### Bancollan Synchronous Belt (polyurethane) standard widths

| Nominal width | | | 025 | 031 | 037 | 050 | 075 | 100 | 150 | 200 | 3 | 5 | 7 | 10 | 13 | 15 | 20 | 25 | 30 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Width (mm) | 3.2 | 4.8 | 6.4 | 7.9 | 9.5 | 12.7 | 19.1 | 25.4 | 38.1 | 50.8 | 3 | 5 | 7 | 10 | 13 | 15 | 20 | 25 | 30 | 50 |
| MXL | ○ | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | |
| XL(DXL) | | | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | | | | |
| L | | | | | | ○ | ○ | ○ | ○ | ○ | | | | | | | | | | |
| T2.5 | | | | | | | | | | | ○ | ○ | ○ | | ○ | | | | | |
| T5(DT5) | | | | | | | | | | | | ○ | | ○ | | ○ | ○ | ○ | | |
| T10(DT10) | | | | | | | | | | | | | | | | ○ | ○ | ○ | ○ | ○ |

### Bancollan Synchronous Belt (polyurethane) length tolerances

(Unit: mm)

| Belt type | Nominal length | Tolerance |
|---|---|---|
| MXL | 45 or more to 71 or less | ±0.15 |
| | Over 71 to 180 or less | ±0.20 |
| | Over 180 to 250 or less | ±0.25 |
| | Over 250 to 375 or less | ±0.30 |
| | Over 375 to 490 or less | ±0.35 |
| | Over 490 to 600 or less | ±0.40 |
| | Over 600 to 1000 or less | ±0.45 |
| XL(DXL) L | Over 60 to 100 or less | ±0.20 |
| | Over 100 to 200 or less | ±0.25 |
| | Over 200 to 300 or less | ±0.30 |
| | Over 300 to 390 or less | ±0.35 |
| | Over 390 to 780 or less | ±0.40 |
| | Over 780 to 800 or less | ±0.45 |
| T5(DT5) T10(DT10) | Over 150 to 320 or less | ±0.15 |
| | Over 320 to 630 or less | ±0.18 |
| | Over 630 to 1000 or less | ±0.25 |
| | Over 1000 to 1960 or less | ±0.40 |
| | Over 1960 to 2300 or less | ±0.50 |

### Bancollan Synchronous Belt (polyurethane) width tolerances

(Unit: mm)

| MXL | | XL (DXL)/L | | T5 (DT5) / T10 (DT10) | |
|---|---|---|---|---|---|
| Nominal width | Tolerance | Nominal width | Tolerance | Width | Tolerance |
| 3.2 | +0.3 -0.6 | 025 | ±0.4 | 5 | ±0.5 |
| 4.8 | | 031 | | — | |
| 8.4 | | 037 | | 10 | |
| 9.5 | | 050 | ±0.5 | 15 | |
| 12.7 | +0.4, -0.8 | 075 | | 20 | |
| | | 100 | ±0.7 | 25 | |
| | | 150 | | 30 | |
| | | 200 | ±1.0 | 50 | |





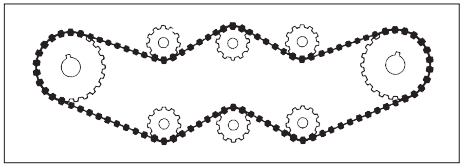
# 3. Double-Sided Synchronous Belt (Rubber/Polyurethane) Product Introduction

The Double-Sided Synchronous Belt [rubber/polyurethane (Bancollan)] has identical tooth profiles on the top and back surfaces of the belt, and a single belt of this belt can synchronously transmit power with multiple shafts. The Bancollan Double-Sided Synchronous Belt is suitable when it is subject to oil or ozone or when dispersion of rubber pieces should be avoided.

## Features

**■ Multi-shaft synchronous power transmission possible**

A single belt can synchronously transmit power with many shafts.



**■ Easy maintenance**

Unlike chains, it has no need to re-tension or lubricate and is easy to maintain.

**■ Low noise**

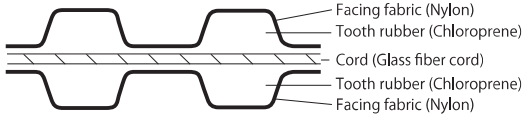
No metal-to-metal contact allows quiet power transmission.

**■ Clean**

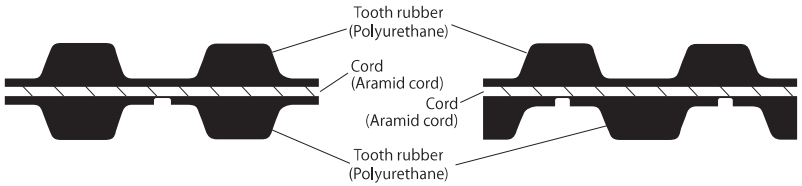
Unlike chains or gears, it has no need for lubrication, eliminating oil dispersion, which provides cleanliness in the sections around the belt.

