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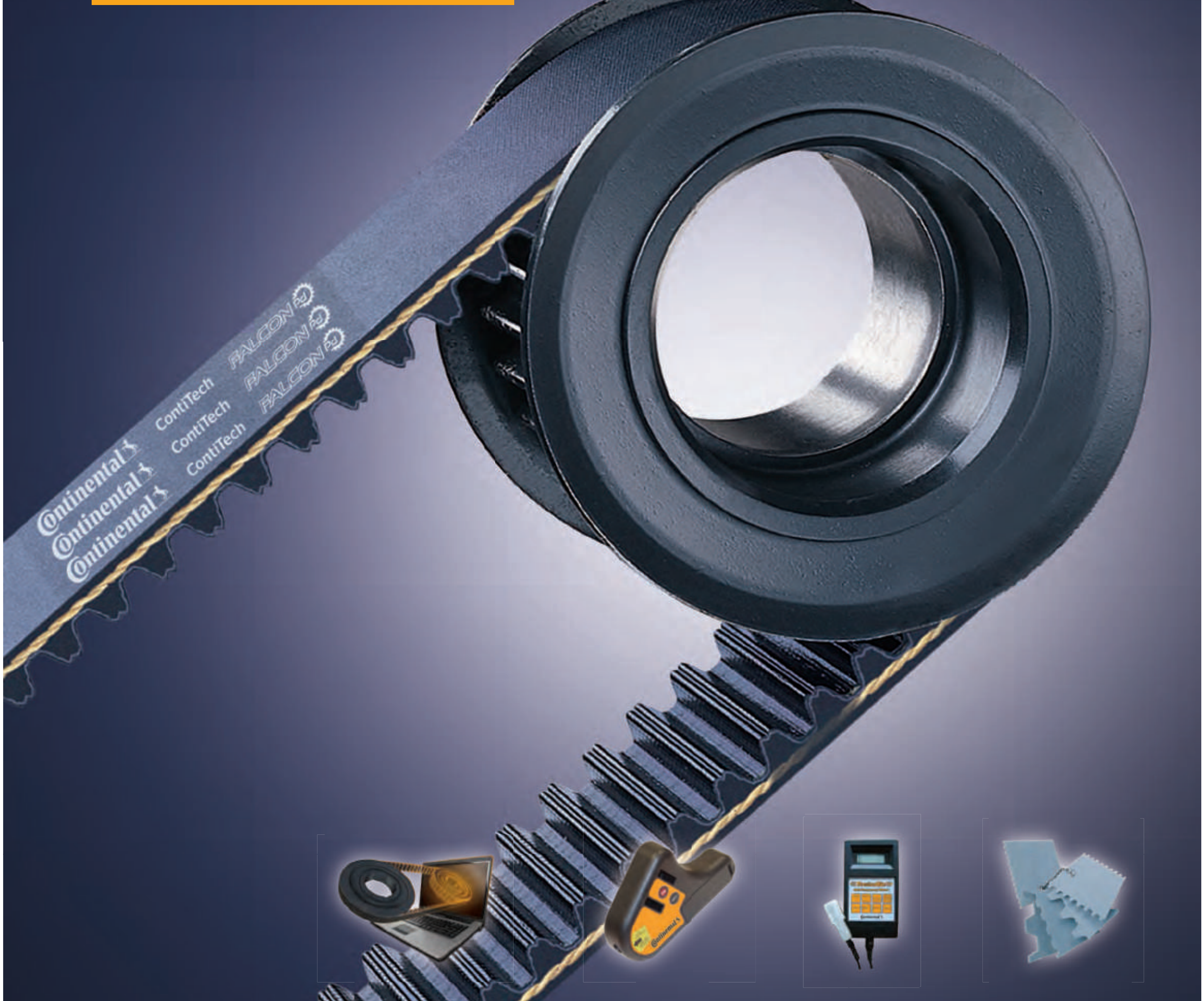


# Power Transmission Belt Drive System

## Installation, Maintenance and Troubleshooting Guide

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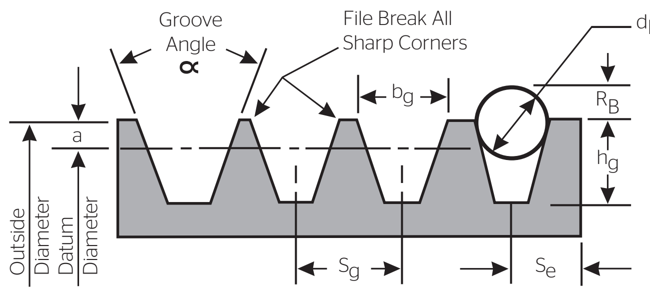
# **V-Belts**
# Installation Guide

Check sheaves for cleanliness, damage and wear each time belt maintenance is performed and whenever belts are changed. The inspection procedure is described on page 7 of this guide.

Use the Groove Dimensions Tables 1 and 2 (on pages 4-6) and tolerance data below as a reference to determine if excessive sheave wear has occurred. They can also aid in replacement belt cross section selection, if necessary.

The tables are based on industry standard dimensions for V-belt sheaves. Always check the original sheave specifications if possible. Variances from industry standards can occur to provide for special design or performance requirements.

### Industry Standard Groove Dimensions for V-Belt Sheaves




Standard Groove Dimensions

Face Width of Standard and Deep Groove Sheaves

Face Width = $S_g (N_g - 1) + 2 S_e$
Where: $N_g$ = Number of Grooves

Table 1 Groove Dimensions

| Cross Section | | Outside Diameter Range | Groove ∝ Angle ±0.33 | $b_g$ | $b_g$ | $h_g$ Min. | $R_B$ Min. | $d_b$ ±0.0005 | $S_g$ ±0.025 | $S_e$ | $S_e$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Standard Groove Dimensions (in.)** | | | | | | | | | |
| A, AX | | Up through 5.65<br>Over 5.65 | 34<br>38 | 0.494<br>0.504 | ±0.005 | 0.460 | 0.151<br>0.152 | 0.4375<br>(7/16) | 0.625 | 0.375 | +0.090<br>−0.062 |
| B, BX | | Up through 7.35<br>Over 7.35 | 34<br>38 | 0.637<br>0.650 | ±0.006 | 0.550 | 0.192<br>0.193 | 0.5625<br>(9/16) | 0.750 | 0.500 | +0.120<br>-0.065 |
| A, AX & B, BX Combination | A, AX | Up through 7.4<br>Over 7.4 | 34<br>38 | 0.612<br>0.625 | ±0.006 | 0.612 | 0.233<br>0.229 | 0.5625<br>(9/16) | 0.750 | 0.500 | +0.120<br>-0.065 |
| A, AX & B, BX Combination | B, BX | Up through 7.4<br>Over 7.4 | 34<br>38 | 0.612<br>0.625 | ±0.006 | 0.612 | 0.233<br>0.229 | 0.5625<br>(9/16) | 0.750 | 0.500 | +0.120<br>-0.065 |
| C, CX | | Up through 8.39<br>Over 8.39 to and including 12.40<br>Over 12.40 | 34<br>36<br>38 | 0.879<br>0.887<br>0.895 | ±0.007 | 0.750 | 0.279<br>0.280<br>0.282 | 0.7812<br>(25/32) | 1.000 | 0.688 | +0.160<br>-0.070 |
| D | | Up through 13.59<br>Over 13.59 to and including 17.60<br>Over 17.60 | 34<br>36<br>38 | 1.259<br>1.271<br>1.283 | ±0.008 | 1.020 | 0.416<br>0.417<br>0.418 | 1.1250<br>(1⅛) | 1.438 | 0.875 | +0.220<br>-0.080 |
| E | | Up through 24.80<br>Over 24.80 | 36<br>38 | 1.527<br>1.542 | ±0.010 | 1.270 | 0.476<br>0.477 | 1.3438<br>(1 11/32) | 1.750 | 1.125 | +0.280<br>-0.090 |

