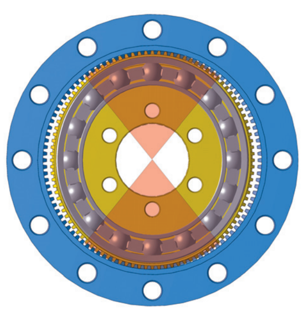



## Harmonic Gearing Tooth Engagement

Tooth engagement between the flexspline and the circular spline takes place at two areas located 180° to each other on the ellipse's major axis. The rotation of the wave generator inside the flexspline generates relative motion between the two splines.

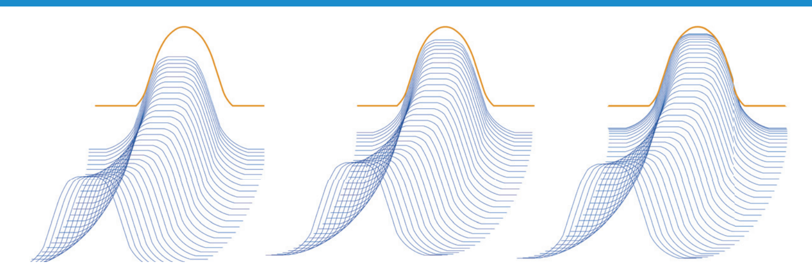



Example: With 100:1 ratio, 100 clockwise input motor rotations result in 1 counterclockwise output rotation.



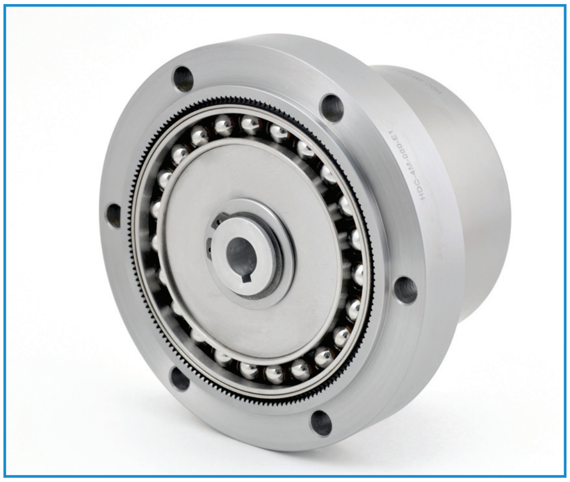
Tooth Engagement Zones

Characteristically, 30-40 percent of the teeth are engaged dependent upon the ratio, and load is shared amongst many teeth giving the drive its high torque capacity.



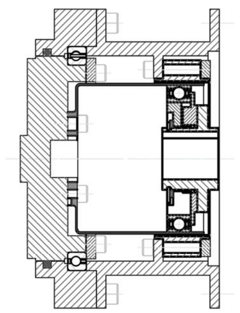
# HDC Zero Backlash Cup Series

**The HDC Series** is a traditional, zero backlash harmonic gear set. It is an excellent choice for applications where axial space is not critical. The standard HDC includes an Oldham coupling on the wave generator input. For zero lost motion between the input motor shaft and wave generator, the wave generator can be modified for direct mounting to the input shaft. Conic manufactures three versions to easily meet most replacement applications without any modifications.



## HDC Installation Examples and Model Options

Speed Reducer

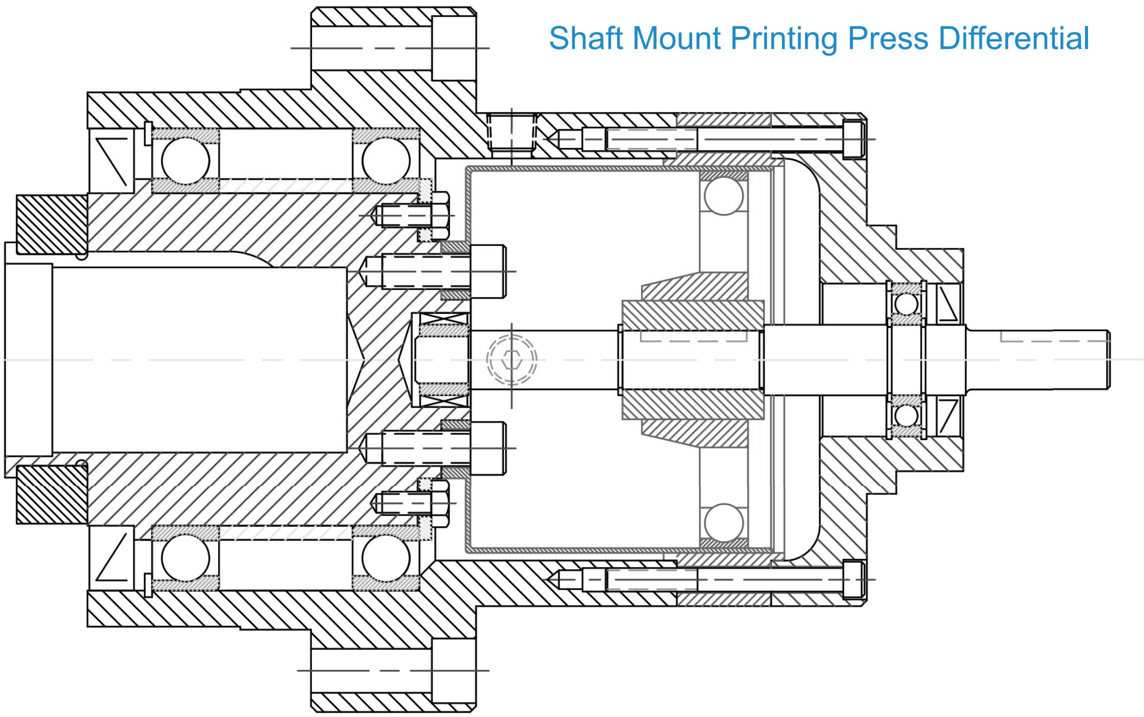


The HDC Series is offered in three model options:

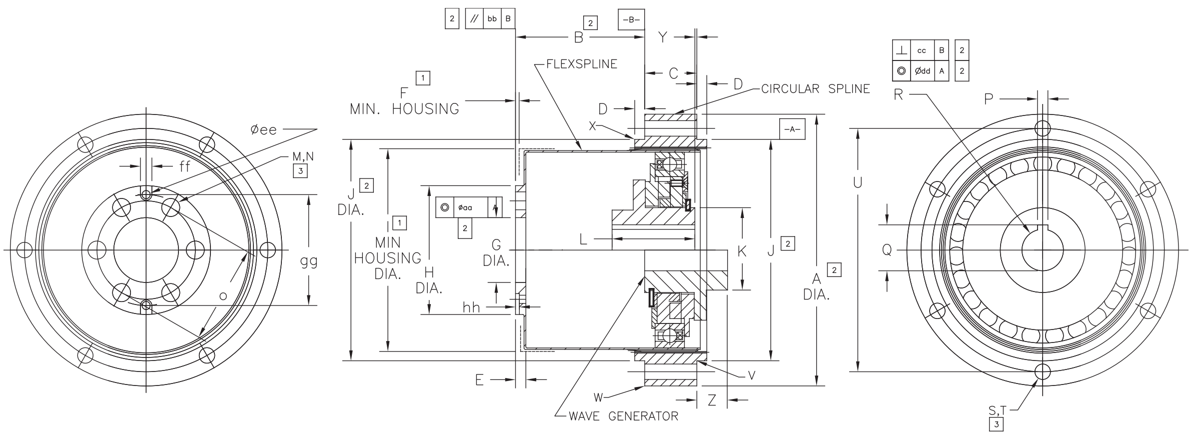
- E1 – English dimensioned unit that is a bolt-in replacement for early harmonic gearing sets manufactured in the USA. The flexspline mounting flange is thinner than the E2 version.
- E2 – English dimensioned unit that is a bolt-in replacement for units previously manufactured in Japan. The flexspline mounting flange is thicker than the E1 version.

  E1 and E2 units are interchangeable if care is taken to ensure proper mounting bolt lengths are used.
- M1 – Industry standard metric dimensioned version.

Shaft Mount Printing Press Differential



# HDC-E1 Dimensions




| | 1C | 3C | 5C | 1M | 2M | 4M | 8M | 15M |
|---|---|---|---|---|---|---|---|---|
| ØA | 2.0 | 2.625 | 3.28 | 4.250 | 5.25 | 6.63 | 8.63 | 10.63 |
| B | .940 ± .015 | 1.270 ± .015 | 1.560 ± .015 | 2.030 ± .015 | 2.50 ± 020 | 3.204 ± .025 | 4.160 ± .035 | 5.060 ± .040 |
| C | .38 | .50 | .63 | .81 | 1.00 | 1.09 | 1.44 | 1.88 |
| D | .09 | .11 | .12 | .13 | .14 | .16 | .19 | .25 |
| E | .125 | .125 | .135 | .197 | .260 | .260 | .322 | .388 |
| F | .08 | .04 | .08 | .08 | .11 | .06 | .10 | .12 |
| ØG | .4375 +.0007 -0 | .6255 +.0005 -0 | .7817 +.0005 -0 | 1.0631 +.0006 -0 | 1.2818 +.0006 -0 | 1.6257 +.0007 -0 | 2.0945 +.0008 -0 | 2.5633 +.0008 -0 |
| ØH | .830 | 1.244 | 1.555 | 2.000 | 2.520 | 3.125 | 4.055 | 5.000 |
| ØI | 1.47 | 2.06 | 2.58 | 3.33 | 4.12 | 5.15 | 6.67 | 8.24 |
| ØJ | 1.5000 +0 -.0012 | 2.1410 +0 -.0012 | 2.6723 +0 -.0025 | 3.5005 +0 -.0012 | 4.2818 +0 -.0013 | 5.3445 +0 -.0028 | 6.9539 +0 -.0029 | 8.5634 +0 -.0032 |
| ØK | .551 | .826 | 1.023 +0 -.001 | 1.023 +0 -.001 | 1.260 +0 -.001 | 1.260 +0 -.002 | 1.890 +0 -.002 | 2.165 +.002 -.002 |
| L | .63 | .750 +0 -.010 | 1.000 +0 -.010 | 1.000 +0 -.010 | 1.500 +0 -.010 | 1.500 +0 -.010 | 1.875 +0 -.010 | 2.437 +0 -.010 |
| M | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| ØN | .125 +.010 -.002 | .187 +.010 -.002 | .218 +.010 -.002 | .343 +.010 -.002 | .406 +.010 -.002 | .406 +.010 -.002 | .531 +.010 -.002 | .781 +.010 -.002 |
| ØO | .656 | .937 | 1.187 | 1.531 | 1.875 | 2.312 | 3.062 | 3.750 |
| P | .062 PIN | .0937 +.002 -0 | .125 +.002 -0 | .125 +.002 -0 | .1875 +.002 -0 | .1875 +.002 -0 | .1875 +.002 -0 | .250 +.002 -0 |
| Q | NA | .415 +.015 -0 | .555 +.015 -0 | .555 +.015 -0 | .710 +.010 -0 | .710 +.015 -0 | .959 +.015 -0 | 1.236 +.015 -0 |
| ØR | .250 +.001 -0 | .3750 +.0004 -0 | .5000 +.0004 -0 | .5000 +.0004 -0 | .6250 +.0005 -0 | .6250 +.0005 -0 | .8750 +.0005 -0 | 1.1250 +.0006 -0 |
| S | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 8 |
| ØT | .125 +.003 -.002 | .147 +.003 -.002 | .187 +.010 -.002 | .218 +.010 -.002 | .281 +.010 -.002 | .406 +.010 -.002 | .468 +.010 -.002 | .468 +.010 -.002 |
| ØU | 1.75 | 2.375 | 2.937 | 3.812 | 4.687 | 5.875 | 7.625 | 9.500 |
| V | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. |
| W | .016 | .016 | .015 | .015 | .015 | .015 | .015 | .015 |
| X | .016 | .016 | .015 | .015 | .015 | .015 | .015 | .015 |
| Y | .005 +0 -.010 | .028 | .067 | .099 | .075 | .047 | .105 | .088 |
| Z | NA | .242 | .361 | .211 | .569 | .448 | .562 | .787 |
| aa | .002 T.I.R. | .0017 T.I.R. | .0018 T.I.R. | .0019 T.I.R. | .0024 T.I.R. | .0026 T.I.R. | .0027 T.I.R. | .0035 T.I.R. |
| bb | .001 | .0011 | .001 | .0017 | .0019 | .0024 | .0027 | .003 |
| cc | .001 | .002 | .002 | .002 | .002 | .002 | .002 | .002 |
| dd | .004 T.I.R. | .0017 T.I.R. | .0018 T.I.R. | .0019 T.I.R. | .0024 T.I.R. | .0026 T.I.R. | .0027 T.I.R. | .0035 T.I.R. |
| ee | .098 | .116 | .116 | .125 | .135 | .236 | .236 | .236 |
| ff | .105 | .116 | .116 | .125 | .135 | .236 | .236 | .236 |
| gg | .656 | .937 | 1.343 | 1.687 | 2.207 | 2.312 | 3.062 | 3.750 |
| hh | .05 | .05 | .05 | .05 | .05 | .05 | .05 | .05 |

1 DIMENSIONS DENOTE MAXIMUM EXTENT OF ENCROACHMENT ADJOINING STRUCTURE.

2 DIMENSIONS ESTABLISH INTERFACE AND INSTALLATION REQUIREMENTS. MAINTAIN AT ASSEMBLY AND UNDER ALL OPERATING LOAD CONDITIONS.