## Structure

### Double-Sided Synchronous Belt (Types DXL/DL/DH)



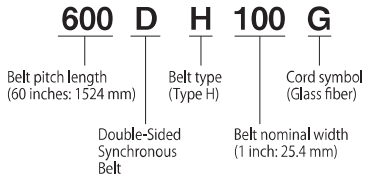

### Bancollan Double-Sided Synchronous Belt (Type DXL)　Bancollan Double-Sided Synchronous Belt (Types DT5/DT10)



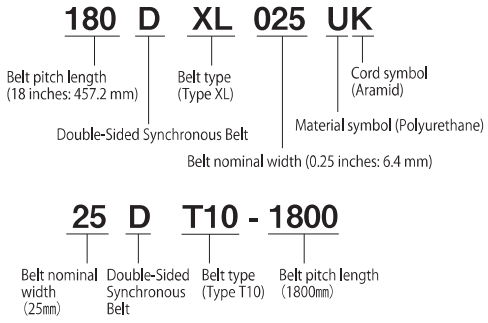

The beads type (⊶⊷) and the zigzag type (⊶⊷) exist taking into consideration domestic and foreign standards and compatibility with other companies' products and have no difference in performance.

## Indication Method

### Double-Sided Synchronous Belt



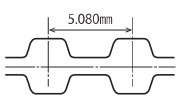

### Bancollan Double-Sided Synchronous Belt



## Rubber Double-Sided Synchronous Belt standard lengths

R: Rubber
U: Polyurethane

### Type DXL




Belt standard widths

| Nominal width | Width (mm) |
|---|---|
| 025 | 6.4 |
| 031 | 7.9 |
| 037 | 9.5 |
| 050 | 12.7 |
| 075 | 19.1 |

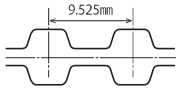
Belt size (Type DXL)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| 160DXL | 406.40 | 80 | ● | - |
| 162DXL | 411.48 | 81 | ● | - |
| 164DXL | 416.56 | 82 | ● | - |
| 166DXL | 421.64 | 83 | ● | - |
| 168DXL | 426.72 | 84 | ● | - |
| 170DXL | 431.80 | 85 | ● | - |
| 172DXL | 436.88 | 86 | ● | - |
| 174DXL | 441.96 | 87 | ● | - |
| 176DXL | 447.04 | 88 | ● | - |
| 178DXL | 452.12 | 89 | ● | - |
| 180DXL | 457.20 | 90 | ● | - |
| 182DXL | 462.28 | 91 | ● | - |
| 184DXL | 467.36 | 92 | ● | - |
| 188DXL | 477.52 | 94 | ● | - |
| 190DXL | 482.60 | 95 | ● | - |
| 194DXL | 492.76 | 97 | ● | - |
| 196DXL | 497.84 | 98 | ● | - |
| 198DXL | 502.92 | 99 | ● | - |
| 200DXL | 508.00 | 100 | ● | - |
| 202DXL | 513.08 | 101 | ● | - |
| 206DXL | 523.24 | 103 | ● | - |
| 208DXL | 528.32 | 104 | ● | - |
| 210DXL | 533.40 | 105 | ● | - |
| 212DXL | 538.48 | 106 | ● | - |
| 214DXL | 543.56 | 107 | ● | - |
| 216DXL | 548.64 | 108 | ● | - |
| 220DXL | 558.80 | 110 | ● | - |
| 222DXL | 563.88 | 111 | ● | - |
| 224DXL | 568.96 | 112 | ● | - |
| 228DXL | 579.12 | 114 | ● | - |
| 230DXL | 584.20 | 115 | ● | - |
| 234DXL | 594.36 | 117 | ● | - |
| 240DXL | 609.60 | 120 | ● | - |
| 244DXL | 619.76 | 122 | ● | - |
| 248DXL | 629.92 | 124 | ● | - |
| 250DXL | 635.00 | 125 | ● | - |
| 260DXL | 660.40 | 130 | ● | - |
| 262DXL | 665.48 | 131 | ● | - |
| 266DXL | 675.64 | 133 | ● | - |
| 270DXL | 685.80 | 135 | ● | - |
| 276DXL | 701.04 | 138 | ● | - |
| 280DXL | 711.20 | 140 | ● | - |
| 282DXL | 716.28 | 141 | ● | - |
| 290DXL | 736.60 | 145 | ● | - |
| 300DXL | 762.00 | 150 | ● | - |
| 310DXL | 787.40 | 155 | ● | - |
| 314DXL | 797.56 | 157 | ● | - |
| 320DXL | 812.80 | 160 | ● | - |
| 322DXL | 817.88 | 161 | ● | - |
| 330DXL | 838.20 | 165 | ● | - |
| 340DXL | 863.60 | 170 | ● | - |
| 344DXL | 873.76 | 172 | ● | - |
| 348DXL | 883.92 | 174 | ● | - |
| 352DXL | 894.08 | 176 | ● | - |
| 356DXL | 904.24 | 178 | ● | - |
| 360DXL | 914.40 | 180 | ● | - |
| 364DXL | 924.56 | 182 | ● | - |
| 370DXL | 939.80 | 185 | ● | - |