**Other Sheave Tolerances**

**Outside Diameter**

Up through 8.0 in.

Outside diameter: ±0.020 in.

For each additional inch of outside diameter add... ±0.005 in.

**Radial Runout***

Up through 10.0 in.

Outside diameter: ±0.010 in.

For each additional inch of outside diameter add... ±0.0005 in.

**Axial Runout***

Up through 5.0 in.

Outside diameter: ±0.005 in.

For each additional inch of outside diameter add... ±0.001 in.

*Total Indicator Reading

Table 1 Groove Dimensions

**Drive Design Factors (in.)**

| Cross Section | Datum Diameter Range | Minimum Recommended Datum Diameter | 2a |
|---|---|---|---|
| A, AX | Up through 5.40<br>Over 5.40 | A: 3.0<br>AX: 2.2 | 0.250 |
| B, BX | Up through 7.00<br>Over 7.00 | B: 5.4<br>BX: 4.0 | 0.350 |
| A, AX & B, BX Combination — A, AX | Up through 7.40 (1)<br>Over 7.40 | A: 3.6 (1)<br>AX: 2.8 | 0.620 (2) |
| A, AX & B, BX Combination — B, BX | Up through 7.40 (1)<br>Over 7.40 | A: 5.7 (1)<br>BX: 4.3 | 0.280 (2) |
| C, CX | Up through 7.99<br>Over 7.99 to and including 12.00<br>Over 12.00 | C: 9.0<br>CX: 6.8 | 0.400 |
| D | Up through 12.99<br>Over 12.99 to and including 17.00<br>Over 17.00 | D: 13.0 | 0.600 |
| E | Up through 24.00<br>Over 24.00 | E: 21.0 | 0.800 |

(1) Diameters shown for combination grooves are outside diameters. A specific datum diameter does not exist for either A or B belts in combination grooves.

(2) The "A" values shown for the A/B combination sheaves are the geometrically-derived values. These values may be different than those shown in manufacturer's catalogs.

Summation of the deviations from "$S_g$" for all grooves in any one sheave shall not exceed ±0.050 in.

The variation in datum diameter between the grooves in any one sheave must be within the following limits: Up through 19.9 in. outside diameter and up through 6 grooves: 0.010 in. (add 0.0005 in. for each additional groove).

20.0 in. and over on outside diameter and up through 10 grooves: 0.015 in. (add 0.0005 in. for each additional groove).

This variation can be obtained easily by measuring the distance across two measuring balls or rods placed diametrically opposite each other in a groove. Comparing this "diameter over balls or rods" measurement between grooves will give the variation in datum diameter.

Deep groove sheaves are intended for drives with belt offset such as quarter-turn or vertical shaft drives. (See RMA Power Transmission Belt Technical Information Bulletin IP-3-10, V-Belt Drives with Twist).

**Joined belts will not operate in deep groove sheaves.**

Also, A and AX joined belts will not operate in A/AX and B/BX combination grooves.

Table 1 Groove Dimensions

**Deep Groove Dimensions (in.)**

| Cross Section | Outside Diameter Range | Groove $\alpha$ Angle ±0.33 | $b_g$ | $b_g$ | hg Min. | 2a | Sg ±0.025 | $S_e$ | $S_e$ |
|---|---|---|---|---|---|---|---|---|---|
| B, BX | Up through 7.71<br>Over 7.71 | 34<br>38 | 0.747<br>0.774 | ±0.006 | 0.730 | 0.710 | 0.875 | 0.562 | +0.120<br>-0.065 |
| C, CX | Up through 9.00<br>Over 9.00 to and including 13.01<br>Over 13.01 | 34<br>36<br>38 | 1.066<br>1.085<br>1.105 | ±0.007 | 1.055 | 1.010 | 1.250 | 0.812 | +0.160<br>-0.070 |
| D | Up through 14.42<br>Over 14.42 to and including 18.43<br>Over 18.43 | 34<br>36<br>38 | 1.513<br>1.541<br>1.569 | ±0.008 | 1.435 | 1.430 | 1.750 | 1.062 | +0.220<br>-0.080 |
| E | Up through 25.69<br>Over 25.69 | 36<br>38 | 1.816<br>1.849 | ±0.010 | 1.715 | 1.690 | 2.062 | 1.312 | +0.280<br>-0.090 |

**Other Sheave Tolerances**

**Outside Diameter**

Up through 8.0 in.

Outside diameter: ±0.020 in.

For each additional inch of outside diameter add... ±0.005 in.

**Radial Runout***

Up through 10.0 in.

Outside diameter: ±0.010 in.

For each additional inch of outside diameter add... ±0.0005 in.

**Axial Runout***

Up through 5.0 in.

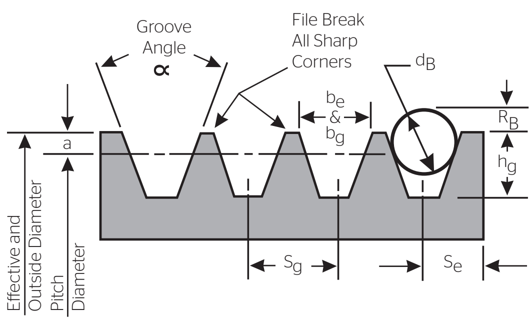
Outside diameter: ±0.005 in.

For each additional inch of outside diameter add... ±0.001 in.