3 USE ALLOY STEEL SCREWS TORQUED TO MAXIMUM RECOMMENDED VALUE. USE THREAD LOCKER OR OTHER MEANS TO PREVENT LOOSENING.

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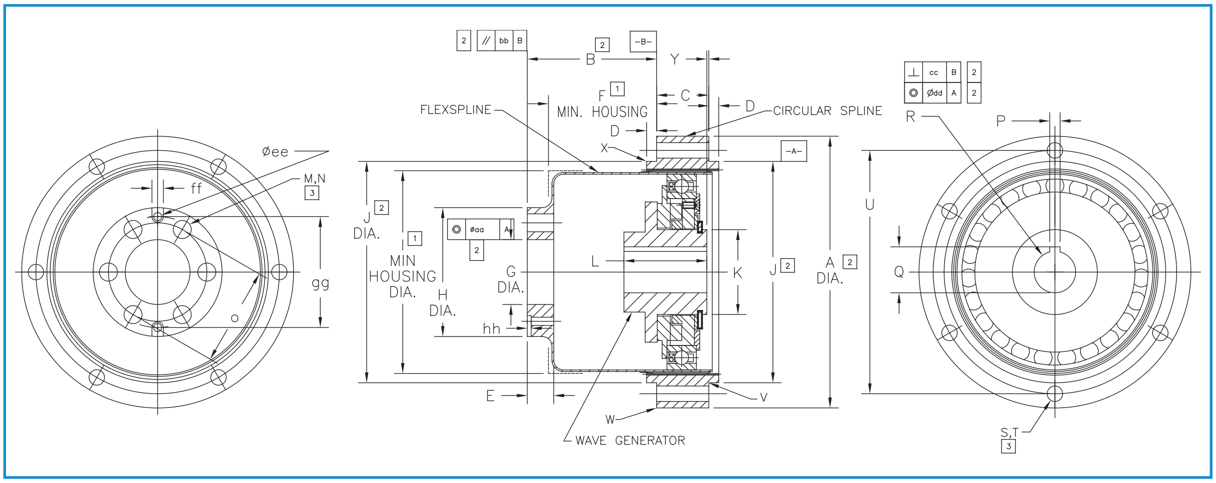
# HDC-E2 Dimensions




| | 1C | 3C | 5C | 1M | 2M | 4M | 8M | 15M |
|---|---|---|---|---|---|---|---|---|
| ØA | 2.0 | 2.630 | 3.28 | 4.250 | 5.25 | 6.63 | 8.63 | 10.63 |
| B | .940 ± .015 | 1.270 ± .015 | 1.560 ± .015 | 2.030 ± .015 | 2.50 ± 020 | 3.204 ± .025 | 4.160 ± .035 | 5.060 ± .040 |
| C | .38 | .50 | .63 | .81 | 1.00 | 1.09 | 1.44 | 1.88 |
| D | .09 | .11 | .12 | .12 | .14 | .16 | .19 | .25 |
| E | .247 | .285 | .320 | .386 | .440 | .505 | .656 | CONSULT |
| F | .791 | 1.09 | 1.34 | 1.75 | 2.20 | 2.85 | 3.69 | CONSULT |
| ØG | .4375 +.0007 -0 | .6255 +.0005 -0 | .7817 +.0005 -0 | 1.0625 +.0008 -0 | 1.2818 +.0006 -0 | 1.6250 +.0007 -0 | 2.0937 +.0008 -0 | CONSULT |
| ØH | .906 | 1.244 | 1.555 | 2.047 | 2.520 | 3.110 | 4.055 | 5.000 |
| ØI | 1.50 | 2.09 | 2.56 | 3.31 | 4.10 | 5.12 | 6.66 | 8.24 |
| ØJ | 1.5000 +0 -.0012 | 2.1410 +0 -.0012 | 2.6723 +0 -.0025 | 3.5005 +0 -.0012 | 4.2818 +0 -.0013 | 5.3445 +0 -.0028 | 6.9539 +0 -.0029 | 8.5634 +0 -.0032 |
| ØK | .551 | .827 | 1.024 | 1.024 | 1.260 | 1.260 | 1.890 | 2.165 |
| L | .630 | .750 | 1.000 | 1.000 | 1.500 | 1.500 | 1.880 | 2.437 |
| M | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| ØN | .125 +.010 -.002 | .187 +.010 -.002 | .218 +.010 -.002 | .343 +.010 -.002 | .406 +.010 -.002 | .406 +.010 -.002 | .531 +.010 -.002 | .781 +.010 -.002 |
| ØO | .656 | .937 | 1.187 | 1.531 | 1.875 | 2.312 | 3.062 | 3.750 |
| P | (2) 4-40 Set Screw | .0937 +.002 -0 | .125 +.002 -0 | .125 +.002 -0 | .1875 +.002 -0 | .1875 +.002 -0 | .1875 +.002 -0 | .250 +.002 -0 |
| Q | NA | .415 +.015 -0 | .555 +.015 -0 | .555 +.015 -0 | .704 +.015 -0 | .704 +.015 -0 | .959 +.015 -0 | 1.236 +.015 -0 |
| ØR | .250 +.001 -0 | .375 +.001 -0 | .500 +.001 -0 | .500 +.001 -0 | .625 +.001 -0 | .625 +.001 -0 | .875 +.001 -0 | 1.1250 +.0006 -0 |
| S | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 8 |
| ØT | .125 +.003 -.002 | .147 +.010 -.002 | .187 +.010 -.002 | .218 +.010 -.002 | .281 +.010 -.002 | .406 +.010 -.002 | .468 +.010 -.002 | .468 +.010 -.002 |
| ØU | 1.75 | 2.375 | 2.937 | 3.812 | 4.687 | 5.875 | 7.625 | 9.500 |
| V | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. | .005R MAX. |
| W | .016 | .016 | .015 | .015 | .015 | .015 | .015 | .015 |
| X | .016 | .016 | .015 | .015 | .015 | .015 | .015 | .015 |
| Y | .010 +0 -.010 | .028 | .067 | .099 | .075 | .047 | .105 | .088 |
| Z | NA | .242 | .361 | .211 | .569 | .448 | .562 | .787 |
| aa | .002 T.I.R. | .002 T.I.R. | .002 T.I.R. | .003 T.I.R. | .004 T.I.R. | .005 T.I.R. | .007 T.I.R. | .007 T.I.R. |
| bb | .001 | .001 | .001 | .001 | .001 | .001 | .001 | .003 |
| cc | .001 | .002 | .002 | .002 | .002 | .002 | .002 | .002 |
| dd | .004 T.I.R. | .004 T.I.R. | .005 T.I.R. | .005 T.I.R. | .006 T.I.R. | .006 T.I.R. | .007 T.I.R. | .007 T.I.R. |
| ee | .098 | .116 | .116 | .125 | .135 | .236 | .236 | .236 |
| ff | .105 | .116 | .116 | .125 | .135 | .236 | .236 | .236 |
| gg | .656 | .937 | 1.343 | 1.687 | 2.207 | 2.312 | 3.062 | 3.750 |
| hh | .05 | .05 | .05 | .05 | .05 | .05 | .05 | .05 |

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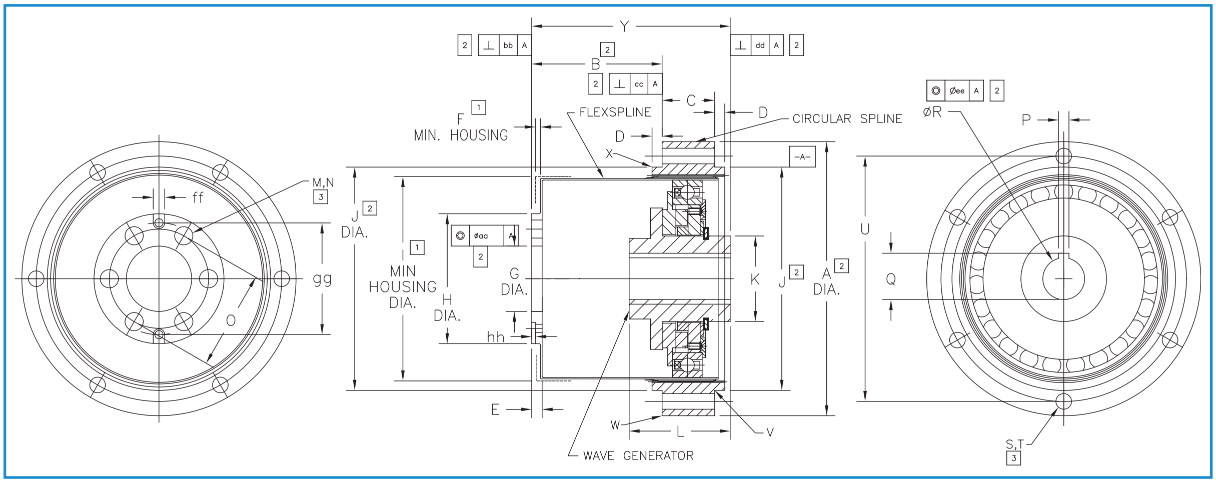
# HDC-M1 Dimensions




| | 20 | 25 | 32 | 40 | 50 | 65 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|
| ØA | 70 +0 -.019 | 85 +0 -.022 | 110 +0 -.022 | 135 +0 -.025 | 170 +0 -.025 | 215 +0 -.029 | 265 +0 -.029 | 330 +0 -.036 |
| B | 31.3 ± .3 | 40.3 ± .3 | 52.3 ± .3 | 63.3 ± .3 | 80.3 ± .3 | 100.3 ± .3 | 119.3 ± .3 | 153.5 ± .5 |
| C | 14 | 16 | 20 | 25 | 30 | 40 | 50 | 60 |
| D | 3 | 3 | 3 | 4 | 4 | 5 | 6 | 6 |
| E | 5.4 | 6.5 | 8.6 | 9.5 | 13.0 | 16.3 | 14.6 | 18 |
| F | 2 | 2 | 2 | 3 | 3 | 4 | 5 | 6 |
| ØG | 16 +.011 -0 | 20 +.013 -0 | 26 +.013 -0 | 32 +.016 -0 | 40 +.016 -0 | 52 +.019 -0 | 65 +.019 -0 | 80 +.019 -0 |
| ØH | 31.6 | 39.5 | 52 | 64 | 79 | 103 | 126 | 158 |
| ØI | 52.3 | 65 | 84.6 | 104.6 | 131 | 169.4 | 209.3 | 261 |
| ØJ | 54 +0 -.019 | 67 +0 -.019 | 90 +0 -.022 | 110 +0 -.022 | 135 +0 -.025 | 177 +0 -.025 | 218 +0 -.029 | 272 +0 -.032 |
| ØK | 21 | 26 | 26 | 32 | 32 | 48 | 55 | 65 |
| L | 27 +0 -.1 | 32 +0 -.1 | 32 +0 -.1 | 40 +0 -.1 | 40 +0 -.1 | 52 +0 -.1 | 65 +0 -.1 | 70 +0 -.1 |
| M | 6 | 6 | 6 | 6 | 6 | 6 | 12 | 12 |
| ØN | 4.5 | 5.5 | 6.6 | 9 | 14 | 14 | 11 | 14 |
| ØO | 24 | 30 | 40 | 50 | 60 | 80 | 104 | 130 |
| P | 3 ± .0125 | 4 ± .0150 | 5 ± .0150 | 5 ± .0150 | 6 ± .0150 | 8 ± .0180 | 8 ± .0180 | 8 ± .0180 |
| Q | 10.4 | 12.8 | 16.3 | 16.3 | 21.8 | 27.3 | 31.3 | 31.3 |
| ØR | 9 +.015 -0 | 11 +.018 -0 | 14 +.018 -0 | 14 +.018 -0 | 19 +.021 -0 | 24 +.021 -0 | 28 +.021 -0 | 28 +.021 -0 |
| S | 6 | 6 | 6 | 6 | 6 | 6 | 8 | 8 |
| ØT | 3.5 | 4.5 | 5.5 | 6.6 | 9 | 11 | 11 | 14 |
| ØU | 60 | 75 | 100 | 120 | 150 | 195 | 240 | 290 |
| V | .3 | .3 | .3 | .3 | .3 | .3 | .3 | .3 |
| W | .4 | .4 | .4 | .4 | .4 | .4 | .4 | .4 |
| X | .4 | .4 | .4 | .4 | .4 | .4 | .4 | .4 |
| Y | 51.5 ± .5 | 63.5 ± .5 | 77.5 ± .6 | 95.5 ± .6 | 116.4 ± .7 | 146.3 ± .7 | 177.3 ± .7 | 220.2 ± .7 |
| aa | .044 | .047 | .050 | .063 | .066 | .070 | .090 | .110 |
| bb | .028 | .036 | .044 | .050 | .060 | .070 | .080 | .090 |
| cc | .031 | .033 | .035 | .045 | .047 | .049 | .064 | .080 |
| dd | .025 | .036 | .036 | .048 | .048 | .048 | .054 | .060 |
| ee | .044 | .047 | .050 | .063 | .066 | .070 | .090 | .110 |
| ff | 2.66 | 2.94 | 2.94 | 3.17 | 3.94 | 6 | 6 | 6 |
| gg | 16.66 | 23.80 | 34.11 | 42.85 | 56.06 | 58.72 | 77.77 | 95.25 |
| hh | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 |