Belt size (Type DXL)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| 372DXL | 944.88 | 186 | ● | - |
| 376DXL | 955.04 | 188 | ● | - |
| 384DXL | 975.36 | 192 | ● | - |
| 386DXL | 980.44 | 193 | ● | - |
| 388DXL | 985.52 | 194 | ● | - |
| 390DXL | 990.60 | 195 | ● | - |
| 396DXL | 1005.84 | 198 | ● | - |
| 400DXL | 1016.00 | 200 | ● | - |
| 408DXL | 1036.32 | 204 | ● | - |
| 424DXL | 1076.96 | 212 | ● | - |
| 430DXL | 1092.29 | 215 | ● | - |
| 450DXL | 1143.00 | 225 | ● | - |
| 456DXL | 1158.24 | 228 | ● | - |
| 460DXL | 1168.40 | 230 | ● | - |
| 470DXL | 1193.80 | 235 | ● | - |
| 490DXL | 1244.60 | 245 | ● | - |
| 496DXL | 1259.84 | 248 | ● | - |
| 510DXL | 1295.40 | 255 | ● | - |
| 564DXL | 1432.56 | 282 | ● | - |
| 592DXL | 1503.68 | 296 | ● | - |
| 608DXL | 1544.32 | 304 | ● | - |
| 630DXL | 1600.20 | 315 | ● | - |
| 638DXL | 1620.52 | 319 | ● | - |

### Type DL




Belt standard widths

| Nominal width | Width (mm) |
|---|---|
| 050 | 12.7 |
| 075 | 19.1 |
| 100 | 25.4 |
| 150 | 38.1 |
| 200 | 50.8 |

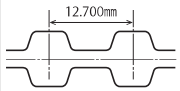
Belt size (Type DL)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| 165DL | 419.10 | 44 | ● | - |
| 169DL | 428.63 | 45 | ● | - |
| 172DL | 438.15 | 46 | ● | - |
| 187DL | 476.25 | 50 | ● | - |
| 203DL | 514.35 | 54 | ● | - |
| 210DL | 533.40 | 56 | ● | - |
| 218DL | 552.45 | 58 | ● | - |
| 225DL | 571.50 | 60 | ● | - |
| 240DL | 609.60 | 64 | ● | - |
| 248DL | 628.65 | 66 | ● | - |
| 255DL | 647.70 | 68 | ● | - |
| 263DL | 666.75 | 70 | ● | - |
| 270DL | 685.80 | 72 | ● | - |
| 277DL | 704.85 | 74 | ● | - |
| 285DL | 723.90 | 76 | ● | - |
| 300DL | 762.00 | 80 | ● | - |
| 304DL | 771.53 | 81 | ● | - |
| 315DL | 800.10 | 84 | ● | - |
| 320DL | 809.63 | 85 | ● | - |
| 322DL | 819.15 | 86 | ● | - |
| 334DL | 847.73 | 89 | ● | - |
| 337DL | 857.25 | 90 | ● | - |
| 345DL | 876.30 | 92 | ● | - |
| 360DL | 914.40 | 96 | ● | - |
| 367DL | 933.45 | 98 | ● | - |
| 375DL | 952.50 | 100 | ● | - |
| 382DL | 971.55 | 102 | ● | - |
| 390DL | 990.60 | 104 | ● | - |
| 394DL | 1000.13 | 105 | ● | - |
| 420DL | 1066.80 | 112 | ● | - |

Belt size (Type DL)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| 427DL | 1085.85 | 114 | ● | - |
| 436DL | 1104.90 | 116 | ● | - |
| 439DL | 1114.43 | 117 | ● | - |
| 446DL | 1133.48 | 119 | ● | - |
| 450DL | 1143.00 | 120 | ● | - |
| 465DL | 1181.10 | 124 | ● | - |
| 480DL | 1219.20 | 128 | ● | - |
| 510DL | 1295.40 | 136 | ● | - |
| 514DL | 1304.93 | 137 | ● | - |
| 525DL | 1333.50 | 140 | ● | - |
| 540DL | 1371.60 | 144 | ● | - |
| 548DL | 1390.65 | 146 | ● | - |
| 581DL | 1476.38 | 155 | ● | - |
| 600DL | 1524.00 | 160 | ● | - |
| 605DL | 1533.53 | 161 | ● | - |
| 619DL | 1571.63 | 165 | ● | - |
| 630DL | 1600.20 | 168 | ● | - |
| 640DL | 1619.25 | 170 | ● | - |
| 653DL | 1657.35 | 174 | ● | - |
| 660DL | 1676.40 | 176 | ● | - |
| 697DL | 1771.65 | 186 | ● | - |
| 728DL | 1847.85 | 194 | ● | - |
| 731DL | 1857.38 | 195 | ● | - |
| 767DL | 1952.63 | 205 | ● | - |
| 780DL | 1981.20 | 208 | ● | - |
| 788DL | 2000.25 | 210 | ● | - |
| 806DL | 2047.88 | 215 | ● | - |
| 855DL | 2171.70 | 228 | ● | - |
| 863DL | 2190.75 | 230 | ● | - |
| 881DL | 2238.38 | 235 | ● | - |
| 915DL | 2324.10 | 244 | ● | - |
| 919DL | 2333.63 | 245 | ● | - |
| 938DL | 2381.25 | 250 | ● | - |
| 1294DL | 3286.13 | 345 | ● | - |