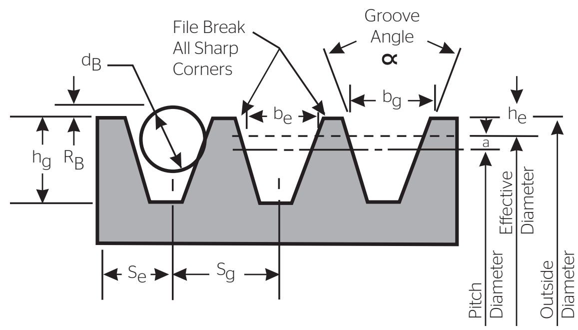
*Total Indicator Reading

# V-Belts
## Installation Guide

### Industry Standard Groove Dimensions for HY-T® Wedge Belt Drives




Standard Groove Dimensions




Deep Groove Dimensions

Face Width of Standard and Deep Groove Sheaves

Face Width = $S_g (N_g - 1) + 2 S_e$
Where: $N_g$ = Number of Grooves

Table 2 Groove Dimensions

| Cross Section | Standard Groove Outside Diameter | Groove Angle ±0.25 Degrees | $b_g$ ±0.0005 | $b_e$ Ref. | $h_g$ Min. | $R_B$ Min. | $d_b$ ±0.0005 | $S_g$ ±0.015 | $S_e$ | Minimum Recommended Outside Diameter | 2a |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Standard Groove Dimensions (in.)** | | | | | | | | | **Design Factors** | |
| 3V, 3VX | Up through 3.49 | 36 | 0.350 | 0.350 | 0.340 | 0.181 | 0.3438 | 0.406 | 0.344 +0.094 -0.031 | 3V: 2.65 3VX: 2.20 | 0 |
| | Over 3.49 to and including 6.00 | 38 | | | | 0.183 | | | | | |
| | Over 6.00 to and including 12.00 | 40 | | | | 0.186 | | | | | |
| | Over 12.00 | 42 | | | | 0.188 | | | | | |
| 5V, 5VX | Up through 9.99 | 38 | 0.600 | 0.600 | 0.590 | 0.329 | 0.5938 | 0.688 | 0.500 +0.125 -0.047 | 5V: 7.10 5VX: 4.40 | 0 |
| | Over 9.99 to and including 16.00 | 40 | | | | 0.332 | | | | | |
| | Over 16.00 | 42 | | | | 0.336 | | | | | |
| 8V | Up through 15.99 | 38 | 1.000 | 1.000 | 0.990 | 0.575 | 1.0000 | 1.125 | 0.750 +0.250 -0.062 | 8V: 12.50 | 0 |
| | Over 15.99 to and including 22.40 | 40 | | | | 0.580 | | | | | |
| | Over 22.40 | 42 | | | | 0.585 | | | | | |

Summation of the deviations from "$S_g$" for all grooves in any one sheave shall not exceed ±0.031 in. The variations in pitch diameter between the grooves in any one sheave must be within the following limits:

Up through 19.9 in. outside diameter and up through 6 grooves – 0.010 in. (add 0.0005 in. for each additional groove).

20.0 in. and over on outside diameter and up through 10 grooves – 0.015 in. (add 0.0005 in. for each additional groove).

This variation can easily be obtained by measuring the distance across two measuring balls or rods placed in the grooves diametrically opposite each other. Comparing this "diameter over balls or rods" measurement between grooves will give the variation in pitch diameter.

Deep groove sheaves are intended for drives with belt offset such as quarter-turn or vertical shaft drives (see Power Transmission Belt Technical Information Bulletin IP-3-10). They may also be necessary where oscillations in the center distance may occur. Joined belts will not operate in deep groove sheaves.

**Other Sheave Tolerances**

Outside Diameter

Up through 8.0 in.

Outside diameter: ±0.020 in.

For each additional inch of outside diameter, add... ±0.005 in.

Radial Runout*

Up through 10.0 in.

Outside diameter: ±0.010 in.

For each additional inch of outside diameter, add... ±0.0005 in.

Axial Runout*

Up through 5.0 in.

Outside diameter: ±0.005 in.

For each additional inch of outside diameter, add... ±0.001 in.

*Total Indicator Reading

Table 2 Groove Dimensions

| | | **Standard Groove Dimensions (in.)** | | | | | | | | **Design Factors** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cross Section** | **Standard Groove Outside Diameter** | **Groove Angle ±0.25 Degrees** | **$b_g$ ±0.005** | **$b_e$ Ref.** | **$b_e$ $h_g$ Min.** | **$R_B$ Min.** | **$d_b$ ±0.0005** | **$s_g$ ±0.015** | **$s_e$** | **Minimum Recommended Outside Diameter** | **2a** | **2he** |
| 3V, 3VX | Up through 3.71 | 36 | 0.421 | 0.350 | 0.449 | 0.073 | 0.3438 | 0.500 | 0.375 +0.094 -0.031 | 3V: 2.87 3VX: 2.42 | 0 | 0.218 |
| | Over 3.71 to and including 6.22 | 38 | 0.425 | | | 0.076 | | | | | | |
| | Over 6.22 to and including 1222 | 40 | 0.429 | | | 0.079 | | | | | | |
| | Over 12.22 | 42 | 0.434 | | | 0.080 | | | | | | |
| 5V, 5VX | Up through 10.31 | 38 | 0.710 | 0.600 | 0.750 | 0.172 | 0.5938 | 0.812 | 0.562 +0.125 -0.047 | 5V: 7.42 5VX: 4.72 | 0 | 0.320 |
| | Over 10.31 to and including 16.32 | 40 | 0.716 | | | 0.176 | | | | | | |
| | Over 16.32 | 42 | 0.723 | | | 0.178 | | | | | | |
| 8V | Up through 16.51 | 38 | 01.180 | 1.000 | 1.262 | 0.317 | 1.000 | 1.312 | 0.844 +0.250 -0.062 | 8V: 13.02 | 0 | 0.524 |
| | Over 16.51 to and including 22.92 | 40 | 1.191 | | | 0.321 | | | | | | |
| | Over 22.92 | 42 | 1.201 | | | 0.326 | | | | | | |

Summation of the deviations from "$S_g$" for all grooves in any one sheave shall not exceed ±0.031 in. The variations in pitch diameter between the grooves in any one sheave must be within the following limits:

Up through 19.9 in. outside diameter and up through 6 grooves – 0.010 in. (add 0.0005 in. for each additional groove).

20.0 in. and over on outside diameter and up through 10 grooves – 0.015 in. (add 0.0005 in. for each additional groove).

This variation can easily be obtained by measuring the distance across two measuring balls or rods placed in the grooves diametrically opposite each other. Comparing this "diameter over balls or rods" measurement between grooves will give the variation in pitch diameter.

Deep groove sheaves are intended for drives with belt offset such as quarter-turn or vertical shaft drives (see Power Transmission Belt Technical Information Bulletin IP-3-10). They may also be necessary where oscillations in the center distance may occur. Joined belts will not operate in deep groove sheaves.

**Other Sheave Tolerances**

**Outside Diameter**

Up through 8.0 in.

Outside diameter: ±0.020 in.

For each additional inch of outside diameter, add... ±0.005 in.

**Radial Runout***

Up through 10.0 in.

Outside diameter: ±0.010 in.

For each additional inch of outside diameter, add... ±0.0005 in.

**Axial Runout***

Up through 5.0 in.

Outside diameter: ±0.005 in.

For each additional inch of outside diameter, add... ±0.001 in.

*Total Indicator Reading

# **V-Belts**
# Installation Guide

## 1. Inspect sheaves

The following sections outline installation procedures that will ensure maximum life and performance for your V-belts.