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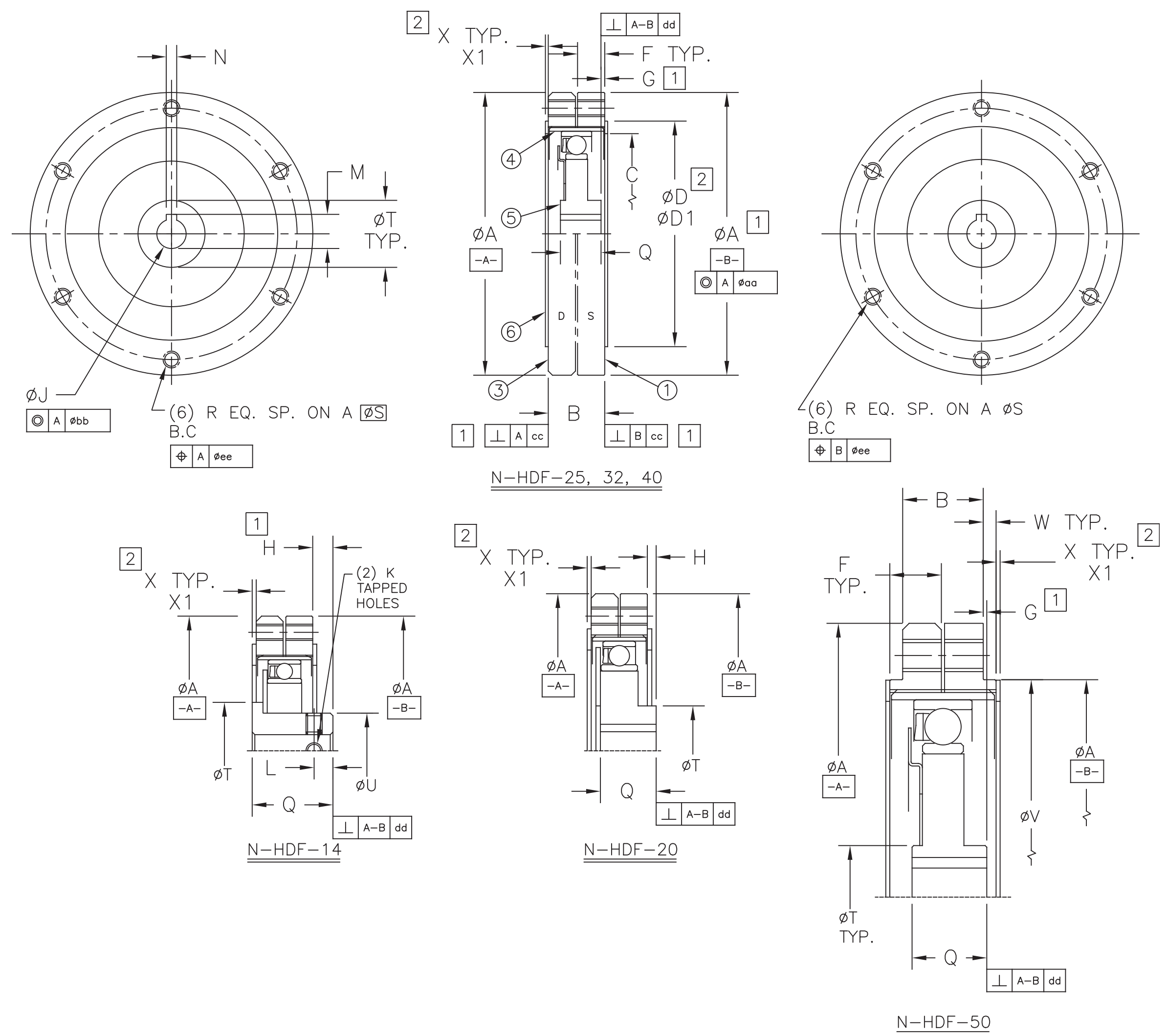
# HDC Specifications

| Size | Ratio | Input Speed 3000rpm | | | Input Speed 1500rpm | | | Input Speed 1000rpm | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Output Torque Nm | Output Speed rpm | Input Power kw | Output Torque Nm | Output Speed rpm | Input Power kw | Output Torque Nm | Output Speed rpm | Input Power kw |
| **English: 1C** | 64 | 4.5 | 46.9 | 0.025 | 4.5 | 23.4 | 0.012 | 4.5 | 15.6 | 0.008 |
| | 80 | 5 | 37.5 | 0.025 | 5.5 | 18.8 | 0.013 | 5.5 | 12.5 | 0.009 |
| **Metric: 17** | 80 | 12 | 37.5 | 0.059 | 12 | 18.8 | 0.029 | 12 | 12.5 | 0.019 |
| | 100 | 15 | 30 | 0.059 | 16.5 | 15 | 0.031 | 17 | 10 | 0.021 |
| **English: 3C Metric: 20** | 80 | 25 | 37.5 | 0.123 | 25 | 18.8 | 0.059 | 25 | 12.5 | 0.039 |
| | 84 | 25 | 35.7 | 0.117 | 25 | 17.9 | 0.056 | 25 | 11.9 | 0.037 |
| | 100 | 30 | 30 | 0.118 | 33 | 15 | 0.062 | 33.6 | 10 | 0.041 |
| | 125 | 30 | 24 | 0.097 | 37.5 | 12 | 0.058 | 43.5 | 8 | 0.044 |
| **English: 5C Metric: 25** | 80 | 40 | 37.5 | 0.197 | 40 | 18.8 | 0.094 | 40 | 12.5 | 0.062 |
| | 100 | 50 | 30 | 0.197 | 55 | 15 | 0.104 | 56 | 10 | 0.069 |
| | 120 | 50 | 25 | 0.169 | 62.5 | 12.5 | 0.101 | 72.5 | 8.3 | 0.074 |
| | 150 | 50 | 20 | 0.146 | 62.5 | 10 | 0.085 | 72.5 | 6.7 | 0.062 |
| | 160 | 50 | 18.8 | 0.139 | 62.5 | 9.4 | 0.078 | 72.5 | 6.3 | 0.057 |
| **English: 1M Metric: 32** | 80 | 100 | 37.5 | 0.493 | 100 | 18.8 | 0.235 | 100 | 12.5 | 0.153 |
| | 100 | 120 | 30 | 0.473 | 132 | 15 | 0.248 | 135 | 10 | 0.165 |
| | 135 | 120 | 22.2 | 0.363 | 150 | 11.2 | 0.215 | 175 | 7.5 | 0.163 |
| | 160 | 120 | 18.8 | 0.312 | 150 | 9.4 | 0.185 | 175 | 6.3 | 0.140 |
| | 200 | 120 | 15 | 0.264 | 150 | 7.5 | 0.156 | 175 | 5 | 0.118 |
| **English: 2M Metric: 40** | 80 | 200 | 37.5 | 0.986 | 200 | 18.8 | 0.469 | 200 | 12.5 | 0.305 |
| | 84 | 200 | 35.7 | 0.939 | 200 | 17.9 | 0.447 | 200 | 11.9 | 0.291 |
| | 100 | 240 | 30 | 0.947 | 265 | 15 | 0.497 | 270 | 10 | 0.330 |
| | 125 | 240 | 24 | 0.777 | 300 | 12 | 0.462 | 300 | 8 | 0.300 |
| | 160 | 240 | 18.8 | 0.624 | 300 | 9.4 | 0.370 | 300 | 6.3 | 0.240 |
| | 168 | 240 | 17.9 | 0.594 | 300 | 8.9 | 0.352 | 300 | 6 | 0.228 |
| | 200 | 240 | 15 | 0.527 | 300 | 7.5 | 0.312 | 300 | 5 | 0.202 |
| **English: 4M Metric: 50** | 80 | 360 | 37.5 | 1.775 | 360 | 18.8 | 0.844 | 360 | 12.5 | 0.549 |
| | 100 | 450 | 30 | 1.775 | 495 | 15 | 0.929 | 505 | 10 | 0.617 |
| | 120 | 450 | 25 | 1.518 | 550 | 12.5 | 0.881 | 600 | 8.3 | 0.625 |
| | 150 | 450 | 20 | 1.25 | 550 | 10 | 0.723 | 600 | 6.7 | 0.513 |
| | 160 | 450 | 18.8 | 1.169 | 550 | 9.4 | 0.678 | 600 | 6.3 | 0.481 |
| | 200 | 450 | 15 | 0.989 | 550 | 7.5 | 0.572 | 600 | 5 | 0.405 |
| **English: 8M Metric: 65** | 80 | | | | 800 | 18.8 | 1.876 | 800 | 12.5 | 1.221 |
| | 100 | | | | 900 | 15 | 1.689 | 1015 | 10 | 1.282 |
| | 134 | | | | 1000 | 11.2 | 1.435 | 1150 | 7.5 | 1.073 |
| | 160 | | | | 1000 | 9.4 | 1.233 | 1150 | 6.3 | 0.921 |
| | 200 | | | | 1000 | 7.5 | 1.040 | 1150 | 5 | 0.776 |
| | 267 | | | | 1000 | 5.6 | 0.823 | 1150 | 3.7 | 0.614 |
| **English: 15M Metric: 80** | 80 | | | | 1500 | 18.8 | 3.518 | 1500 | 12.5 | 2.289 |
| | 100 | | | | 1800 | 15 | 3.377 | 2000 | 10 | 2.442 |
| | 125 | | | | 2000 | 12 | 3.077 | 2300 | 8 | 2.301 |
| | 168 | | | | 2000 | 8.9 | 2.348 | 2300 | 6 | 1.755 |
| | 200 | | | | 2000 | 7.5 | 2.079 | 2300 | 5 | 1.552 |
| | 250 | | | | 2000 | 6 | 1.758 | 2300 | 4 | 1.311 |
| **Metric: 100** | 80 | | | | 2500 | 18.8 | 5.863 | 2500 | 12.5 | 3.816 |
| | 100 | | | | 3500 | 15 | 6.567 | 3650 | 10 | 4.457 |
| | 120 | | | | 3500 | 12.5 | 5.609 | 4000 | 8.3 | 4.169 |
| | 150 | | | | 3500 | 10 | 4.602 | 4000 | 6.7 | 3.419 |
| | 160 | | | | 3500 | 9.4 | 4.315 | 4000 | 6.3 | 3.205 |
| | 200 | | | | 3500 | 7.5 | 3.638 | 4000 | 5 | 2.699 |
| | 250 | | | | 3500 | 6 | 3.077 | 4000 | 4 | 2.280 |
| | 315 | | | | 3500 | 4.8 | 2.514 | 4000 | 3.2 | 1.920 |

# HDF Compact Pancake Series

**The HDF Series** offers the shortest axial length of all harmonic gearing components. It is designed for applications where space is the primary constraint. The drive utilizes a single wave generator bearing and is recommended for light duty speed reduction and phase shifting applications. The HDF offers low backlash, standard ratios ranging from 64:1 to 200:1, and torque capacities up to 1000 Nm. Custom drives are available upon request.



# HDF-M1 Dimensions

| | 14 | 20 | 25 | 32 | 40 | 50 |
|---|---|---|---|---|---|---|
| **ØA** | 50 +0 -.015 | 70 +0 -.018 | 85 +0 -.023 | 110 +0 -.025 | 135 +0 -.025 | 170 +0 -.025 |
| **B** | 10.7 ± .15 | 12.7 ± .15 | 17 ± .25 | 21 ± .25 | 27 ± .30 | 25 ± .30 |
| **ØC** | 32 ± .51 | 47 ± .51 | 59 ± .51 | 77 ± .51 | 95 ± .51 | 119 ± .51 |
| **ØD** | 39.5 ± .51 | 54 ± .51 | 69.4 ± .51 | 92.1 ± .51 | 111.1 ± .51 | 134.4 ± .51 |
| **ØD1** | 40.2 ± .51 | 54.7 ± .51 | 70.2 ± .51 | 92.9 ± .51 | 111.9 ± .51 | 135.2 ± .51 |
| **F** | 5 ± .1 | 6 ± .1 | 8 ± .2 | 10 ± .2 | 13 ± .2 | 16 ± .2 |
| **G** | - | - | .38 ± .38 | .94 ± .38 | 1.8 ± .38 | 1.12 ± .38 |
| **H** | 3.76 ± .38 | .94 ± .38 | - | - | - | - |
| **ØJ** | 6 +.012 -0 | 9 +.015 -0 | 11 +.018 -0 | 14 +.020 -0 | 14 +.020 -0 | 19 +.020 -0 |
| **K** | M3 x 0.5 | - | - | - | - | - |
| **L** | 3.5 ± .38 | - | - | - | - | - |
| **ØM** | - | 10.4 +.1 -0 | 12.8 +.1 -0 | 16.3 +.1 -0 | 16.3 +.1 -0 | 21.8 +.1 -0 |
| **N** | - | 3 ± .0125 | 4 ± .013 | 5 ± .013 | 5 ± .013 | 6 ± .013 |
| **Q** | 15.0 | 11.4 | 12.8 | 15.6 | 19.4 | 23.2 |
| **R** | M3 x 0.5 | M4 x 0.7 | M5 x 0.8 | M6 x 1.0 | M8 x 1.25 | M10 x 1.5 |
| **S** | 44 | 60 | 75 | 100 | 120 | 150 |
| **ØT** | 18 | 20 | 28 | 36 | 32 | 50 |
| **ØU** | 14 | - | - | - | - | - |
| **ØV** | - | - | - | - | - | 135 +0 -.025 |
| **W** | - | - | - | - | - | 4.52 ± .1 |
| **X** | .81 ± .13 | .81 ± .13 | .81 ± .13 | .81 ± .13 | 1.57 ± .13 | 1.57 ± .13 |
| **X1** | .94 +.13 -0 | .94 +.13 -0 | .94 +.13 -0 | .94 +.13 -0 | 1.70 +.13 -0 | 1.70 +.13 -0 |
| **aa** | .050 | .070 | .076 | .078 | .088 | .098 |
| **bb** | .013 | .013 | .015 | .015 | .018 | .020 |
| **cc** | .018 | .018 | .023 | .025 | .025 | .025 |
| **dd** | .010 | .010 | .013 | .013 | .013 | .015 |
| **ee** | .25 | .25 | .25 | .25 | .25 | .25 |
| **Weight kg (lb)** | .09 (.2) | .32 (.7) | .59 (1.3) | 1.04 (2.3) | 2 (4.4) | 3.31 (7.3) |

A
ITEM 1 STATIC CIRCULAR SPLINE MARKED “S”
ITEM 2 ONLY APPEARS WITH HDR & HDA
ITEM 3 DYNAMIC CIRCULAR SPLINE MARKED “D”
ITEM 4 FLEXSPLINE
ITEM 5 WAVE GENERATOR
ITEM 6 WEAR WASHERS

B DIMENSIONS MARKED 1 ESTABLISH INTERFACE AND INSTALLATION REQUIREMENTS, AND MUST BE MAINTAINED UNDER ALL OPERATING CONDITIONS.