### Type DH




Belt standard widths

| Nominal width | Width (mm) |
|---|---|
| 075 | 19.1 |
| 100 | 25.4 |
| 150 | 38.1 |
| 200 | 50.8 |
| 300 | 76.2 |

Belt size (Type DH)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| 185DH | 469.90 | 37 | ● | - |
| 225DH | 571.50 | 45 | ● | - |
| 230DH | 584.20 | 46 | ● | - |
| 240DH | 609.60 | 48 | ● | - |
| 245DH | 622.30 | 49 | ● | - |
| 270DH | 685.80 | 54 | ● | - |
| 280DH | 711.20 | 56 | ● | - |
| 300DH | 762.00 | 60 | ● | - |
| 310DH | 787.40 | 62 | ● | - |
| 315DH | 800.10 | 63 | ● | - |
| 320DH | 812.80 | 64 | ● | - |
| 330DH | 838.20 | 66 | ● | - |
| 340DH | 863.60 | 68 | ● | - |
| 350DH | 889.00 | 70 | ● | - |
| 360DH | 914.40 | 72 | ● | - |
| 370DH | 939.80 | 74 | ● | - |
| 375DH | 952.50 | 75 | ● | - |
| 390DH | 990.60 | 78 | ● | - |
| 400DH | 1016.00 | 80 | ● | - |
| 410DH | 1041.40 | 82 | ● | - |





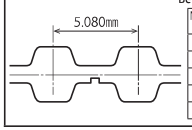
Belt size (Type DH)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| 420DH | 1066.80 | 84 | ● | - |
| 430DH | 1092.20 | 86 | ● | - |
| 450DH | 1143.00 | 90 | ● | - |
| 465DH | 1181.10 | 93 | ● | - |
| 480DH | 1219.20 | 96 | ● | - |
| 490DH | 1244.60 | 98 | ● | - |
| 510DH | 1295.40 | 102 | ● | - |
| 530DH | 1346.20 | 106 | ● | - |
| 540DH | 1371.60 | 108 | ● | - |
| 560DH | 1422.40 | 112 | ● | - |
| 565DH | 1435.10 | 113 | ● | - |
| 570DH | 1447.80 | 114 | ● | - |
| 580DH | 1473.20 | 116 | ● | - |
| 600DH | 1524.00 | 120 | ● | - |
| 605DH | 1536.70 | 121 | ● | - |
| 630DH | 1600.20 | 126 | ● | - |
| 640DH | 1625.60 | 128 | ● | - |
| 650DH | 1651.00 | 130 | ● | - |
| 660DH | 1676.40 | 132 | ● | - |
| 680DH | 1727.20 | 136 | ● | - |
| 700DH | 1778.00 | 140 | ● | - |
| 730DH | 1854.20 | 146 | ● | - |
| 750DH | 1905.00 | 150 | ● | - |
| 760DH | 1930.40 | 152 | ● | - |
| 770DH | 1955.80 | 154 | ● | - |
| 800DH | 2032.00 | 160 | ● | - |
| 810DH | 2057.40 | 162 | ● | - |
| 820DH | 2082.80 | 164 | ● | - |
| 840DH | 2133.60 | 168 | ● | - |
| 850DH | 2159.00 | 170 | ● | - |
| 860DH | 2184.40 | 172 | ● | - |
| 880DH | 2235.20 | 176 | ● | - |
| 900DH | 2286.00 | 180 | ● | - |
| 950DH | 2413.00 | 190 | ● | - |
| 985DH | 2501.90 | 197 | ● | - |
| 1000DH | 2540.00 | 200 | ● | - |
| 1020DH | 2590.80 | 204 | ● | - |
| 1050DH | 2667.00 | 210 | ● | - |
| 1100DH | 2794.00 | 220 | ● | - |
| 1130DH | 2870.20 | 226 | ● | - |
| 1140DH | 2895.60 | 228 | ● | - |
| 1250DH | 3175.00 | 250 | ● | - |
| 1325DH | 3365.50 | 265 | ● | - |
| 1350DH | 3429.00 | 270 | ● | - |
| 1400DH | 3556.00 | 280 | ● | - |
| 1680DH | 4267.20 | 336 | ● | - |
| 1700DH | 4318.00 | 340 | ● | - |

## Bancollan Double-Sided Synchronous Belt (polyurethane) standard lengths

R: Rubber
U: Polyurethane

### Type DXL



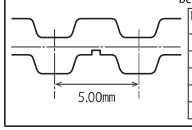

Belt standard widths

| Nominal width | Width (mm) |
|---|---|
| 025 | 6.4 |
| 031 | 7.9 |
| 037 | 9.5 |
| 050 | 12.7 |
| 075 | 19.1 |