Check sheaves for cleanliness, damage and wear whether you are replacing an existing belt, performing routine maintenance or installing a new drive.

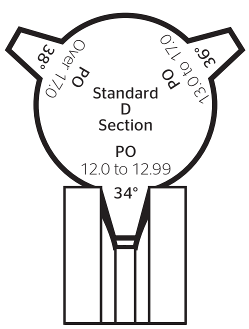
**WARNING**

**Disconnect power supply to the machine before removing or installing sheaves or belts.**

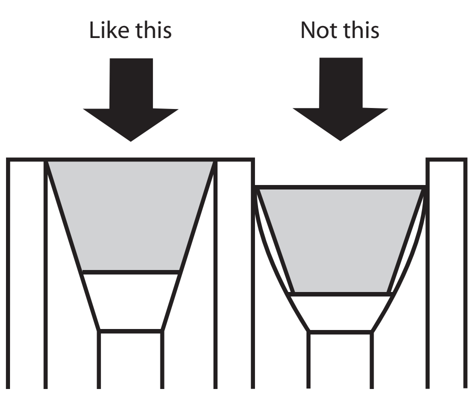
**WARNING**

**Do not reinstall damaged or worn sheaves on equipment.**

Sheave Groove Gauge




Use a stiff brush to remove rust and dirt. Use a soft cloth to wipe off oil and grease. Select the proper sheave groove gauge and template for the sheave diameter. Insert the gauge in the groove and look for voids that indicate dishing or other uneven and abnormal wear.




An alternative method for checking for sheave groove wear is to place a new belt in the sheave groove. Note that the top of the belt should be flush with or slightly above the outer diameter of the sheave. Remember that if the belt top is below the sheave's outer diameter, the groove is worn. Perform further inspection if possible. Use the Groove Dimension Tables 1 and 2 (on pages 3-6) to determine if excessive wear has occurred or to select replacement belts and sheave cross sections.

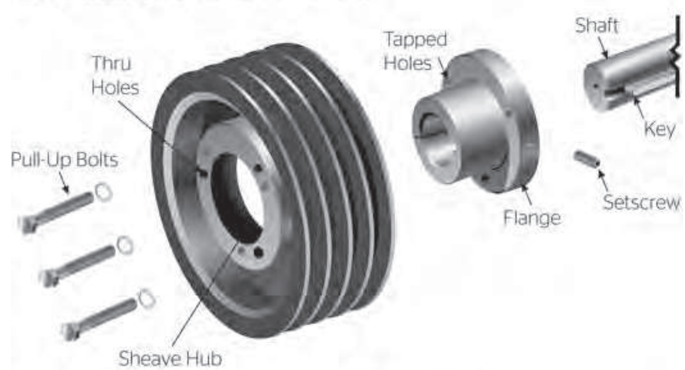
## 2. Install hardware

Always remember to select the correct sheave. Then, after you make the correct selection, be sure to install the sheaves correctly.

Before performing any installation, follow correct lockout procedures to prevent any accidents.

**IMPORTANT:** Disconnect power supply to machine **before doing ANY work**.

**QD® Bushing** (Conventional Mount)




*QD® is a registered trademark of Emerson Power Transmission Manufacturing, L.P.

# **QD® Bushing**

If the sheaves are made with a QD® hub, follow these installation and removal instructions:

## 3. How to install a sheave with a QD® hub

Insert the bushing in the hub and line up bolt holes.

Insert the pull-up bolts and turn until finger tight.

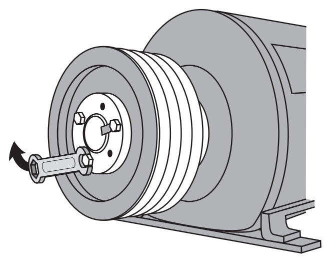
Hold the loosely–assembled unit so the bushing flange points toward the shaft bearings. Reverse mounting the QD® bushing can be advantageous for some applications.

Slip the unit onto the shaft and align the hub in the desired position.

Tighten the setscrew in the flange only enough to hold the assembly in position.

Tighten each pull-up bolt alternately and evenly.

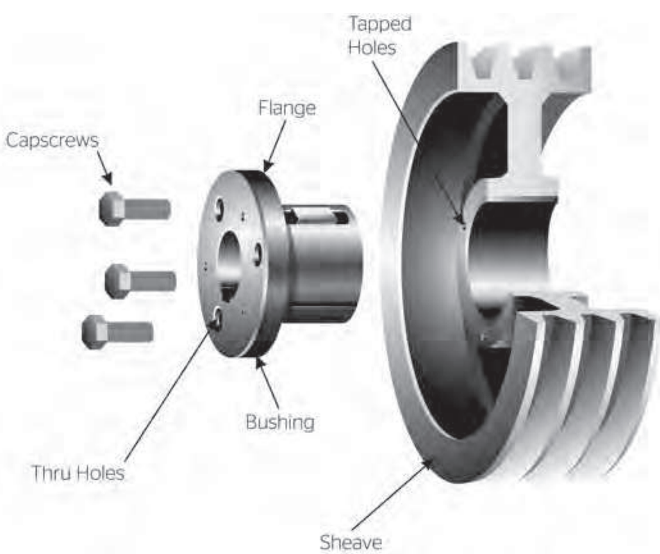
Recheck alignment and completely tighten the setscrew on the shaft.



## 4. How to remove a sheave with a QD® hub

Place two of the pull-up bolts in the tapped holes in the sheave.

Turn the bolts alternately and evenly. They will push against the bushing flange and act as jackscrews to break the grip between the bushing and the hub.




# Split Taper Bushing

If the sheaves are made for split taper bushings, follow these installation and removal instructions:

## 5. How to install split taper bushing sheaves

Put the bushing loosely in the sheave and start the capscrews.

Place the assembly on the shaft. Align both edges of the sheave with the edges of its mating sheave (example: the sheave on the driven shaft).

Tighten the capscrews according to the instructions furnished with the bushings.

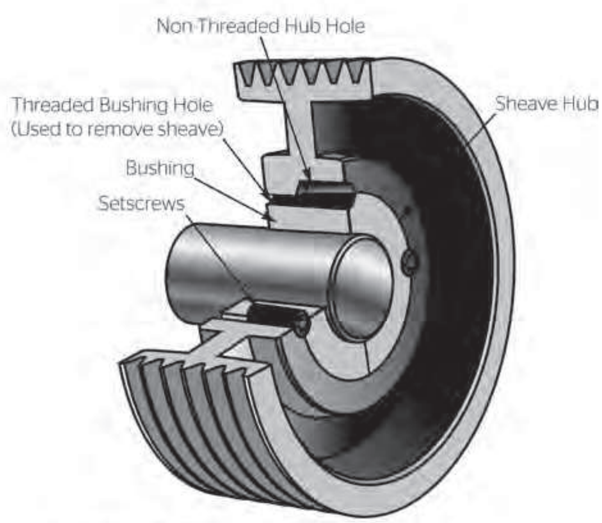
## 6. How to remove split taper bushing sheaves

Remove all capscrews.