C DIMENSIONS MARKED 2 ARE NECESSARY TO LOCATE WEAR WASHERS, ITEM 6, IN CORRECT POSITION.

D HDF 50 CAN BE LOCATED ON THE OUTER DIAMETER OF THE CIRCULAR SPLINE, DIMENSION A, OR ON THE PLOT DIAMETER DIMENSION V.

E DRAWING IS FOR DIMENSIONAL REVIEW ONLY. **DO NOT SCALE**

# HDF Specifications

| Size | Ratio | Input Speed 3000rpm | | | Input Speed 1500rpm | | | Input Speed 1000rpm | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Output Torque Nm | Output Speed rpm | Input Power kw | Output Torque Nm | Output Speed rpm | Input Power kw | Output Torque Nm | Output Speed rpm | Input Power kw |
| **14** | 64 | 3 | 46.9 | 0.023 | 3 | 23.4 | 0.012 | 3.5 | 15.6 | 0.009 |
| | 80 | 3.5 | 37.5 | 0.022 | 3.5 | 18.8 | 0.011 | 4 | 12.5 | 0.009 |
| **20** | 80 | 15 | 37.5 | 0.096 | 15 | 18.8 | 0.049 | 15 | 12.5 | 0.033 |
| | 84 | 15 | 35.7 | 0.092 | 15 | 17.9 | 0.047 | 15 | 11.9 | 0.031 |
| | 100 | 18 | 30 | 0.092 | 20 | 15 | 0.052 | 22 | 10 | 0.038 |
| | 120 | 20 | 25 | 0.085 | 22.5 | 12.5 | 0.049 | 25 | 8.3 | 0.036 |
| | 126 | 20 | 23.8 | 0.081 | 22.5 | 11.9 | 0.047 | 25 | 7.9 | 0.034 |
| **25** | 80 | 25 | 37.5 | 0.160 | 25 | 18.8 | 0.082 | 27.5 | 12.5 | 0.060 |
| | 100 | 30 | 30 | 0.154 | 33 | 15 | 0.086 | 35 | 10 | 0.061 |
| | 120 | 32 | 25 | 0.137 | 35 | 12.5 | 0.076 | 38 | 8.3 | 0.055 |
| | 150 | 36 | 20 | 0.134 | 40 | 10 | 0.070 | 43.5 | 6.7 | 0.051 |
| | 160 | 36 | 18.8 | 0.126 | 40 | 9.4 | 0.066 | 40 | 6.3 | 0.043 |
| **32** | 80 | 55 | 37.5 | 0.353 | 55 | 18.8 | 0.180 | 55 | 12.5 | 0.120 |
| | 100 | 70 | 30 | 0.359 | 77 | 15 | 0.202 | 80 | 10 | 0.140 |
| | 135 | 80 | 22.2 | 0.332 | 88 | 11.1 | 0.170 | 97 | 7.4 | 0.125 |
| | 160 | 85 | 18.8 | 0.297 | 93.5 | 9.4 | 0.153 | 102 | 6.3 | 0.112 |
| | 200 | 85 | 15 | 0.238 | 93.5 | 7.5 | 0.122 | 102 | 5 | 0.089 |
| **40** | 80 | 100 | 37.5 | 0.641 | 100 | 18.8 | 0.328 | 100 | 12.5 | 0.218 |
| | 84 | 100 | 35.7 | 0.610 | 100 | 17.9 | 0.312 | 100 | 11.9 | 0.208 |
| | 100 | 120 | 30 | 0.615 | 132 | 15 | 0.346 | 135 | 10 | 0.236 |
| | 125 | 135 | 24 | 0.554 | 150 | 12 | 0.314 | 150 | 8 | 0.209 |
| | 160 | 150 | 18.8 | 0.524 | 165 | 9.4 | 0.271 | 165 | 6.3 | 0.181 |
| | 168 | 150 | 17.9 | 0.499 | 165 | 8.9 | 0.256 | 165 | 6 | 0.173 |
| **50** | 80 | 180 | 37.5 | 1.154 | 180 | 18.8 | 0.59 | 180 | 12.5 | 0.393 |
| | 100 | 220 | 30 | 1.128 | 240 | 15 | 0.628 | 245 | 10 | 0.428 |
| | 120 | 250 | 25 | 1.068 | 275 | 12.5 | 0.6 | 280 | 8.3 | 0.406 |
| | 150 | 280 | 20 | 1.044 | 310 | 10 | 0.544 | 320 | 6.7 | 0.374 |
| | 160 | 280 | 18.8 | 0.979 | 310 | 9.4 | 0.509 | 320 | 6.3 | 0.352 |
| | 200 | 280 | 17.9 | 0.783 | 310 | 7.5 | 0.406 | 320 | 5 | 0.279 |
| **65** | 80 | | | | 480 | 18.8 | 1.420 | 480 | 12.5 | 1.047 |
| | 100 | | | | 540 | 15 | 1.278 | 605 | 10 | 1.055 |
| | 135 | | | | 625 | 11.2 | 1.148 | 700 | 7.4 | 0.904 |
| | 160 | | | | 650 | 9.4 | 1.041 | 715 | 6.3 | 0.786 |
| | 200 | | | | 650 | 7.5 | 0.833 | 715 | 5 | 0.624 |
| **80** | 80 | | | | 900 | 18.8 | 2.663 | 900 | 12.5 | 1.963 |
| | 100 | | | | 950 | 15 | 2.249 | 990 | 10 | 1.728 |
| | 125 | | | | 1000 | 12 | 1.985 | 1100 | 8 | 1.536 |
| | 168 | | | | 1000 | 8.9 | 1.57 | 1100 | 6 | 1.151 |
| | 200 | | | | 1000 | 7.5 | 1.374 | 1100 | 5 | 0.960 |

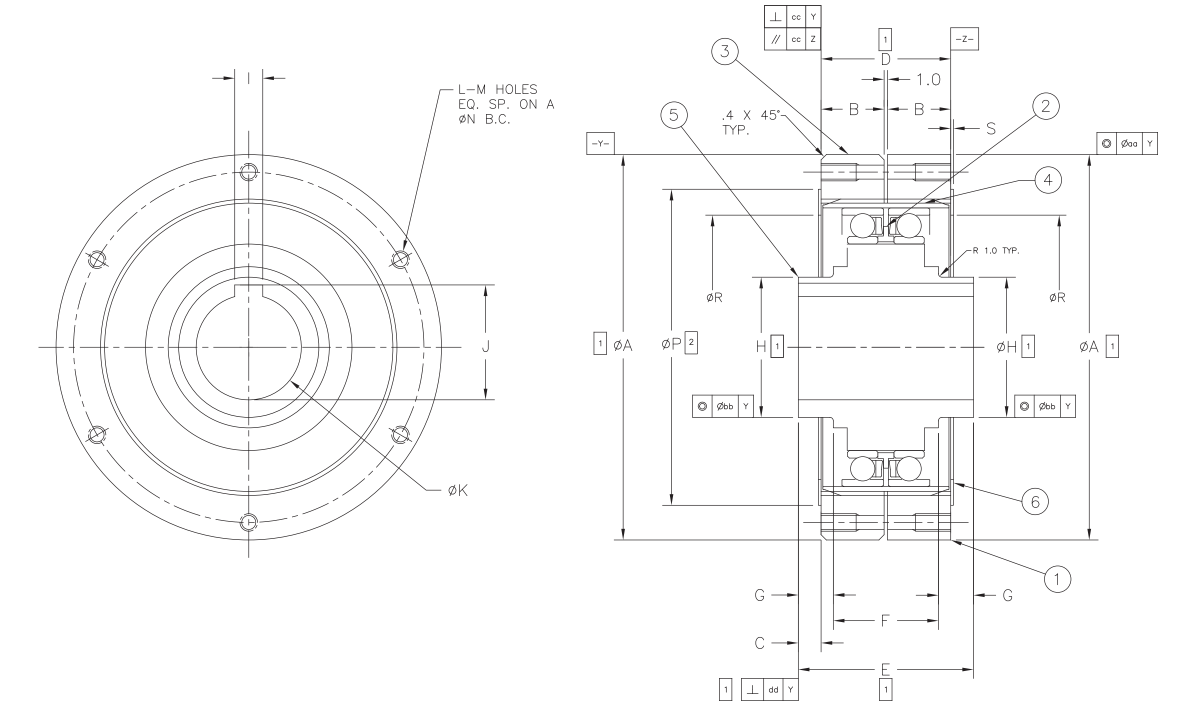
# HDA Heavy Duty Pancake Series w/Hubs

**The HDA Series** is a heavy duty pancake design that utilizes a double bearing wave generator and wider splines. It also includes an extended wave generator hub for mounting bearings and features a large through bore. The HDA is commonly used in differential applications where shock loads are present, such as corrugated machinery and printing press cutters. The HDA offers low backlash and standard ratios from 80:1 to 200:1 with torque capacities up to 2000 Nm. Custom drives are available upon request.


