

MINIATURE TIMING BELTS & PULLEYS

MINIATURE HTD® TIMING BELT DRIVES

BASIC CONSTRUCTION

Timing belts are essentially flat belts with the addition of evenly spaced teeth along the surface that contacts toothed pulleys. Power is transmitted smoothly and without slippage. Pulley pitch diameters are larger than their outside diameters and the belt pitch lines lie within the flat portion. Tension members are molded in the flat portion to serve as load-carrying elements. Miniature HTD timing belts have deep curvilinear tooth forms, as contrasted to trapezoidal for conventional timing belts. Greater strength, lower tooth pressures and decreased stress concentration result in superior performance.

SELECTION

The following general guidelines apply to selection of miniature HTD timing belts and pulleys:

Design with ample reserve horsepower capacity and apply the proper service factors.

The belt must have six or more teeth in engagement with the smaller pulley to carry rated Horsepower.

Avoid small pulley diameters where practical to assure satisfactory belt life.

Belt speed should not exceed 6500 feet per minute.

At least one pulley in the drive should be flanged.

For vertical shafts or where center distance exceeds eight times the smaller pulley diameter, both pulleys should be flanged.

Horsepower Rating Tables provide ratings for operation no more than ten hours per day under uniform loading. Selection procedure is as follows:

1. Select Service Factor from chart below.
2. Determine Design Horsepower.

Design Horsepower = Application Horsepower x Service Factor.

3. Select small pulley and belt size from the rating tables, choosing a combination whose rating does not exceed the Design Horsepower.
4. For speed increasing applications an additional amount must be added to the Service Factor.
5. For speeds, higher than shown in rating Tables, consult factory.

SERVICE FACTORS

| Load Classification | Service Factor |
|---------------------------------|----------------|
| Uniform to 10 hrs./day | 1.0 |
| Uniform over 10 hrs./day | 1.5 |
| Moderate Shock to 10 hrs./day | |
| Moderate Shock over 10 hrs./day | 2.0 |
| Heavy Shock to 10 hrs./day | |

SPEED-UP DRIVES

| Ratio Range | Additional Factor |
|-------------------|-------------------|
| 1 through 1.24 | 0 |
| 1.25 through 1.74 | 0.1 |
| 1.75 through 2.49 | 0.2 |
| 2.50 through 3.49 | 0.3 |
| 3.50 and over | 0.4 |

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MINIATURE TIMING BELTS & PULLEYS

MINIATURE HTD TIMING BELT DRIVES (Continued) HORSEPOWER RATINGS

3mm PITCH—6mm WIDE BELT

| | | NUMBER OF GROOVES ON THE SMALL PULLEY | | | | | | | | | | | | | |
|---------------------|------|---------------------------------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| | | 10 | 11 | 12 | 14 | 15 | 16 | 18 | 20 | 22 | 24 | 25 | 28 | 30 | 32 |
| RPM of Small Pulley | PD | .376 | .414 | .451 | .526 | .564 | .602 | .677 | .752 | .827 | .902 | .940 | 1.053 | 1.128 | 1.203 |
| | 100 | .005 | .005 | .006 | .007 | .008 | .009 | .010 | .011 | .012 | .013 | .013 | .016 | .019 | .020 |
| | 300 | .016 | .017 | .018 | .021 | .023 | .025 | .029 | .033 | .037 | .040 | .041 | .048 | .055 | .059 |
| | 500 | .022 | .024 | .027 | .030 | .032 | .035 | .039 | .043 | .048 | .053 | .055 | .062 | .066 | .070 |
| | 700 | .031 | .035 | .037 | .042 | .046 | .049 | .054 | .061 | .068 | .075 | .078 | .087 | .092 | .098 |
| | 1160 | .040 | .045 | .050 | .056 | .061 | .066 | .072 | .078 | .089 | .097 | .101 | .113 | .120 | .127 |
| | 1500 | .052 | .058 | .064 | .072 | .078 | .085 | .093 | .101 | .115 | .125 | .130 | .145 | .155 | .165 |
| | 1750 | .061 | .068 | .075 | .085 | .091 | .099 | .108 | .117 | .134 | .146 | .152 | .170 | .182 | .194 |
| | 2500 | .067 | .074 | .080 | .091 | .101 | .107 | .117 | .134 | .148 | .161 | .168 | .192 | .200 | .213 |
| | 3500 | .094 | .103 | .113 | .127 | .141 | .151 | .165 | .188 | .207 | .226 | .236 | .268 | .278 | .296 |

3mm PITCH—9mm WIDE BELT

| | | NUMBER OF GROOVES ON THE SMALL PULLEY | | | | | | | | | | | | | |
|---------------------|------|---------------------------------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| | | 10 | 11 | 12 | 14 | 15 | 16 | 18 | 20 | 22 | 24 | 25 | 28 | 30 | 32 |
| RPM of Small Pulley | PD | .376 | .414 | .451 | .526 | .564 | .602 | .677 | .752 | .827 | .902 | .940 | 1.053 | 1.128 | 1.203 |
| | 100 | .007 | .008 | .009 | .011 | .013 | .014 | .016 | .017 | .019 | .021 | .022 | .025 | .030 | .032 |
| | 300 | .025 | .027 | .029 | .033 | .036 | .040 | .046 | .052 | .059 | .063 | .066 | .076 | .087 | .092 |
| | 500 | .035 | .038 | .043 | .048 | .051 | .055 | .062 | .068 | .076 | .084 | .088 | .098 | .104 | .111 |
| | 700 | .049 | .056 | .059 | .067 | .073 | .078 | .085 | .096 | .107 | .119 | .124 | .138 | .146 | .156 |
| | 1160 | .063 | .071 | .079 | .089 | .097 | .104 | .114 | .123 | .141 | .154 | .160 | .179 | .190 | .203 |
| | 1500 | .082 | .092 | .101 | .114 | .123 | .135 | .147 | .160 | .182 | .198 | .206 | .230 | .246 | .263 |
| | 1750 | .097 | .108 | .119 | .135 | .144 | .157 | .171 | .185 | .212 | .231 | .241 | .269 | .289 | .308 |
| | 2500 | .106 | .117 | .127 | .144 | .160 | .169 | .185 | .212 | .235 | .255 | .266 | .304 | .317 | .338 |
| | 3500 | .149 | .163 | .179 | .201 | .223 | .239 | .262 | .298 | .328 | .358 | .372 | .425 | .441 | .470 |