Put two of the capscrews in the tapped holes in the flange of the bushing.

Turn the bolts alternately and evenly until the sheave has loosened.

Remove the sheave/flange assembly from the shaft.




*Taper-Lock: TM Reliance Electric Company

# Taper-Lock Bushing

## 7. How to install a sheave made with a taper-lock hub

Look at the bushing and the hub. Each has a set of half-holes. The threaded holes in the hub are the mates to the non-threaded holes in the bushing.

# **V-Belts**
# Installation Guide

Insert the bushing in the hub and slide it onto the shaft. Align a threaded hub hole with non-threaded bushing hole.

Start the setscrews into the holes that are threaded in the hub only. Do not tighten the setscrews yet.

Align both edges of the sheave with the edges of its mating sheave.

Tighten the screws alternately and evenly. This procedure will wedge the bushing inward and cause it to contract evenly and grip the shaft.

## 8. How to remove a sheave made with a taper-lock hub

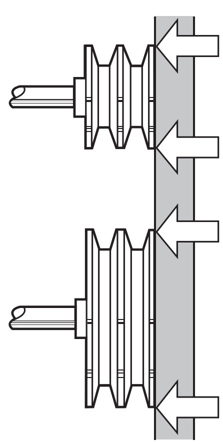
Remove all the setscrews.

Place two of the setscrews in the holes that are threaded in the bushing only.

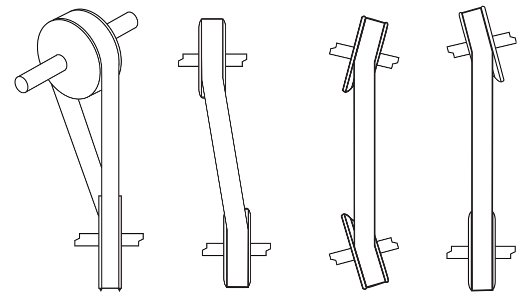
Turn the setscrews alternately and evenly. This movement will unlock the grip and permit easy removal of the assembly with no shock to the bearings or machinery.

## 9. Check alignment

Proper alignment is essential for long V-belt life. Check belt alignment whenever you maintain or replace belts or whenever you remove or install sheaves. Limit misalignment to 1/2 degree or approximately 1/10 inch per foot of center distance.



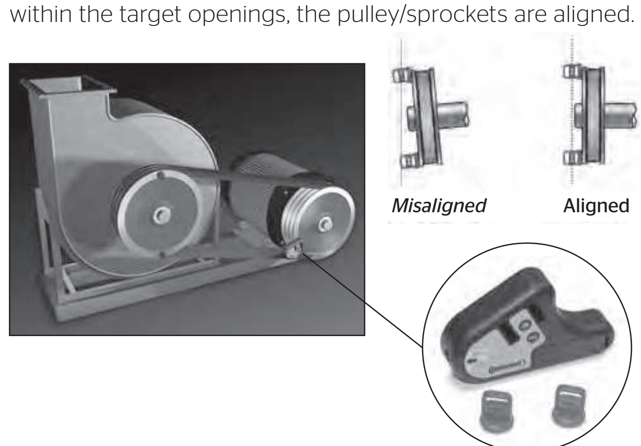
The illustration above shows the correct way to check alignment between two sheaves with a straight edge. Check both front and back alignment. Straight edge should touch sheaves at the four points indicated.



Non-parallel shafts or sheaves not aligned axially can cause angular misalignment.

# Laser Alignment Tool

With our Laser Alignment Tool, you can quickly align drive components to improve efficiency and reduce costly maintenance. Much easier to use than a straight edge, it attaches in seconds and when the highly-visible sight line lies within the target openings, the pulley/sprockets are aligned.




## 10. Identify correct belt

Always select belts to match sheave grooves. Use a sheave groove gauge to determine the proper belt cross section (Figure A).

Use a belt gauge to verify the old belt cross section when belt identification is no longer legible (Figure B).

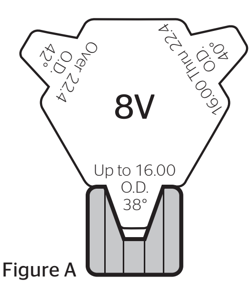



Figure A

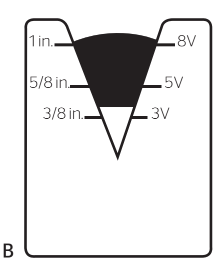
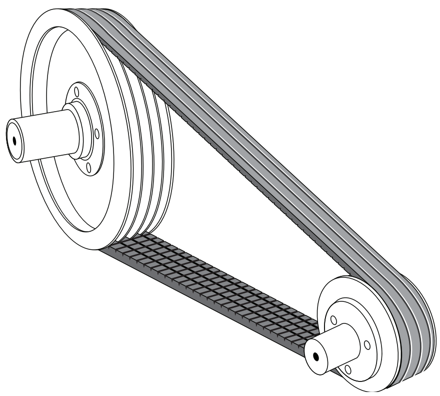



Figure B

## 11. Matching belts

When using multiple grooved sheaves, be sure that all of the belts are the same brand. Always replace complete sets of V-belts even if only one is worn or damaged.



## 12. How to install belts

After you correctly install and align the sheaves, you can install the belts.

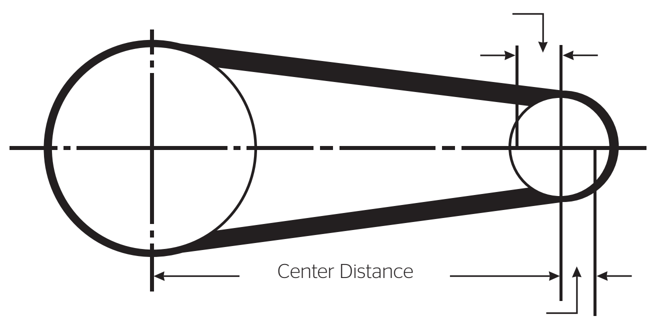
Always move the drive unit so you can easily slip the belts into the grooves without force.

Never force belts into a sheave with a tool such as a screwdriver or a wedge. Doing so may rupture the envelope fabric or break the cords.

Refer to Tables 3 and 4 (below and page 11) to determine if enough clearance exists for belt installation and take-up.

For example, if you are installing a B75 HY-T® Plus belt, the minimum allowable center distance for installation is 1.25 inches. For belt take-up, the minimum allowance above center to maintain tension is 2 inches.