Belt size (Type DXL)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| 140DXL | 355.60 | 70 | - | ○ |
| 146DXL | 370.84 | 73 | - | ○ |
| 150DXL | 381.00 | 75 | - | ○ |
| 166DXL | 421.64 | 83 | - | ○ |
| 170DXL | 431.80 | 85 | - | ○ |
| 180DXL | 457.20 | 90 | - | ○ |
| 190DXL | 482.60 | 95 | - | ○ |
| 200DXL | 508.00 | 100 | - | ○ |
| 210DXL | 533.40 | 105 | - | ○ |
| 220DXL | 558.80 | 110 | - | ○ |
| 230DXL | 584.20 | 115 | - | ○ |
| 240DXL | 609.60 | 120 | - | ○ |
| 270DXL | 685.80 | 135 | - | ○ |
| 290DXL | 736.60 | 145 | - | ○ |
| 300DXL | 762.00 | 150 | - | ○ |
| 320DXL | 812.80 | 160 | - | ○ |
| 376DXL | 955.04 | 188 | - | ○ |
| 400DXL | 1016.00 | 200 | - | ○ |
| 430DXL | 1092.20 | 215 | - | ○ |
| 490DXL | 1244.60 | 245 | - | ○ |

### Type DT5



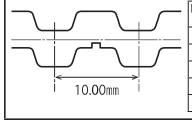

Belt standard widths

| Nominal width | Width (mm) |
|---|---|
| 5 | 5 |
| 10 | 10 |
| 15 | 15 |
| 20 | 20 |
| 25 | 25 |

Belt size (Type DT5)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| DT5- 300 | 300.0 | 60 | - | ○ |
| DT5- 410 | 410.0 | 82 | - | ○ |
| DT5- 460 | 460.0 | 92 | - | ○ |
| DT5- 480 | 480.0 | 96 | - | ○ |
| DT5- 515 | 515.0 | 103 | - | ○ |
| DT5- 550 | 550.0 | 110 | - | ○ |
| DT5- 590 | 590.0 | 118 | - | ○ |
| DT5- 620 | 620.0 | 124 | - | ○ |
| DT5- 650 | 650.0 | 130 | - | ○ |
| DT5- 700 | 700.0 | 140 | - | ○ |
| DT5- 750 | 750.0 | 150 | - | ○ |
| DT5- 800 | 800.0 | 160 | - | ○ |
| DT5- 815 | 815.0 | 163 | - | ○ |
| DT5- 860 | 860.0 | 172 | - | ○ |
| DT5- 900 | 900.0 | 180 | - | ○ |
| DT5- 940 | 940.0 | 188 | - | ○ |
| DT5-1075 | 1075.0 | 215 | - | ○ |
| DT5-1100 | 1100.0 | 220 | - | ○ |

### Type DT10




Belt standard widths

| Nominal width | Width (mm) |
|---|---|
| 15 | 15 |
| 20 | 20 |
| 25 | 25 |
| 30 | 30 |
| 50 | 50 |

Belt size (Type DT10)

| Belt nominal length | Pitch length (mm) | No. of teeth | R | U |
|---|---|---|---|---|
| DT10- 260 | 260.0 | 26 | - | - |
| DT10- 400 | 400.0 | 40 | - | ○ |
| DT10- 530 | 530.0 | 53 | - | ○ |
| DT10- 630 | 630.0 | 63 | - | ○ |
| DT10- 660 | 660.0 | 66 | - | ○ |
| DT10- 700 | 700.0 | 70 | - | ○ |
| DT10- 720 | 720.0 | 72 | - | ○ |
| DT10- 800 | 800.0 | 80 | - | ○ |
| DT10- 840 | 840.0 | 84 | - | ○ |
| DT10- 900 | 900.0 | 90 | - | ○ |
| DT10- 980 | 980.0 | 98 | - | ○ |
| DT10-1100 | 1100.0 | 110 | - | ○ |
| DT10-1210 | 1210.0 | 121 | - | ○ |
| DT10-1240 | 1240.0 | 124 | - | ○ |
| DT10-1250 | 1250.0 | 125 | - | ○ |
| DT10-1320 | 1320.0 | 132 | - | ○ |
| DT10-1350 | 1350.0 | 135 | - | ○ |
| DT10-1420 | 1420.0 | 142 | - | ○ |
| DT10-1500 | 1500.0 | 150 | - | ○ |
| DT10-1610 | 1610.0 | 161 | - | ○ |
| DT10-1800 | 1800.0 | 180 | - | ○ |
| DT10-1880 | 1880.0 | 188 | - | ○ |

For tolerances of effective length and belt width, refer to **P. 74**.

# How to Design a Synchronous Belt

## Step 1. Determining conditions required for the design

① Machine type
② Transmission power, or rated power of the driving machine
③ Degree of load fluctuation
④ Daily operating hours
⑤ Pinion revolution
⑥ Speed ratio $\left(\frac{\text{No. of teeth of large pulley}}{\text{No. of teeth of pinion}}\right)$
⑦ Temporary center distance
⑧ Pulley diameter restriction
⑨ Operating environment (high temperature, low temperature, oil, water, dirt, acid, alkali)

## Step 2-1 Calculating the design power

Calculate the design power with Formula 1.