## HDA Specifications

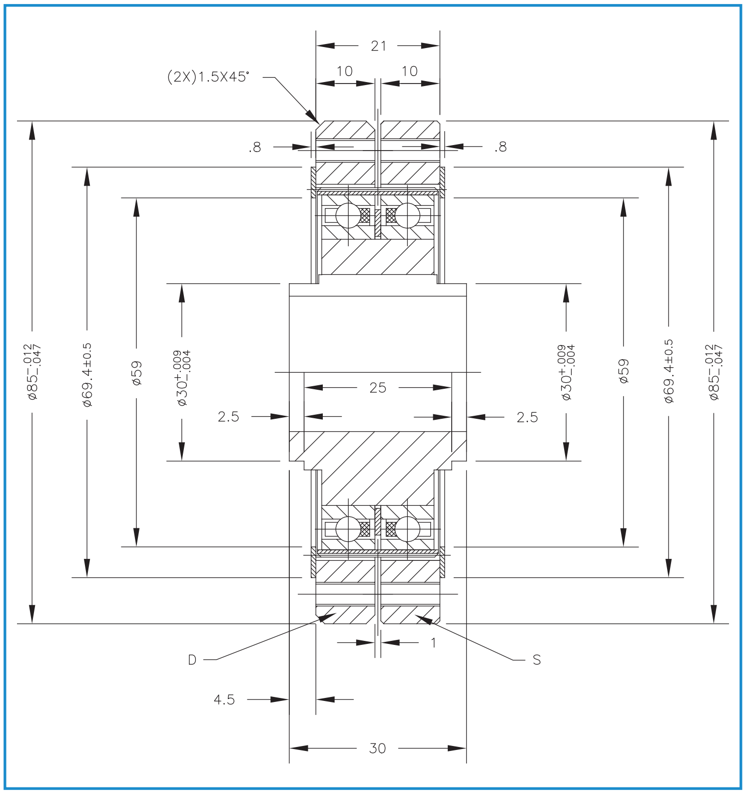
| Size | Maximum Input Speed | | Ratio | Input Speed 3000 rpm | | | Input Speed 1500 rpm | | | Input Speed 1000 rpm | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grease | Oil | | Output Torque | Output Speed | Input Power | Output Torque | Output Speed | Input Power | Output Torque | Output Speed | Input Power |
| | | | | Nm | rpm | kw | Nm | rpm | kw | Nm | rpm | kw |
| **20** | 3500 | 5000 | 80 | 25 | 37.5 | 0.123 | 25 | 18.8 | 0.059 | 25 | 12.5 | 0.039 |
| | | | 84 | 25 | 35.7 | 0.117 | 25 | 17.9 | 0.056 | 25 | 11.9 | 0.037 |
| | | | 100 | 30 | 30 | 0.118 | 33 | 15 | 0.062 | 33.6 | 10 | 0.041 |
| | | | 120 | 30 | 25 | 0.101 | 37.5 | 25 | 0.06 | 33.6 | 25 | 0.042 |
| | | | 126 | 30 | 24 | 0.097 | 37.5 | 12 | 0.058 | 43.5 | 8 | 0.044 |
| **25** | 3000 | 5000 | 80 | 40 | 37.5 | 0.197 | 40 | 18.8 | 0.094 | 40 | 12.5 | 0.062 |
| | | | 100 | 50 | 30 | 0.197 | 55 | 15 | 0.104 | 56 | 10 | 0.069 |
| | | | 120 | 50 | 25 | 0.169 | 62.5 | 12.5 | 0.101 | 72.5 | 8.3 | 0.074 |
| | | | 150 | 50 | 20 | 0.146 | 62.5 | 10 | 0.085 | 72.5 | 6.7 | 0.062 |
| | | | 160 | 50 | 18.8 | 0.139 | 62.5 | 9.4 | 0.078 | 72.5 | 6.3 | 0.057 |
| **32** | 3000 | 4500 | 80 | 100 | 37.5 | 0.493 | 100 | 18.8 | 0.235 | 100 | 12.5 | 0.153 |
| | | | 100 | 120 | 30 | 0.473 | 132 | 15 | 0.248 | 135 | 10 | 0.165 |
| | | | 135 | 120 | 22.2 | 0.363 | 150 | 11.2 | 0.215 | 175 | 7.5 | 0.163 |
| | | | 160 | 120 | 18.8 | 0.312 | 150 | 9.4 | 0.185 | 175 | 6.3 | 0.014 |
| | | | 200 | 120 | 15 | 0.264 | 150 | 7.5 | 0.156 | 175 | 5 | 0.118 |
| **40** | 3000 | 4500 | 80 | 200 | 37.5 | 0.986 | 200 | 18.8 | 0.469 | 200 | 12.5 | 0.305 |
| | | | 84 | 200 | 35.7 | 0.939 | 200 | 17.9 | 0.447 | 200 | 11.9 | 0.291 |
| | | | 100 | 240 | 30 | 0.947 | 265 | 15 | 0.497 | 270 | 10 | 0.33 |
| | | | 125 | 240 | 24 | 0.777 | 300 | 12 | 0.462 | 300 | 8 | 0.3 |
| | | | 160 | 240 | 18.8 | 0.624 | 300 | 9.4 | 0.37 | 300 | 6.3 | 0.24 |
| | | | 168 | 240 | 17.9 | 0.594 | 300 | 8.9 | 0.352 | 300 | 6 | 0.228 |
| | | | 200 | 240 | 15 | 0.527 | 300 | 7.5 | 0.312 | 300 | 5 | 0.202 |
| **50** | 2500 | 3500 | 80 | 360 | 37.5 | 1.775 | 360 | 18.8 | 0.844 | 360 | 12.5 | 0.549 |
| | | | 100 | 450 | 30 | 1.775 | 495 | 15 | 0.929 | 505 | 10 | 0.617 |
| | | | 120 | 450 | 25 | 1.518 | 550 | 12.5 | 0.881 | 600 | 8.3 | 0.625 |
| | | | 150 | 450 | 20 | 1.25 | 550 | 10 | 0.723 | 600 | 6.7 | 0.513 |
| | | | 160 | 450 | 18.8 | 1.169 | 550 | 9.4 | 0.678 | 600 | 6.3 | 0.481 |
| | | | 200 | 450 | 15 | 0.989 | 550 | 7.5 | 0.572 | 600 | 5 | 0.405 |
| **65** | 1750 | 1750 | 80 | | | | 800 | 18.8 | 1.876 | 800 | 12.5 | 1.221 |
| | | | 96 | | | | 900 | 15.6 | 1.76 | 1015 | 10.4 | 1.335 |
| | | | 100 | | | | 900 | 15 | 1.689 | 1015 | 10 | 1.282 |
| | | | 126 | | | | 1000 | 11.9 | 1.558 | 1150 | 7.9 | 1.162 |
| | | | 132 | | | | 1000 | 11.4 | 1.487 | 1150 | 7.6 | 1.11 |
| | | | 135 | | | | 1000 | 11.2 | 1.454 | 1150 | 7.4 | 1.086 |
| | | | 160 | | | | 1000 | 9.4 | 1.233 | 1150 | 6.3 | 0.921 |
| | | | 200 | | | | 1000 | 7.5 | 1.04 | 1150 | 5 | 0.776 |
| **80** | 1500 | 1500 | 80 | | | | 1500 | 18.8 | 3.518 | 1500 | 12.5 | 2.289 |
| | | | 100 | | | | 1800 | 15 | 3.377 | 2000 | 10 | 2.442 |
| | | | 125 | | | | 2000 | 12 | 3.077 | 2300 | 8 | 2.301 |
| | | | 168 | | | | 2000 | 8.9 | 2.348 | 2300 | 6 | 1.755 |
| | | | 200 | | | | 2000 | 8.9 | 2.079 | 2300 | 5 | 1.552 |
| | | | 250 | | | | 2000 | 6 | 1.758 | 2300 | 4 | 1.311 |

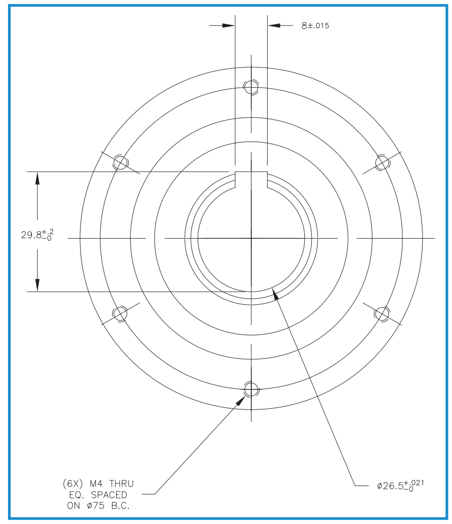
# HDA-M1 Dimensions




| | 20 | | 25 | | 32 | | 40 | | 50 | | 65 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ØA** | 70 | -.010<br>-.040 | 85 | -.012<br>-.047 | 110 | -.012<br>-.047 | 135 | -.014<br>-.054 | 170 | -.014<br>-.054 | 215 | -.015<br>-.061 |
| **B** | 12 | | 14 | | 18 | | 21 | | 26 | | 35 | |
| **C** | 6.5 | | 5.5 | | 6.5 | | 12.5 | | 12.5 | | 8 | |
| **D** | 25 | | 29 | | 37 | | 43 | | 53 | | 71 | |
| **E** | 38 | | 40 | | 50 | | 68 | | 78 | | 87 | |
| **F** | 21.5 | | 25 | | 30 | | 44 | | 54 | | 59 | |
| **G** | 8.25 | | 7.5 | | 10 | | 12 | | 12 | | 14 | |
| **ØH** | 20 | +.009<br>-.004 | 30 | +.009<br>-.004 | 40 | +.011<br>-.005 | 50 | +.011<br>-.005 | 60 | +.012<br>-.007 | 70 | +.012<br>-.007 |
| **I** | 4 ± .015 | | 6 ± .015 | | 8 ± .018 | | 10 ± .018 | | 12 ± .0215 | | 14 ± .0215 | |
| **J** | 13.8 | | 22.8 | | 33.3 | | 38.3 | | 43.3 | | 53.8 | |
| **ØK** | 12 | +.018<br>-0 | 20 | +.021<br>-0 | 30 | +.021<br>-0 | 35 | +.025<br>-0 | 40 | +.025<br>-0 | 50 | +.025<br>-0 |
| **L** | 6 | | 6 | | 6 | | 6 | | 6 | | 6 | |
| **M** | M3 x 6 DP | | M4 x 8 DP | | M5 x 10 DP | | M6 x 12 DP | | M8 x 16 DP | | M10 x 20 DP | |
| **ØN** | 60 | | 75 | | 100 | | 120 | | 150 | | 195 | |
| **ØP** | 54 ± .5 | | 69.4 ± .5 | | 92 ± .5 | | 111 ± .5 | | 134.4 ± .5 | | 176 ± .5 | |
| **ØR** | 47 | | 59 | | 77 | | 95 | | 119 | | 150 | |
| **S** | .8 | | .8 | | .8 | | 1.6 | | 1.6 | | 1.6 | |
| **aa** | .016 | | .016 | | .017 | | .019 | | .024 | | .027 | |
| **bb** | .013 | | .016 | | .016 | | .017 | | .021 | | .025 | |
| **cc** | .017 | | .024 | | .026 | | .026 | | .028 | | .034 | |
| **dd** | .010 | | .012 | | .012 | | .012 | | .015 | | .015 | |
| **Weight kg (lb)** | .6 (1.3) | | 1 (2.2) | | 2 (4.4) | | 3.6 (7.9) | | 7.2 (16) | | 14 (31) | |

# Custom Large Bore Option* (Size 25 Example)




* Customers requiring large bores, custom wave generators or splines are encouraged to contact Conic Systems for availability information. Conic Systems strives to meet its customers' application requirements and will modify its component sets to suit most application needs.

## HDA-M1 DRAWING NOTES

**A**

| | |
|---|---|
| ITEM 1 | STATIC CIRCULAR SPLINE MARKED “S” |
| ITEM 2 | ONLY APPEARS WITH HDR & HDA |
| ITEM 3 | DYNAMIC CIRCULAR SPLINE MARKED “D” |
| ITEM 4 | FLEXSPLINE |
| ITEM 5 | WAVE GENERATOR |
| ITEM 6 | WEAR WASHERS |

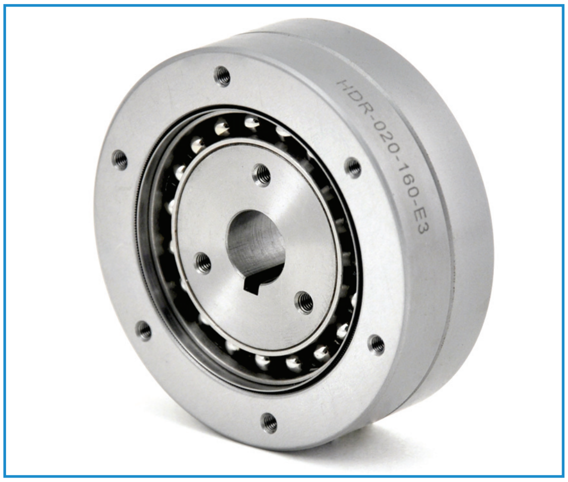
**B** DIMENSIONS MARKED 1 ESTABLISH INTERFACE AND INSTALLATION REQUIREMENTS, AND MUST BE MAINTAINED UNDER ALL OPERATING CONDITIONS.

**C** DIMENSIONS MARKED 2 ARE NECESSARY TO LOCATE WEAR WASHERS, ITEM 6, IN CORRECT POSITION.

**D** DRAWING IS FOR DIMENSIONAL REVIEW ONLY. **DO NOT SCALE**

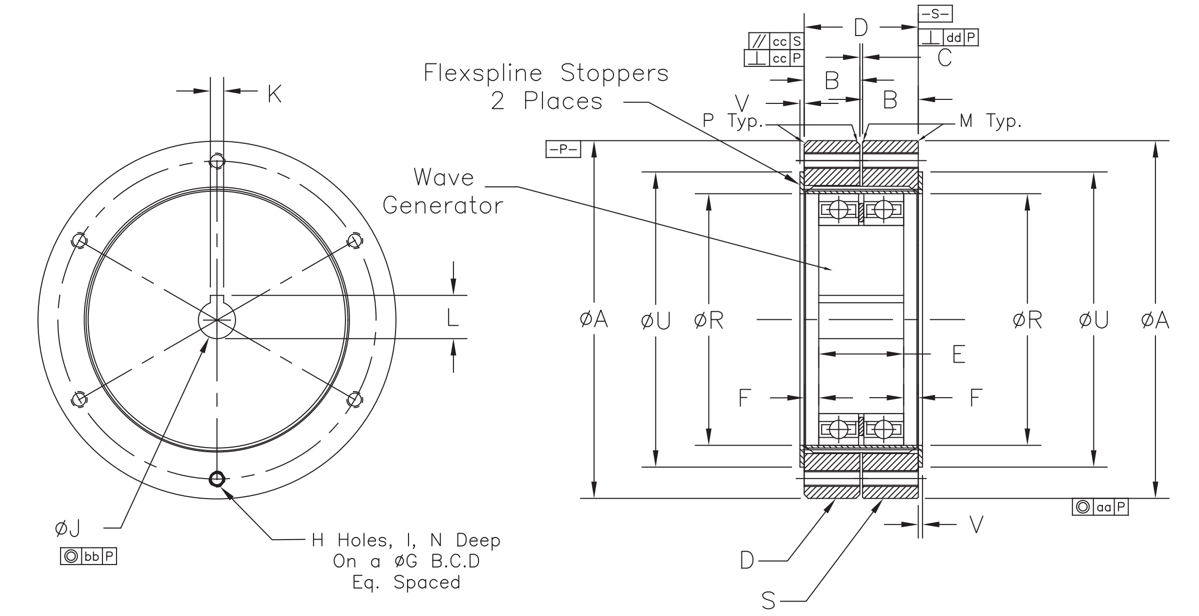
# HDR Heavy Duty Pancake Series

**The HDR Series** is a heavy duty pancake design that utilizes a double bearing wave generator and wider splines than the HDF Series. The HDR is commonly used in heavy service load applications where shock loads are present, such as corrugated machinery and printing press cutters. The HDR offers low backlash and standard ratios from 80:1 to 200:1 with torque capacities up to 2000 Nm.  Custom drives are available upon request.