Shorter Center Distance for V-Belt Installation




Longer Center Distance for V-Belt Take-Up

Table 3 HY-T® Plus V-Belts

| | Minimum Allowance Below Standard Center Distance for Installation of Belts (in.) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Standard Length Designation** | **A** | **B** | **B Torque Team®** | **C** | **C Torque Team®** | **D** | **D Torque Team®** | **E** | **Minimum Allowance Above Standard Center Distance for Maintaining Tension All Cross Sections** |
| Up to and including 35 | 0.75 | 1.00 | 1.50 | | | | | | 1.00 |
| Over 35 to and including 55 | 0.75 | 1.00 | 1.50 | 1.50 | 2.00 | | | | 1.50 |
| Over 55 to and including 85 | 0.75 | 1.25 | 1.60 | 1.50 | 2.00 | | | | 2.00 |
| Over 85 to and including 112 | 1.00 | 1.25 | 1.60 | 1.50 | 2.00 | | | | 2.50 |
| Over 112 to and including 144 | 1.00 | 1.25 | 1.80 | 1.50 | 2.10 | 2.00 | 2.90 | | 3.00 |
| Over 144 to and including 180 | | 1.25 | 1.80 | 2.00 | 2.20 | 2.00 | 3.00 | 2.50 | 3.50 |
| Over 180 to and including 210 | | 1.50 | 1.90 | 2.00 | 2.30 | 2.00 | 3.20 | 2.50 | 4.00 |
| Over 210 to and including 240 | | 1.50 | 2.00 | 2.00 | 2.50 | 2.50 | 3.20 | 2.50 | 4.50 |
| Over 240 to and including 300 | | 1.50 | 2.20 | 2.00 | 2.50 | 2.50 | 3.50 | 3.00 | 5.00 |
| Over 300 to and including 390 | | | | 2.00 | 2.70 | 2.60 | 3.60 | 3.00 | 6.00 |
| Over 390 | | | | 2.50 | 2.90 | 3.00 | 4.10 | 3.50 | 1.5% of belt length |

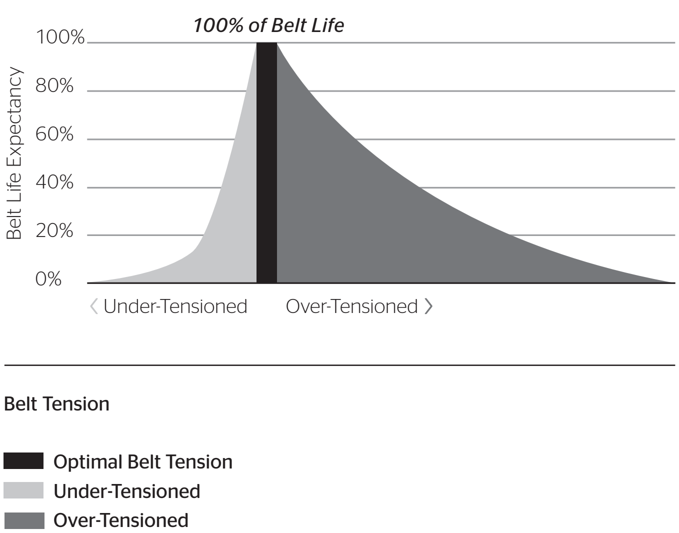
# **V-Belts**
# Installation Guide

Table 4 HY-T® Wedge and Wedge TLP™ V-Belts

| | Minimum Allowance Below Standard Center Distance for Installation of Belts (in.) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Standard Length Designation** | **3V, 3VT** | **3V Torque Team®** | **5V, 5VT** | **5V Torque Team®** | **8V, 8VT** | **8V Torque Team®** | **Minimum Allowance Above Standard Center Distance for Maintaining Tension All Cross Sections** |
| Up to and including 475 | 0.5 | 1.2 | | | | | 1.0 |
| Over 475 to and including 710 | 0.8 | 1.4 | 1.0 | 2.1 | | | 1.2 |
| Over 710 to and including 1060 | 0.8 | 1.4 | 1.0 | 2.1 | 1.5 | 3.4 | 1.5 |
| Over 1060 to and including 1250 | 0.8 | 1.4 | 1.0 | 2.1 | 1.5 | 3.4 | 1.8 |
| Over 1250 to and including 1700 | 0.8 | 1.4 | 1.0 | 2.1 | 1.5 | 3.4 | 2.2 |
| Over 1700 to and including 2000 | | | 1.0 | 2.1 | 1.8 | 3.6 | 2.5 |
| Over 2000 to and including 2360 | | | 1.2 | 2.4 | 1.8 | 3.6 | 3.0 |
| Over 2360 to and including 2650 | | | 1.2 | 2.4 | 1.8 | 3.6 | 3.2 |
| Over 2650 to and including 3000 | | | 1.2 | 2.4 | 1.8 | 3.6 | 3.5 |
| Over 3000 to and including 3550 | | | 1.2 | 2.4 | 2.0 | 4.0 | 4.0 |
| Over 3550 to and including 3750 | | | | | 2.0 | 4.0 | 4.5 |
| Over 3750 to and including 5000 | | | | | 2.0 | 4.0 | 5.5 |

## 13. Tension

**Belt Life Expectancy vs. Tension**




Proper tension is essential for maximum belt life and efficiency.

Improper belt tension is the primary cause of premature belt failure and increased costs. Under-tensioned belts lead to slippage, overheating, rollover and noise, all of which lead to higher maintenance costs and inefficient transmission of power. Also, over-tensioning belts leads to premature wear, along with bearing, shaft and sheave problems. The result is more frequent replacement of drive components and costly downtime.

## Common sense rules of V-belt tensioning

The ideal tension is the lowest tension at which the belt will not slip under peak load conditions.

Check the belt tension frequently during the first 24-48 hours of run-in operation.

Do not over-tension belts. Doing so will shorten belt and bearing life.

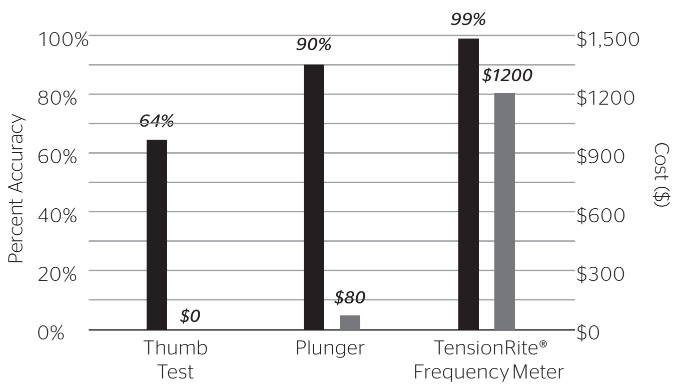
Keep belts free from foreign materials that may cause slippage. Inspect the V-drive periodically. Re-tension the belts if they are slipping.

Maintain sheave alignment with a strong straight-edge tool while tensioning V-belts.

# Tensioning Methods

When you install belts at optimal tension, you save time and money. To illustrate this point, this table compares the cost and accuracy of various V-belt tensioning methods.