**Formula 1**

$$Pd = Pt \times (Ko + Ki + Kr)$$

| | | |
|---|---|---|
| Pd | : Design power | (kW) |
| Pt | : Transmission power | (kW) |
| Ko | : Load correction factor | **(Table 1 → P. 81)** |
| Ki | : Idler correction factor | **(Table 2 → P. 81)** |
| Kr | : Speed-up ratio correction factor | **(Table 3 → P. 81)** |

Note 1) For transmission power, it is ideal to use the load of the driven machine; however, if it is unknown, use the rated power of the driving machine.
If torque or horsepower is used for indication, convert it into watt or kilowatt using Formula 2.
Note 2) For use in a decelerating mechanism, Kr = 0.

**Formula 2**

$$Pt = \frac{Tr \times n}{9550}$$

| | | |
|---|---|---|
| Pt | : Transmission power | (kW) |
| n | : Revolution | (rpm) |
| Tr | : Load torque | (Nm) |

1PS=0.7355(kW)

## Step 2-2 Calculating the design power when there are sudden stops or sudden accelerations

Under conditions of sudden stop and sudden acceleration, an abnormal torque may be applied to the belt due to the inertial force of the machine; check with Formula 3 in advance, and if the width falls short, it needs to be corrected.
Compare the Pd calculated in **Step 2-1** and the Pdq calculated next and use the larger value as the design power.

**Formula 3**

$$Trq = \frac{\Sigma GD^2 \times (n_1 - n_2)}{38.2 \times t} \quad (N{\cdot}m)$$

From Formula 2, $Ptq = \frac{Trq \times n}{9550}$ (kW)

$$Pdq = Ptq \times Kq \quad (kW)$$

| | | |
|---|---|---|
| Trq | : Rotational torque at the time of a sudden stop or sudden acceleration | (N•m) |
| $GD^2$ | : Flywheel effect (Sum total of GD2 on the opposite side to the brake) | ($kgf{\cdot}m^2$) |
| $n_1 - n_2$ | : Difference in revolution (opposite side to the brake) | (rpm) |
| t | : Time to change from $n_1$ to $n_2$ | (S) |
| Pdq | : Design power | (kW) |
| Kq | : Correction factor(table below) | |

**Correction factor Kq by rotation at the time of a sudden stop or sudden acceleration**

| revolutions/day | 1 | 2 | 3~4 | 5~10 | 11~15 |
|---|---|---|---|---|---|
| Kq | 1.0 | 1.2 | 1.3 | 1.5 | 1.6 |
| revolutions/day | 16~25 | 26~40 | 41~60 | 61~100 | 101~ |
| Kq | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 |

## Step 3 Selecting a belt type

Obtain a belt type based on design power and pinion revolution from **Fig. 3 "Belt type selection diagram" (→ P. 82)**.
If an obtained type is close to the line of intersection of two types, design both belt types as a trial and choose the one that matches the purpose of the design and that is the more economical.
For S4.5M and DS4.5M, please contact us.

## Step 4 Selecting a pulley diameter

Select an appropriate pulley diameter from Formula 4, taking the restriction of the power transmission space etc. into consideration.

**Formula 4**

$$Z_2 = \frac{n_1}{n_2} \times Z_1$$

$$\text{Speed ratio} = \frac{n_1}{n_2}$$

$Z_1$: Number of teeth of pinion
Z2: No. of teeth of large pulley
$n_1$: Pinion revolution (rpm)
n2: Large pulley revolution (rpm)

For relations among the number of teeth of pulleys, pulley diameter, and pitch diameter, refer to the **"List of Pulley Diameters" (→ P. 83 to P. 99)**. Obtain an unlisted number of teeth of a pulley from Formula 5.

**Formula 5**

$$dp = pt(Z) / \pi$$
$$do = pt(Z) / \pi - 2a$$

| | | |
|---|---|---|
| dp | : Pulley pitch diameter | (mm) |
| do | : Pulley outside diameter | (mm) |
| pt | : Pulley tooth pitch | (mm) |
| z | : No. of teeth of pulley | |
| 2a | : Difference between pulley pitch diameter and pulley outside diameter | **(Table 4 → P. 100)** |





When you determine a pulley diameter, check the following items:

**- Check of the minimum number of teeth of a pulley**
Generally, when a pulley with a small number of teeth is used, the flex fatigue of the belt increases, reducing the belt service life.
Hence, please use a pulley with a larger number of teeth than the ones shown in **Table 5 "Minimum number of teeth of pulleys" (→ P. 100)** at least.

**- Check on the belt speed**
Check if the belt speed exceeds the value in **Table 6 "Basic Belt Speeds" (→ P. 100)**. If the belt speed exceeds it, reduce the pulley diameter. If the minimum pulley diameter is not satisfied, change and reconsider the belt type. Calculate the belt speed from Formula 6.