| Size | Maximum Input Speed | | Ratio | Input Speed 3000 rpm | | | Input Speed 1500 rpm | | | Input Speed 1000 rpm | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Output Torque | Output Speed | Input Power | Output Torque | Output Speed | Input Power | Output Torque | Output Speed | Input Power |
| | Grease | Oil | | Nm | rpm | kw | Nm | rpm | kw | Nm | rpm | kw |
| **20** | 3500 | 5000 | 80 | 25 | 37.5 | 0.123 | 25 | 18.8 | 0.059 | 25 | 12.5 | 0.039 |
| | | | 84 | 25 | 35.7 | 0.117 | 25 | 17.9 | 0.056 | 25 | 11.9 | 0.037 |
| | | | 100 | 30 | 30 | 0.118 | 33 | 15 | 0.062 | 33.6 | 10 | 0.041 |
| | | | 120 | 30 | 25 | 0.101 | 37.5 | 25 | 0.06 | 33.6 | 25 | 0.042 |
| | | | 126 | 30 | 24 | 0.097 | 37.5 | 12 | 0.058 | 43.5 | 8 | 0.044 |
| **25** | 3000 | 5000 | 80 | 40 | 37.5 | 0.197 | 40 | 18.8 | 0.094 | 40 | 12.5 | 0.062 |
| | | | 100 | 50 | 30 | 0.197 | 55 | 15 | 0.104 | 56 | 10 | 0.069 |
| | | | 120 | 50 | 25 | 0.169 | 62.5 | 12.5 | 0.101 | 72.5 | 8.3 | 0.074 |
| | | | 150 | 50 | 20 | 0.146 | 62.5 | 10 | 0.085 | 72.5 | 6.7 | 0.062 |
| | | | 160 | 50 | 18.8 | 0.139 | 62.5 | 9.4 | 0.078 | 72.5 | 6.3 | 0.057 |
| **32** | 3000 | 4500 | 80 | 100 | 37.5 | 0.493 | 100 | 18.8 | 0.235 | 100 | 12.5 | 0.153 |
| | | | 100 | 120 | 30 | 0.473 | 132 | 15 | 0.248 | 135 | 10 | 0.165 |
| | | | 135 | 120 | 22.2 | 0.363 | 150 | 11.2 | 0.215 | 175 | 7.5 | 0.163 |
| | | | 160 | 120 | 18.8 | 0.312 | 150 | 9.4 | 0.185 | 175 | 6.3 | 0.014 |
| | | | 200 | 120 | 15 | 0.264 | 150 | 7.5 | 0.156 | 175 | 5 | 0.118 |
| **40** | 3000 | 4500 | 80 | 200 | 37.5 | 0.986 | 200 | 18.8 | 0.469 | 200 | 12.5 | 0.305 |
| | | | 84 | 200 | 35.7 | 0.939 | 200 | 17.9 | 0.447 | 200 | 11.9 | 0.291 |
| | | | 100 | 240 | 30 | 0.947 | 265 | 15 | 0.497 | 270 | 10 | 0.33 |
| | | | 125 | 240 | 24 | 0.777 | 300 | 12 | 0.462 | 300 | 8 | 0.3 |
| | | | 160 | 240 | 18.8 | 0.624 | 300 | 9.4 | 0.37 | 300 | 6.3 | 0.24 |
| | | | 168 | 240 | 17.9 | 0.594 | 300 | 8.9 | 0.352 | 300 | 6 | 0.228 |
| | | | 200 | 240 | 15 | 0.527 | 300 | 7.5 | 0.312 | 300 | 5 | 0.202 |
| **50** | 2500 | 3500 | 80 | 360 | 37.5 | 1.775 | 360 | 18.8 | 0.844 | 360 | 12.5 | 0.549 |
| | | | 100 | 450 | 30 | 1.775 | 495 | 15 | 0.929 | 505 | 10 | 0.617 |
| | | | 120 | 450 | 25 | 1.518 | 550 | 12.5 | 0.881 | 600 | 8.3 | 0.625 |
| | | | 150 | 450 | 20 | 1.25 | 550 | 10 | 0.723 | 600 | 6.7 | 0.513 |
| | | | 160 | 450 | 18.8 | 1.169 | 550 | 9.4 | 0.678 | 600 | 6.3 | 0.481 |
| | | | 200 | 450 | 15 | 0.989 | 550 | 7.5 | 0.572 | 600 | 5 | 0.405 |
| **65** | 1750 | 1750 | 80 | | | | 800 | 18.8 | 1.876 | 800 | 12.5 | 1.221 |
| | | | 96 | | | | 900 | 15.6 | 1.76 | 1015 | 10.4 | 1.335 |
| | | | 100 | | | | 900 | 15 | 1.689 | 1015 | 10 | 1.282 |
| | | | 126 | | | | 1000 | 11.9 | 1.558 | 1150 | 7.9 | 1.162 |
| | | | 132 | | | | 1000 | 11.4 | 1.487 | 1150 | 7.6 | 1.11 |
| | | | 135 | | | | 1000 | 11.2 | 1.454 | 1150 | 7.4 | 1.086 |
| | | | 160 | | | | 1000 | 9.4 | 1.233 | 1150 | 6.3 | 0.921 |
| | | | 200 | | | | 1000 | 7.5 | 1.04 | 1150 | 5 | 0.776 |
| **80** | 1500 | 1500 | 80 | | | | 1500 | 18.8 | 3.518 | 1500 | 12.5 | 2.289 |
| | | | 100 | | | | 1800 | 15 | 3.377 | 2000 | 10 | 2.442 |
| | | | 125 | | | | 2000 | 12 | 3.077 | 2300 | 8 | 2.301 |
| | | | 168 | | | | 2000 | 8.9 | 2.348 | 2300 | 6 | 1.755 |
| | | | 200 | | | | 2000 | 8.9 | 2.079 | 2300 | 5 | 1.552 |
| | | | 250 | | | | 2000 | 6 | 1.758 | 2300 | 4 | 1.311 |

# HDR-M1 Dimensions




| Size | | | | | | |
|---|---|---|---|---|---|---|
| | **20** | **25** | **32** | **40** | **50** | **65** |
| **ØA** | 70 +0 -0.019 | 85 +0 -0.022 | 110 +0 -0.022 | 135 +0 -0.025 | 170 +0 -0.025 | 215 +0 -0.029 |
| **B** | 12 | 14 | 18 | 21 | 26 | 35 |
| **C** | 1 | 1 | 1 | 1 | 1 | 1 |
| **D** | 25 | 29 | 37 | 43 | 53 | 71 |
| **E** | 17.3 | 20 | 25.9 | 31.5 | 39.1 | 50.5 |
| **F** | 3.85 | 4.5 | 5.55 | 5.75 | 6.95 | 10.25 |
| **ØG** | 60 | 75 | 100 | 120 | 150 | 195 |
| **H** | 6 | 6 | 6 | 6 | 6 | 6 |
| **I** | M3x0.5 | M4x0.7 | M5x0.8 | M6x1 | M8x1.25 | M10x1.5 |
| **ØJ** | 9 +0.015 -0 | 11 +0.018 -0 | 14 +0.018 -0 | 14 +0.018 -0 | 19 +0.021 -0 | 24 +0.021 -0 |
| **ØK** | 3 ±0.0125 | 4 ±0.015 | 5 ±0.015 | 5 ±0.015 | 6 ±0.015 | 6 ±0.018 |
| **L** | 10.4 | 12.8 | 16.3 | 16.3 | 21.8 | 27.3 |
| **M** | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| **N** | 6 | 8 | 10 | 12 | 16 | 20 |
| **ØR** | 47 | 59 | 77 | 95 | 119 | 150 |
| **ØU** | 54.8 | 69.7 | 92.6 | 111.4 | 135 | 177 |
| **V** | 1 +0.13 -0 | 1 +0.13 -0 | 1 +0.13 -0 | 1.78 +0.13 -0 | 1.78 +0.13 -0 | 1.78 +0.13 -0 |
| **aa** | 0.016 | 0.016 | 0.017 | 0.019 | 0.024 | 0.027 |
| **dd** | 0.01 | 0.012 | 0.012 | 0.012 | 0.015 | 0.015 |
| **cc** | 0.017 | 0.024 | 0.026 | 0.026 | 0.028 | 0.034 |
| **bb** | 0.013 | 0.016 | 0.016 | 0.017 | 0.021 | 0.025 |
| **Weight kg (lb)** | 0.5 (1.1) | 0.8 (1.8) | 1.7 (3.7) | 3 (6.6) | 6 (13.2) | 12 (26.5) |

## HDA-M1 DRAWING NOTES

A
- ITEM 1 STATIC CIRCULAR SPLINE MARKED “S”
- ITEM 2 ONLY APPEARS WITH HDR & HDA
- ITEM 3 DYNAMIC CIRCULAR SPLINE MARKED “D”
- ITEM 4 FLEXSPLINE
- ITEM 5 WAVE GENERATOR
- ITEM 6 WEAR WASHERS

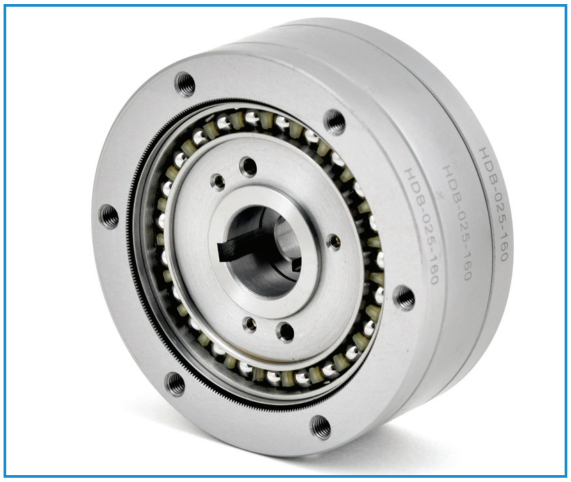
B DIMENSIONS MARKED 1 ESTABLISH INTERFACE AND INSTALLATION REQUIREMENTS, AND MUST BE MAINTAINED UNDER ALL OPERATING CONDITIONS.

C DIMENSIONS MARKED 2 ARE NECESSARY TO LOCATE WEAR WASHERS, ITEM 6, IN CORRECT POSITION.

D DRAWING IS FOR DIMENSIONAL REVIEW ONLY. **DO NOT SCALE**

# HDB Back-to-Back 1:1 Pancake Series

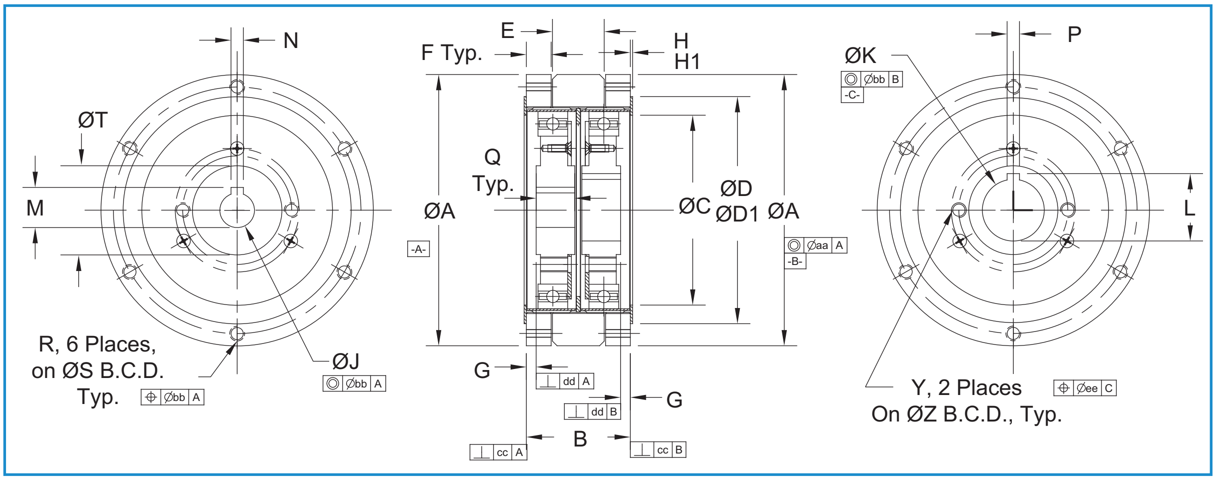
**The HDB Series** is a 1:1 double pancake design used for phase shifting differential applications. It is most often used in printing, converting, and packaging machinery where the wave generator is held stationary except when making intermittent registration / phase shifting adjustments. Conic Systems also offers the HDB packaged in a complete shaft mount differential gearbox.