**Average % Accuracy and Cost of Tensioning Devices**




Comparison of V-Belt Tensioning Methods

Percent Accuracy
Cost ($)

Choose one of two tensioning methods for V-belts:

## TensionRite® Belt Frequency Meter

Using advanced optical technology, our TensionRite® Belt Frequency Meter provides a simple, repeatable and reliable method for tensioning belts. It displays the natural vibration frequency of the belt strand so you can closely monitor belt tension. The device works with all industrial transmission belts, including V-belts, synchronous belts, banded belts and Poly-V® belts and calculates the corresponding belt tension in either English or SI units.

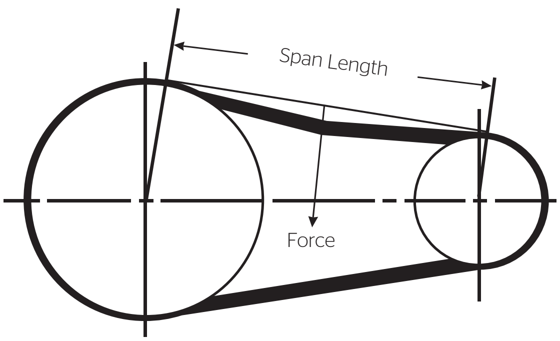

## Deflection Principle

Plunger-type gauges utilize the deflection principle to check the tension of a belt drive.


The gauge deflects the center of the belt span and the force of this deflection is compared to a target deflection force for the particular span. Then, one can adjust the belt tension until the actual deflection force equals the target.

# **V-Belts**
# Installation Guide

## Measuring the Span Length




Deflection 1/64 in. per in. of span

Mark the center of the span. At the center mark, use a tension tester and apply a force perpendicular to the span large enough to deflect the belt 1/64 inch for every inch of span length (example: a 100 inch span requires a deflection of 100/64 inch or 1⁹⁄₁₆ inches).

Compare the actual deflection force with the values in Tables 5, 6 and 7 (at right and page 14). A force below the target value indicates under-tension. A force above the target indicates over-tension.

Table 5 Belt Deflection Force

| | | | Belt Deflection (force pounds) | | | |
|---|---|---|---|---|---|---|
| | | | **Uncogged HY-T® Belts and Uncogged HY-T® Torque Team®** | | **Cogged Torque-Flex® and Machined Edge Torque Team® Belts** | |
| **Cross Section** | **Smallest Sheave Diameter Range** | **RPM Range** | **New Belt** | **Used Belt** | **New Belt** | **Used Belt** |
| A, AX | 3.0-3.6 | 1000-2500 | 5.5 | 3.7 | 6.1 | 4.1 |
| | | 2501-4000 | 4.2 | 2.8 | 5.0 | 3.4 |
| | 3.8-4.8 | 1000-2500 | 6.8 | 4.5 | 7.4 | 5.0 |
| | | 2501-4000 | 5.7 | 3.8 | 6.4 | 4.3 |
| | 5.0-7.0 | 1000-2500 | 8.0 | 5.4 | 9.4 | 5.7 |
| | | 2501-4000 | 7.0 | 4.7 | 7.6 | 5.1 |
| B, BX | 3.4-4.2 | 860-2500 | | | 7.2 | 4.9 |
| | | 2501-4000 | | | 6.2 | 4.2 |
| | 4.4-5.6 | 860-2500 | 7.9 | 5.3 | 10.5 | 7.1 |
| | | 2501-4000 | 6.7 | 4.5 | 9.1 | 6.2 |
| | 5.8-8.6 | 860-2500 | 9.4 | 6.3 | 12.6 | 8.5 |
| | | 2501-4000 | 8.2 | 5.5 | 10.9 | 7.3 |
| C, CX | 7.0-9.0 | 500-1740 | 17.0 | 11.5 | 21.8 | 14.7 |
| | | 1741-3000 | 13.8 | 9.4 | 17.5 | 11.9 |
| | 9.5-16.0 | 500-1740 | 21.0 | 14.1 | 23.5 | 15.9 |
| | | 1741-3000 | 18.5 | 12.5 | 21.6 | 14.6 |
| D | 12.0-16.0 | 200-850 | 37.0 | 24.9 | | |
| | | 851-1500 | 31.3 | 21.2 | | |
| | 18.0-20.0 | 200-850 | 45.2 | 30.4 | | |
| | | 851-1500 | 38.0 | 25.6 | | |

Table 6 Belt Deflection Force

| | | | Belt Deflection (force pounds) | | | |
|---|---|---|---|---|---|---|
| | | | Uncogged HY-T® Wedge Belts and Uncogged HY-T® Wedge Torque Team® | | Cogged HY-T® Wedge Belts and HY-T® Wedge Machine Edge Torque Team® | |
| **Cross Section** | **Smallest Sheave Diameter Range** | **RPM Range** | **New Belt** | **Used Belt** | **New Belt** | **Used Belt** |
| 3V, 3VX | 2.2-2.4 | 1000-2500 | | | 4.9 | 3.3 |
| | | 2501-4000 | | | 4.3 | 2.9 |
| | 2.65-3.65 | 1000-2500 | 5.1 | 3.6 | 6.2 | 4.2 |
| | | 2501-4000 | 4.4 | 3.0 | 5.6 | 3.8 |
| | 4.12-6.90 | 1000-2500 | 7.3 | 4.9 | 7.9 | 5.3 |
| | | 2501-4000 | 6.6 | 4.4 | 7.3 | 4.9 |
| | 4.4-6.7 | 500-1749 | | | 15.2 | 10.2 |
| | | 1750-3000 | | | 13.2 | 8.8 |
| | | 3001-4000 | | | 8.5 | 5.6 |
| 5V, 5VX | 7.1-10.9 | 500-1740 | 18.9 | 12.7 | 22.1 | 14.8 |
| | | 1741-3000 | 16.7 | 11.2 | 20.1 | 13.7 |
| | 11.8-16.0 | 500-1740 | 23.4 | 15.5 | 25.5 | 17.1 |
| | | 1741-3000 | 21.8 | 14.6 | 25.0 | 16.8 |
| | 12.5-17.0 | 200-850 | 49.3 | 33.0 | | |
| | | 851-1500 | 39.9 | 26.8 | | |
| 8V | 18.0-22.4 | 200-850 | 59.2 | 39.6 | | |
| | | 851-1500 | 52.7 | 35.3 | | |