**Formula 6**

$$v = \frac{dp \times n}{19100}$$

| | | |
|---|---|---|
| v | : Belt speed | (m/s) |
| dp | : Pulley pitch diameter | (mm) |
| n | : Revolution | (rpm) |

## Step 5 Selecting an effective length

Calculate a rough effective length with Formula 7 and select an effective length L' that is closest to this value from the **"Table of standard effective lengths."**

■ **Table of standard effective lengths**

**Ceptor-X → P. 43**
**Ceptor-VI→P.45~P.46**
**HP-STS→P.49~P.50**
**HP-HTS → P. 50**
**STS→P.55~P.57**
**Double-Sided STS → P. 59 to P. 62**
**TN10/TN15 → P. 66**
**Synchronous Belt →P.70~P.73**
**Double-Sided Synchronous Belt →P.77~P.78**

**Formula 7**

$$L' = 2C + 1.57(Dp + dp) + \frac{(Dp - dp)^2}{4C}$$

| | | |
|---|---|---|
| L' | : Rough effective length | (mm) |
| C | : Center distance | (mm) |
| Dp | : Large pulley pitch diameter | (mm) |
| dp | : Pinion pitch diameter | (mm) |

Backcalculate the center distance at that time from the pitch length L of the selected belt using Formula 8.

**Formula 8**

$$C = \frac{B + \sqrt{B^2 - 2(Dp - dp)^2}}{4}$$

$$B = Lp - 1.57\,(Dp + dp)$$

Lp: Belt pitch length (mm)

## Step 6 Determining the belt width

(1) **Determination of basic power rating**
From the **"Table of basic power ratings" (→ P. 101 to P. 126)**, obtain the transmission capacity per basic belt width. For the basic belt width, refer to the values listed in the "Table of basic power ratings."

(2) **Mesh correction factor Km**
From Formula 9, calculate the number of meshed teeth of the pinion, and from **Table 7 (→ P. 127)**, obtain the mesh correction factor Km.

**Formula 9**

$$Zm = Z \times \frac{\theta_1}{360}$$

$$\theta_1 = 180 - \frac{57.3(Dp - dp)}{C}$$

| | | |
|---|---|---|
| Zm | : Number of meshed teeth of pinion | |
| Z | : Number of teeth of pinion | |
| $\theta_1$ | : Angle of contact of pinion | (° ) |
| Dp | : Large pulley pitch diameter | (mm) |
| dp | : Pinion pitch diameter | (mm) |

(3) **Correction factor by effective length Kl**
Obtain the effective length correction factor Kl for the standard effective length obtained in **Step 5** from **Table 8 "Table of Effective Length Correction Factors" (→ P. 127)**.
Note) For STS and Synchronous Belts, Kl is unnecessary.

(4) **Calculation of belt width**
From Formula 10, obtain the correction factor of the belt width Kb.

**Formula 10**

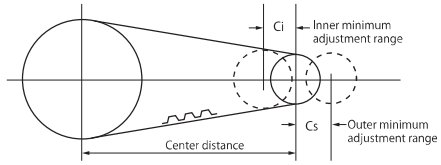
$$Kb = \frac{Pd}{Pr \cdot Km \cdot Kl}$$

| | | |
|---|---|---|
| Kb | : Width correction factor | |
| Pd | : Design power | (kW) |
| Pr | : Basic power rating | (kW) |
| Km | : Mesh correction factor | |
| Kl | : Length correction factor | |

From **Table 9 "Table of Belt Width Correction Factors" (→ P. 127 to P. 129)**, obtain the belt width for the width correction factor Kb obtained from Formula 10.

## Step 7 Checking the adjustment range of the center distance

From **Table 10 "Table of Adjustment Ranges of Center Distance" (→ P. 129)**, obtain the installation range and the tension range of the belt.