## HDB Specifications

| Size | Ratio | Input Speed 3000rpm | | | Input Speed 1500rpm | | | Input Speed 1000rpm | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Output Torque Nm | Output Speed rpm | Input Power kw | Output Torque Nm | Output Speed rpm | Input Power kw | Output Torque Nm | Output Speed rpm | Input Power kw |
| 20 | 80 | 15 | 37.5 | 0.096 | 15 | 18.8 | 0.049 | 15 | 12.5 | 0.033 |
| | 84 | 15 | 35.7 | 0.092 | 15 | 17.9 | 0.047 | 15 | 11.9 | 0.031 |
| | 100 | 18 | 30 | 0.092 | 20 | 15 | 0.052 | 22 | 10 | 0.038 |
| | 120 | 20 | 25 | 0.085 | 22.5 | 12.5 | 0.049 | 25 | 8.3 | 0.036 |
| | 126 | 20 | 23.8 | 0.081 | 22.5 | 11.9 | 0.047 | 25 | 7.9 | 0.034 |
| 25 | 80 | 25 | 37.5 | 0.160 | 25 | 18.8 | 0.082 | 27.5 | 12.5 | 0.060 |
| | 100 | 30 | 30 | 0.154 | 33 | 15 | 0.086 | 35 | 10 | 0.061 |
| | 120 | 32 | 25 | 0.137 | 35 | 12.5 | 0.076 | 38 | 8.3 | 0.055 |
| | 150 | 36 | 20 | 0.134 | 40 | 10 | 0.070 | 43.5 | 6.7 | 0.051 |
| | 160 | 36 | 18.8 | 0.126 | 40 | 9.4 | 0.066 | 40 | 6.3 | 0.043 |
| 32 | 80 | 55 | 37.5 | 0.353 | 55 | 18.8 | 0.180 | 55 | 12.5 | 0.120 |
| | 100 | 70 | 30 | 0.359 | 77 | 15 | 0.202 | 80 | 10 | 0.140 |
| | 135 | 80 | 22.2 | 0.332 | 88 | 11.1 | 0.170 | 97 | 7.4 | 0.125 |
| | 160 | 85 | 18.8 | 0.297 | 93.5 | 9.4 | 0.153 | 102 | 6.3 | 0.112 |
| | 200 | 85 | 15 | 0.238 | 93.5 | 7.5 | 0.122 | 102 | 5 | 0.089 |
| 40 | 80 | 100 | 37.5 | 0.641 | 100 | 18.8 | 0.328 | 100 | 12.5 | 0.218 |
| | 84 | 100 | 35.7 | 0.610 | 100 | 17.9 | 0.312 | 100 | 11.9 | 0.208 |
| | 100 | 120 | 30 | 0.615 | 132 | 15 | 0.346 | 135 | 10 | 0.236 |
| | 125 | 135 | 24 | 0.554 | 150 | 12 | 0.314 | 150 | 8 | 0.209 |
| | 160 | 150 | 18.8 | 0.524 | 165 | 9.4 | 0.271 | 165 | 6.3 | 0.181 |
| | 168 | 150 | 17.9 | 0.499 | 165 | 8.9 | 0.256 | 165 | 6 | 0.173 |
| 50 | 80 | 180 | 37.5 | 1.154 | 180 | 18.8 | 0.59 | 180 | 12.5 | 0.393 |
| | 100 | 220 | 30 | 1.128 | 240 | 15 | 0.628 | 245 | 10 | 0.428 |
| | 120 | 250 | 25 | 1.068 | 275 | 12.5 | 0.6 | 280 | 8.3 | 0.406 |
| | 150 | 280 | 20 | 1.044 | 310 | 10 | 0.544 | 320 | 6.7 | 0.374 |
| | 160 | 280 | 18.8 | 0.979 | 310 | 9.4 | 0.509 | 320 | 6.3 | 0.352 |
| | 200 | 280 | 17.9 | 0.783 | 310 | 7.5 | 0.406 | 320 | 5 | 0.279 |

# HDB-M1 Dimensions




| | 20 | | 25 | | 32 | | 40 | | 50 | |
|---|---|---|---|---|---|---|---|---|---|---|
| **ØA** | 70 | +0 -0.018 | 85 | +0 -0.022 | 110 | +0 -0.025 | 134 | +0 -0.025 | 170 | +0 -0.025 |
| **B** | 26.5 | +0.25 -0 | 34.8 | +0.25 -0 | 42 | +0.6 -0 | 56.5 | +0.8 -0 | See Drawing | |
| **ØC** | 47 | ±0.51 | 59 | ±0.51 | 77 | ±0.51 | 95 | ±0.51 | 119 | ±0.51 |
| **ØD** | 54 | ±0.51 | 69.4 | ±0.51 | 92.1 | ±0.51 | 111.1 | ±0.51 | 134.4 | ±0.51 |
| **ØD1** | 54.7 | +0.51 -0 | 70.2 | +0.51 -0 | 92.9 | +0.38 -0 | 92.9 | +0.38 -0 | 135.2 | +0.38 -0 |
| **E** | 14 | ±0.1 | 18 | ±0.1 | 20.9 | ±0.1 | 28 | ±0.1 | 35 | ±0.2 |
| **F** | 6 | ±0.1 | 8 | ±0.2 | 10 | ±0.2 | 13 | ±0.2 | 13 | ±0.2 |
| **G** | 1.8 | ±0.51 | 3.27 | ±0.51 | 3.95 | ±0.51 | 1.95 | ±0.51 | 1.4 | ±0.51 |
| **H** | 0.81 | ±0.13 | 0.81 | ±0.13 | 0.81 | ±0.13 | 1.57 | ±0.13 | 1.57 | ±0.13 |
| **H1** | 0.94 | +0.13 -0 | 0.94 | +0.13 -0 | 0.94 | +0.13 -0 | 1.69 | +0.13 -0 | 1.69 | +0.13 -0 |
| **ØJ** | 9 | +0.015 -0 | 11 | +0.018 -0 | 14 | +0.02 -0.02 | 14 | +0.02 -0.02 | 19 | +0.02 -0.02 |
| **ØK** | 16 | +0.013 -0 | 19 | +0.013 -0 | 25 | +0.02 -0 | 25 | +0.02 -0 | 35 | +0.023 -0 |
| **L** | 17.4 | ±0.1 | 20.8 | ±0.1 | 27.3 | ±0.2 | 27.3 | ±0.2 | 38.3 | ±0.2 |
| **M** | 10.4 | +0.1 -0 | 12.8 | +0.1 -0 | 16.3 | +0.1 -0 | 16.3 | +0.1 -0 | 21.8 | +0.1 -0 |
| **N** | 3 | ±0.0125 | 4 | ±0.013 | 5 | ±0.013 | 5 | ±0.013 | 6 | ±0.013 |
| **P** | 3 | ±0.0125 | 4 | ±0.013 | 5 | ±0.013 | 5 | ±0.013 | 10 | ±0.023 |
| **Q** | 11.4 | | 12.8 | | 15.6 | | 19.4 | | 23.2 | |
| **R** | M4x0.7 | | M5x0.8 | | M6x1 | | M8x1.25 | | M10x1.5 | |
| **ØS** | 60 | | 75 | | 100 | | 120 | | 150 | |
| **ØT** | 20 | | 28 | | 36 | | 32 | | 50 | |
| **Y** | M4x0.7 | | M4x0.7 | | M6x1 | | M8x1.25 | | M8x1.25 | |
| **ØZ** | 27 | | 35 | | 44 | | 48 | | 65 | |
| **aa** | 0.07 | | 0.076 | | 0.078 | | 0.088 | | 0.098 | |
| **bb** | 0.013 | | 0.015 | | 0.015 | | 0.018 | | 0.02 | |
| **cc** | 0.018 | | 0.023 | | 0.025 | | 0.025 | | 0.025 | |
| **dd** | 0.01 | | 0.013 | | 0.013 | | 0.013 | | 0.015 | |
| **ee** | 0.25 | | 0.25 | | 0.25 | | 0.25 | | 0.25 | |
| **Weight kg (lb)** | 0.7 (1.50) | | 1.23 (2.70) | | 2.14 (4.70) | | 4.09 (9.00) | | 6.9 (15.3) | |

# Driving Arrangements

Conic Systems harmonic gearing can be used with a number of input, output, and fixed element drive variations for speed reduction, speed increasing, and phasing differential applications. The arrangements that apply are illustrated below.

**Cup Type:**

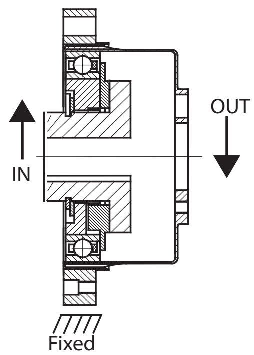
**FS** Flexspline
**S** Circular Spline
**N** Speed (RPM)
**R** Ratio
**WG** Wave Generator

**Pancake Type:**

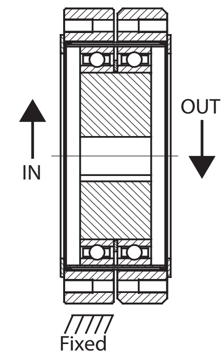
**FS** Flexspline
**S** Circular Spline
**N** Speed (RPM)
**R** Ratio
**WG** Wave Generator
**D** Dynamic Spline

## 1 Speed Reducer

$N_{FS} = \frac{N_{WG}}{R}$

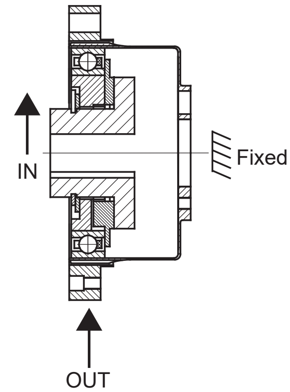



$N_D = \frac{N_{WG}}{R}$

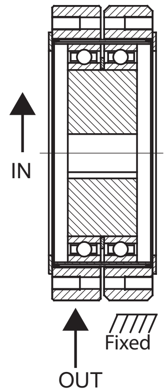



## 2 Speed Reducer

$N_S = \frac{N_{WG}}{R+1}$

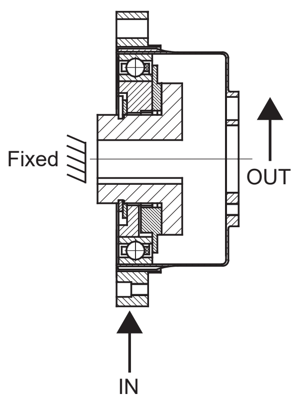



$N_S = \frac{N_{WG}}{R+1}$

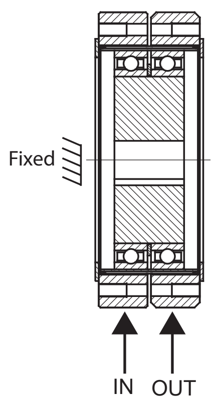



## 3 Speed Increaser

$N_{FS} = N_S \bullet \left(\frac{R+1}{R}\right)$

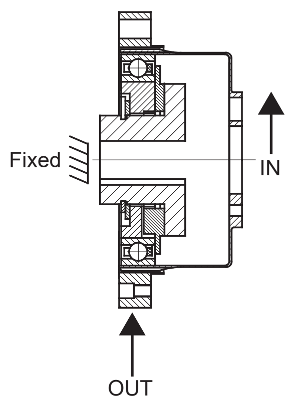



$N_D = N_S \bullet \left(\frac{R+1}{R}\right)$

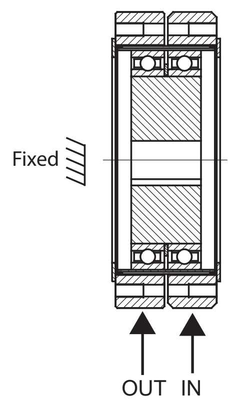



## 4 Speed Reducer

$N_S = N_{FS} \bullet \left(\frac{R}{R+1}\right)$

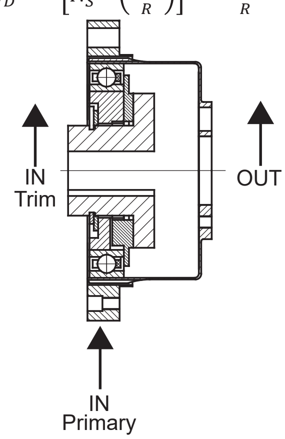



$N_S = N_D \bullet \left(\frac{R}{R+1}\right)$

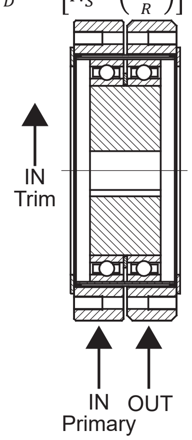



## 5 Differential Speed Reducer

$N_D = \left[N_S \bullet \left(\frac{R+1}{R}\right)\right] - \frac{N_{WG}}{R}$

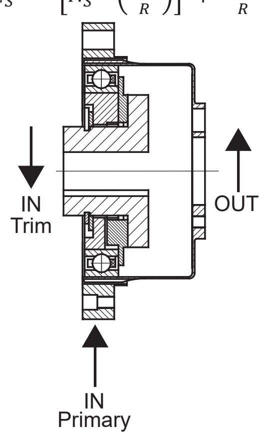



$N_D = \left[N_S \bullet \left(\frac{R+1}{R}\right)\right] - \frac{N_{WG}}{R}$

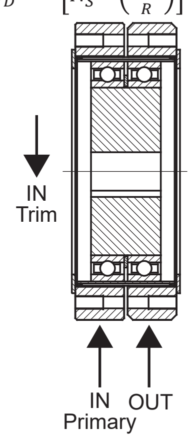



## 6 Differential Speed Reducer

$N_{FS} = \left[N_S \bullet \left(\frac{R+1}{R}\right)\right] + \frac{N_{WG}}{R}$