5mm PITCH—9mm WIDE BELT

| | | NUMBER OF GROOVES ON THE SMALL PULLEY | | | | | | | | | | | |
|---------------------|------|---------------------------------------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 11 | 12 | 14 | 15 | 16 | 18 | 20 | 22 | 24 | 25 | 28 | 30 |
| RPM of Small Pulley | PD | .689 | .752 | .877 | .940 | 1.003 | 1.128 | 1.253 | 1.379 | 1.504 | 1.566 | 1.754 | 1.880 |
| | 100 | .021 | .024 | .027 | .030 | .033 | .039 | .042 | .045 | .051 | .053 | .063 | .069 |
| | 300 | .063 | .069 | .081 | .090 | .096 | .108 | .126 | .138 | .153 | .159 | .186 | .204 |
| | 500 | .090 | .099 | .117 | .126 | .132 | .150 | .165 | .183 | .198 | .206 | .231 | .249 |
| | 700 | .129 | .138 | .162 | .174 | .186 | .210 | .231 | .255 | .279 | .291 | .324 | .348 |
| | 1160 | .162 | .180 | .207 | .225 | .240 | .270 | .300 | .327 | .360 | .375 | .420 | .447 |
| | 1500 | .210 | .231 | .270 | .291 | .309 | .348 | .387 | .423 | .465 | .484 | .543 | .579 |
| | 1750 | .243 | .270 | .315 | .339 | .360 | .405 | .453 | .495 | .540 | .562 | .633 | .675 |
| | 2500 | .267 | .291 | .342 | .366 | .393 | .441 | .492 | .540 | .588 | .613 | .687 | .735 |
| | 3500 | .372 | .405 | .477 | .510 | .549 | .615 | .690 | .756 | .822 | .856 | .960 | 1.03 |

Belt life will be reduced for ratings to the left of the heavy line.

MINIATURE TIMING BELTS & PULLEYS

MINIATURE HTD TIMING BELT DRIVES (Continued) HORSEPOWER RATINGS

5mm PITCH—15mm WIDE BELT

| | | NUMBER OF GROOVES ON THE SMALL PULLEY | | | | | | | | | | |
|---------------------|------|---------------------------------------|------|------|------|-------|-------|-------|-------|-------|-------|-------|
| | | 11 | 12 | 14 | 15 | 16 | 18 | 20 | 22 | 24 | 28 | 30 |
| RPM of Small Pulley | PD | .689 | .752 | .877 | .940 | 1.003 | 1.128 | 1.253 | 1.379 | 1.504 | 1.754 | 1.880 |
| | 100 | .038 | .043 | .049 | .054 | .060 | .071 | .076 | .082 | .093 | .115 | .126 |
| | 300 | .115 | .126 | .148 | .164 | .175 | .197 | .230 | .252 | .280 | .340 | .373 |
| | 500 | .164 | .181 | .214 | .230 | .241 | .274 | .302 | .335 | .362 | .423 | .456 |
| | 700 | .236 | .252 | .296 | .318 | .340 | .384 | .423 | .467 | .511 | .593 | .637 |
| | 1160 | .296 | .329 | .379 | .412 | .439 | .494 | .549 | .599 | .659 | .769 | .819 |
| | 1500 | .384 | .423 | .494 | .533 | .566 | .637 | .709 | .775 | .852 | .995 | 1.06 |
| | 1750 | .445 | .494 | .577 | .621 | .659 | .742 | .830 | .907 | .989 | 1.16 | 1.23 |
| | 2500 | .489 | .533 | .626 | .670 | .720 | .808 | .901 | .989 | 1.07 | 1.25 | 1.34 |
| | 3500 | .681 | .742 | .874 | .934 | 1.00 | 1.12 | 1.26 | 1.38 | 1.50 | 1.75 | 1.88 |

Belt life will be reduced for ratings to the left of the heavy line.

CENTER DISTANCE

To calculate the approximate Belt Length:

$$BL = 2C + \frac{D_1 - D_2}{4C} + 1.57 (D_1 + D_2)$$

An approximate formula for center distance of a timing belt drive is:

$$C = \frac{P}{4} \left[NB - \frac{N_1 + N_2}{2} + \sqrt{\left(NB - \frac{N_1 + N_2}{2} \right)^2 - 2 \left(\frac{N_1 - N_2}{2} \right)^2} \right]$$

Where:

C = Center Distance—Inches

P = Belt Pitch—Inches

NB = Number of Teeth in Belt

N₁ = Number of Grooves in larger Pulley

N₂ = Number of Grooves in smaller Pulley

BL = Belt Length

D₁ = Pitch Diameter of larger Pulley

D₂ = Pitch Diameter of smaller Pulley

INSTALLATION SUGGESTIONS

1. Use care in handling belts to avoid breakage of the reinforcing fibers.
2. Make sure shafts are parallel and pulleys in alignment.
3. Belt should fit snugly, neither too loose nor too tight. Avoid preload, which can cause premature failure.
4. Provision for some Center Distance adjustment will ease the installation and permit proper initial fitting of belts.