## Table 1 Load Correction Factors (Ko)

| Machine using the product<br>Note 2) When your driven machine cannot be found in the table, use the load correction factor of a machine with a similar start-up load or shock load. | Driving machine | | | | | |
|---|---|---|---|---|---|---|
| | Those with the maximum output 300% or less of the rating | | | Those with the maximum output over 300% of the rating | | |
| | AC motor (standard motor, synchronous motor)<br>DC motor (shunt-wound)<br>Engine with two or more cylinders | | | Special motor (high torque)<br>DC motor (direct-wound)<br>Single-cylinder engine<br>Operation by line shaft or clutch | | |
| | Operating hours | | | Operating hours | | |
| | 3~5hr/day | 8~10hr/day | 16~24hr/day | 3~5hr/day | 8~10hr/day | 16~24hr/day |
| ● Exhibition apparatuses ● Projectors ● Measuring instruments ● Medical equipment | 1.0 | 1.2 | 1.4 | 1.2 | 1.4 | 1.6 |
| ● Vacuum cleaners ● Sewing machines ● Office machinery ● Woodworking lathes ● Band-sawing machines | 1.2 | 1.4 | 1.6 | 1.4 | 1.6 | 1.8 |
| ● Light-duty belt conveyors ● Packaging machines ● Sieves | 1.3 | 1.5 | 1.7 | 1.5 | 1.7 | 1.9 |
| ● Liquid stirring machines ● Drill presses ● Lathes ● Screw cutting machines ● Circular sawing machines ● Planing machines ● Laundry machines ● Papermaking machines (not including pulper) ● Printing machines | 1.4 | 1.6 | 1.8 | 1.6 | 1.8 | 2.0 |
| ● Stirring machines (cement, viscous substances) ● Belt conveyors (ore, coal, sand) ● Grinding machines ● Shaping machines ● Boring machines ● Milling machines ● Compressors (centrifugal type) ● Vibrating sieves ● Fiber machines (warping machines, winders) ● Rotary compressors ● Compressors (reciprocating type) | 1.5 | 1.7 | 1.9 | 1.7 | 1.9 | 2.1 |
| ● Conveyors (aprons, pans, buckets, elevators) ● Extraction pumps ● Rinsing machines ● Fans, blowers (centrifugal type, suction, exhaust) ● Generators ● Exciters ● Hoists ● Elevators ● Rubber processing machines (calenders, rolls, extruders) ● Fiber machines (weaving machines, spinning machines, yarn-twisting machines, pirn winders) | 1.6 | 1.8 | 2.0 | 1.8 | 2.0 | 2.2 |
| ● Centrifugal separators / conveyors (flight, screw) ● Hammer mills ● Papermaking machines (pulper, beaders) | 1.7 | 1.9 | 2.1 | 1.9 | 2.1 | 2.3 |
| ● Ceramic industry machines (bricks, clay kneading machines) ● Propellers for mines ● Forced air blowers | 1.8 | 2.0 | 2.2 | 2.0 | 2.2 | 2.4 |

## Table 2 Idler Correction Factors

| Idler installation location | Ki |
|---|---|
| - No idlers | 0.0 |
| - Installed from the inside on the slack side | 0.0 |
| - Installed from the outside on the slack side | 0.1 |
| - Installed from the inside on the tight side | 0.1 |
| - Installed from the outside on the tight side | 0.2 |

## Table 3 Speed-up Ratio Correction Factors

| Speed-up ratio | Kr |
|---|---|
| 1.00~1.24 | 0.0 |
| 1.25~1.74 | 0.1 |
| 1.75~2.49 | 0.2 |
| 2.50~3.49 | 0.3 |
| 3.50 or more | 0.4 |





Fig. 3-1 Belt type selection diagram (Ceptor-X)

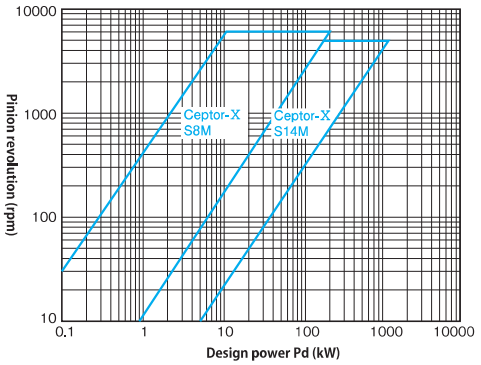



Fig. 3-2 Belt type selection diagram (Ceptor-VI)

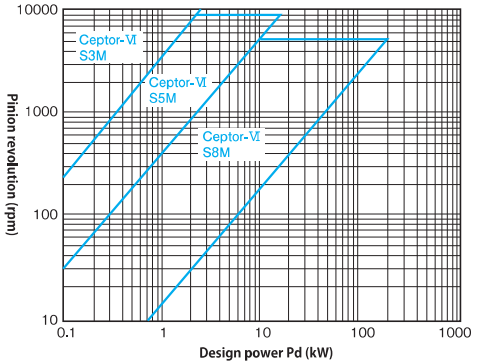



Fig. 3-3 Belt type selection diagram (HP-STS/HP-HTS)

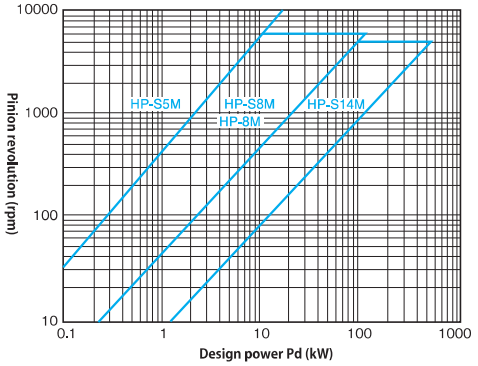



Fig. 3-4 Belt type selection diagram (STS)

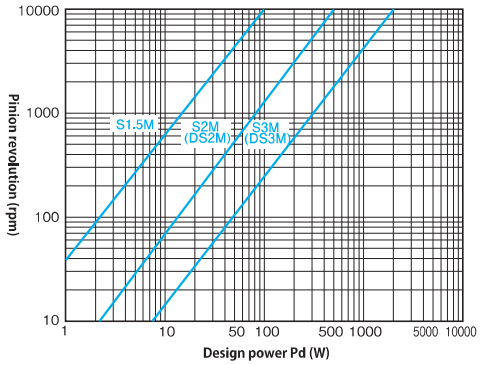



Fig. 3-5 Belt type selection diagram (Synchronous Belt)