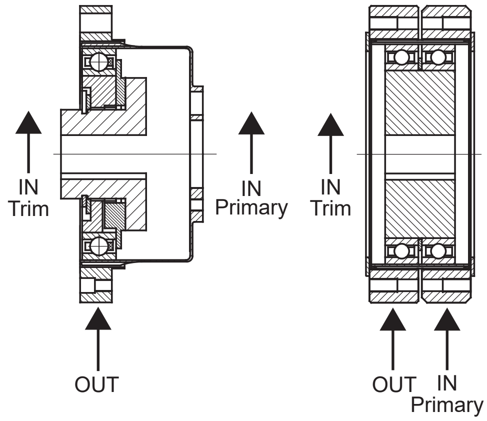



$N_D = \left[N_S \bullet \left(\frac{R+1}{R}\right)\right] + \frac{N_{WG}}{R}$



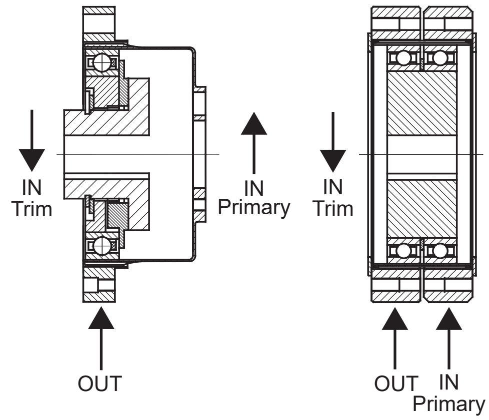
## 7 Differential Speed Reducer

$$N_S = \left[N_{FS} \bullet \left(\frac{R}{R+1}\right)\right] + \frac{N_{WG}}{R+1} \quad N_S = \left[N_D \bullet \left(\frac{R}{R+1}\right)\right] + \frac{N_{WG}}{R+1}$$



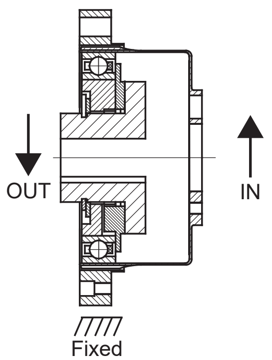

## 8 Differential Speed Reducer

$$N_S = \left[N_{FS} \bullet \left(\frac{R}{R+1}\right)\right] - \frac{N_{WG}}{R+1} \quad N_S = \left[N_D \bullet \left(\frac{R}{R+1}\right)\right] - \frac{N_{WG}}{R+1}$$



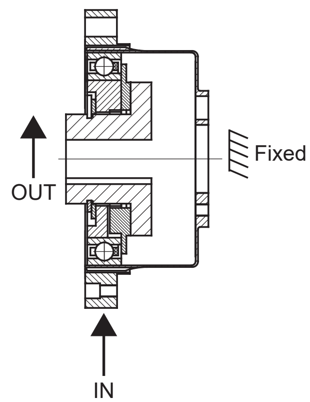

## 9 Speed Increaser 1:R

$$N_{WG} = N_{FS} \bullet R$$



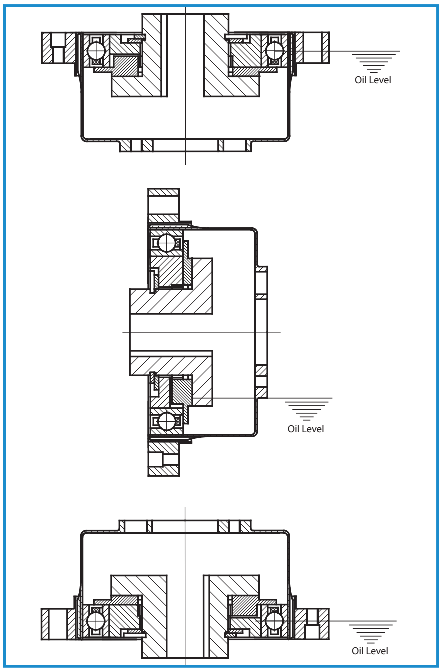

## 10 Speed Increaser 1:(R+1)

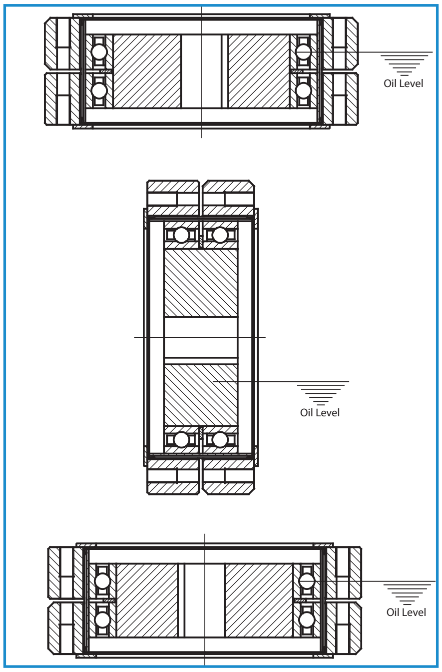
$$N_{WG} = N_S \bullet (R+1)$$



# Lubrication

Suggested oil levels are shown below. When using grease lubrication, the grease should be applied generously inside the flexspline, the wave generator bearings, and on the teeth of the circular spline. Fill approximately 30% of the volume with grease.




Oil Changes: Oil changes are suggested after 100 hours of operation and at intervals of 1000 running hours thereafter.

Grease Changes: When operating under nominal torque, grease should be changed after approximately 1000 hours of operation. Light duty operation may allow for longer intervals between changes. To change grease, completely disassemble and clean units before re-greasing.

# Component Assembly

1 Clean all components prior to assembly and installation.

2 The gearing components must be maintained as a matched set.

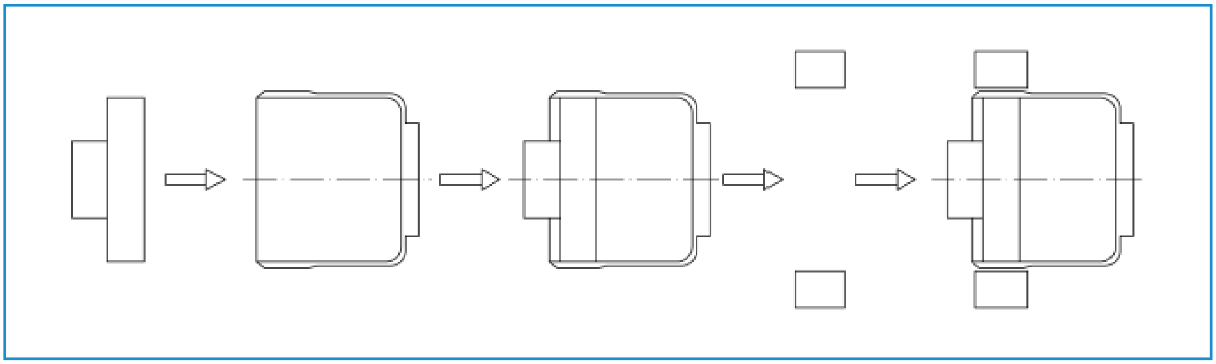
3 Coat the non-bolting surfaces of each component with a thin layer of lubricant to protect against rust and to ease assembly.

4 If dowel pins are used for flexspline mounting, match drill the output shaft prior to dowel pin installation.

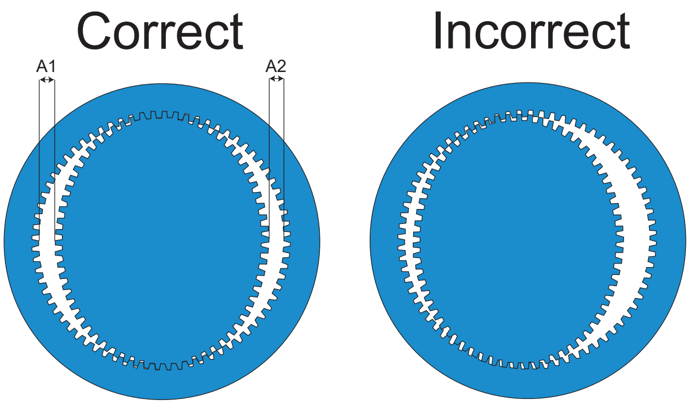
5 When a clamp ring is used to mount an HDC flexspline, insure the ring OD is less than the diameter of the flexspline's mounting boss. Mounting rings require an adequate radius at its OD to prevent damage to the mating flexspline diaphragm surface.

6 To assemble, insert the wave generator into the open end of the flexspline. Slightly tilting the wave generator during installation may ease the process.

7 Slide the circular spline over the flexspline. For cup style harmonic gears, sliding from the closed end is generally easier and preferred. Slowly rotating the wave generator eases installation.



8 If possible, check the engagement symmetry to ensure there is an equal amount of space between the flexspline and circular spline where the teeth are not engaged. “A1” should be equal to “A2”. If the assembly is not symmetric, disassemble and start the assembly process again. An incorrectly aligned assembly will function, but it will be subject to reduced life and performance.




# Technical Notes

Conic recommends limiting the maximum acceleration, deceleration, and momentary peak torque to 150% of the rated torque for most applications. If higher peak torque is required for a given drive, please contact Conic's Engineering Department for assistance in evaluating the drive's suitability for the applications.

Efficiency, spring rate, inertia, maximum speed, and back driving torque vary with drive size, style, and ratio. Contact Conic's Engineering Department for data on a particular drive selection.

# Ordering Codes

HDC — 25 — 080 — E1 — – – –

- **HDC** — Models: HDC, HDF, HDR, HDA, HDB
- **25** — Size Option: 17, 20, 25, 32, 40, etc.
- **080** — Ratio: Wave Generator Speed (Input) / Flexspline (Output) Speed
- **E1** — Configuration
  Inch Dimension: E1, E2
  Metric Dimension: M1
- **– – –** — Special Designator: Value provided for non-standard units.

  Contact Conic Systems for details on unique designator codes.

## Disclaimer

Notice: All efforts have been made to assure that the information in this catalog is complete and accurate. However, Conic Systems is not liable for any errors, omissions, or inaccuracies in the reported data. Conic Systems reserves the right to change the product specifications, for any reason, without prior notice. Customers are responsible for determining product applicability to any particular application.

# Our History

Since we introduced the first harmonic gearing differential in 1968, Conic Systems has been focused on providing the highest quality, longest lasting harmonic gearing systems and controls to customers worldwide. Today, our product lines include harmonic servo gearheads, speed changing and phase shifting harmonic differential transmissions, harmonic gearing component sets, and a wide array of industrial control modules. We also offer custom solutions, repair, replacement, and rebuilding services for all brand harmonics.

Equipment and capabilities include: super precision turning, 4 axis milling, Liebherr gear cutting, Wenzel involute and non-involute gear and cutter inspection, single flank spiral bevel gearing inspection, tactile and optical CMM measuring, metallurgical sampling/mounting/polishing, sub 1 arc-sec positional accuracy testing, 0.2 arc-sec repeatability testing resolution, programmable dynamic torque-speed testing, Rockwell hardness and Vickers micro hardness testing, dynamic FEA analysis, full compliment of manufacturing, engineering, and quality inspection equipment and software suites.


- 1968 Conic Systems is established in Fairfield, NJ and introduces the harmonic differential
- 1972 Conic introduces harmonic web tension infeed controls
- 1991 Conic introduces digital HDD draw control systems
- 1992 Operations move to Port Jervis, NY
- 1994 Conic introduces 1:1 HDB shaft mount harmonic differentials
- 1999 Conic introduces 1:1 and 2:1 CSF right angle speed changing harmonic gearboxes
- 2004 Conic acquires Datatran Labs
- 2007 Conic establishes NAC Harmonic Gearing in Jacksonville, FL
- 2016 Conic establishes Tetragon Labs in Jacksonville, FL for Research & Development
- 2018 Conic introduces harmonic gearing servo gearheads

Visit www.conicsystems.com for information on additional Conic product lines, engineering data, drawings, and 3D model downloads.

***CSF Short Cup Series*** – A high performance, compact, zero backlash series of drives. The CSF utilizes a proprietary non-involute tooth form for greater load capacities and is offered in standard sizes with nominal capacities to 647 Nm and ratios of 50:1 to 160:1.

***LT Lifetime Series Servo Gearheads*** – Available in four sizes with nominal capacities to 120 Nm, the LT Series offers the advantages of zero backlash harmonic gearing in an industrial servo gearhead. It is available in NEMA 17, 23, 34, & 42 mounts as well as metric configurations with adapters to meet customer specified motor mounting requirements.

***CSF and SHF Units with Integrated Cross Roller Bearings*** – Designed to meet common configurations of robotic and automation applications, Conic offers enclosed drives with integrated cross roller bearings. These compact, high performance designs simplify mounting and are customizable to meet customer requirements.

***Custom Engineered Drives*** – Conic offers custom harmonic gearing solutions to meet application needs. Examples include ultra-short cup designs for robotic and medical applications and low cost drives for high volume automotive and energy applications.

***Right Angle, Shaft Mount & Foot Mount Harmonic Differentials*** – Conic offers a wide variety of speed changing & phase shifting harmonic differential transmissions. Typically used in printing, packaging, and converting applications, Conic harmonic differentials are designed to withstand high loads in demanding applications like chill stands and rotary cutters. Units are offered in nominal capacities to 4000 Nm.

CONIC SYSTEMS

TETRAGON LABS

**Harmonic Gearing Systems Since 1968**

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info@conicsystems.com • 11 Rebel Lane, Port Jervis, NY 12771

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