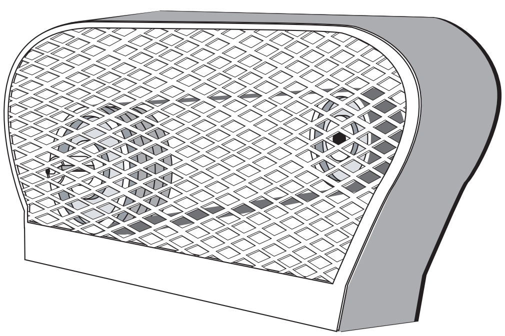
Table 7 Belt Deflection Force

| | | | Belt Deflection (force pounds) | |
|---|---|---|---|---|
| **Cross Section** | **Smallest Sheave Diameter Range** | **RPM Range** | **New Belt** | **Used Belt** |
| 3VT | 2.65-3.65 | 1000-2500 | 4.6 | 5.4 |
| | 2.65-3.65 | 2501-4000 | 4.0 | 4.7 |
| | 4.12-6.9 | 1000-2500 | 6.3 | 7.6 |
| | 4.12-6.9 | 2501-4000 | 5.8 | 6.9 |
| 5VT | 7.1-10.9 | 500-1740 | 18.5 | 22.1 |
| | 7.1-10.9 | 1741-3000 | 16.4 | 19.6 |
| | 11.8-16 | 500-1740 | 21.6 | 25.8 |
| | 11.8-16 | 1741-3000 | 19.4 | 23.2 |
| 8VT | 12.5-17.0 | 200-850 | 43.1 | 51.6 |
| | 12.5-17.0 | 851-1500 | 35.3 | 42.2 |
| | 18.0-22.4 | 200-850 | 51.3 | 61.4 |
| | 18.0-22.4 | 851-1500 | 46.1 | 55.2 |

# **V-Belts**
# Installation Guide

The following sections detail other issues that could arise during V-belt drive installation:

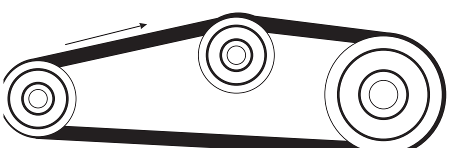
## 14. Belt guards



V-belt drive guards ensure cleanliness and safety. Screened, meshed or grilled guards are preferable because they allow for air circulation and heat escape.

## 15. Idlers

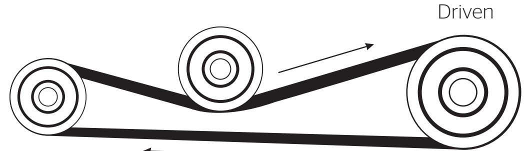
Avoid the use of idlers if at all possible. A properly-designed V-belt drive will not require an idler to deliver fully-rated horsepower. Idlers put an additional bending stress point on belts, which reduces their horsepower rating and life. Also, remember the smaller the idler, the greater the stress and the shorter a belt's life; however, if the drive design requires an idler, observe the following design recommendations.




### Inside idler

A V-grooved idler located on the inside of the belts on the slack side of the drive is preferable to a back side idler. Locate the idler near the large sheave to avoid reduction of the arc of contact with the small sheave.

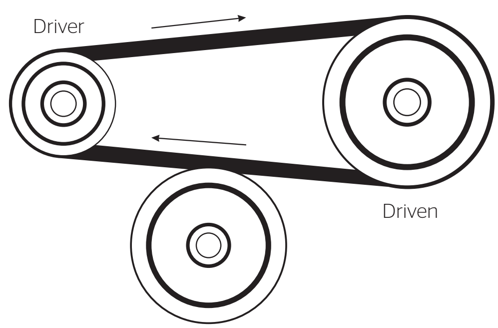
Note that the size of the V-idler pulley should be equal to or larger (preferably) than the diameter of the small sheave.




### Back side idler

A back side idler increases the arc of contact on both sheaves; however, such an idler also forces a backward bend in the V-belt, which contributes to unwanted wear such as bottom cracking and premature failure. If a back side idler is the only option, follow two guidelines:

1. Make sure the diameter of the flat idler pulley is at least 1.5 times the diameter of the small sheave.
**and**
2. Locate the back side idler as close as possible to the small sheave on the slack side.




### Kiss idler

Unlike the back side idler, the kiss idler does not penetrate the belt span and create a back bend. Consequently, the kiss idler does not contribute to premature failure. The kiss idler can help control belt vibration and whip on drives subject to shock and pulsating loads. When using a kiss idler, make sure the diameter of the flat pulley is at least 1.5 times the diameter of the small sheave on the slack side.

# Torque Team® V-Belts
Installation Guide

## 1. Inspect sheaves
The following sections outline installation procedures that will ensure maximum life and performance for your Torque Team® V-belts.

Check sheaves for cleanliness, damage and wear whether you are replacing an existing belt, performing routine maintenance or installing a new drive.

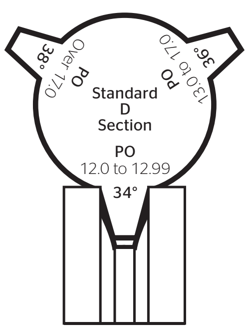
**WARNING**

**Disconnect power supply to the machine before removing or installing sheaves or belts.**

**WARNING**

**Do not reinstall damaged or worn sheaves on equipment.**

Sheave Groove Gauge



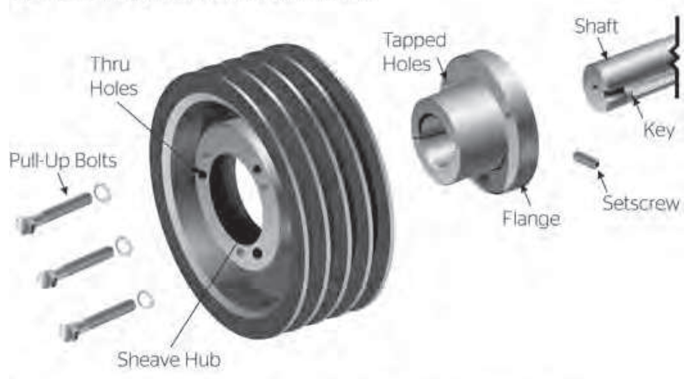

Use a stiff brush to remove rust and dirt. Use a soft cloth to wipe off oil and grease. Select the proper sheave groove gauge and template for the sheave diameter. Insert the gauge in the groove and look for voids that indicate dishing or other uneven and abnormal wear.

## 2. Install hardware
Always remember to select the correct sheave. Then, after you make the correct selection, be sure to install the sheaves correctly.

Before performing any installation, follow correct lockout procedures to prevent any accidents.

**IMPORTANT:** Disconnect power supply to machine **before doing ANY work**.

**QD® Bushing** (Conventional Mount)




*QD® is a registered trademark of Emerson Power Transmission Manufacturing, L.P.

# QD® Bushing

If the sheaves are made with a QD® hub, follow these installation and removal instructions:

## 3. How to install a sheave with a QD® hub
Insert the bushing in the hub and line up bolt holes.

Insert the pull-up bolts and turn until finger tight.

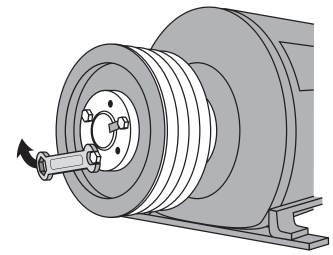
Hold the loosely-assembled unit so the bushing flange points toward the shaft bearings. Reverse mounting the QD® bushing can be advantageous for some applications.

Slip the unit onto the shaft and align the hub in the desired position.

Tighten the setscrew in the flange only enough to hold the assembly in position.

Tighten each pull-up bolt alternately and evenly.

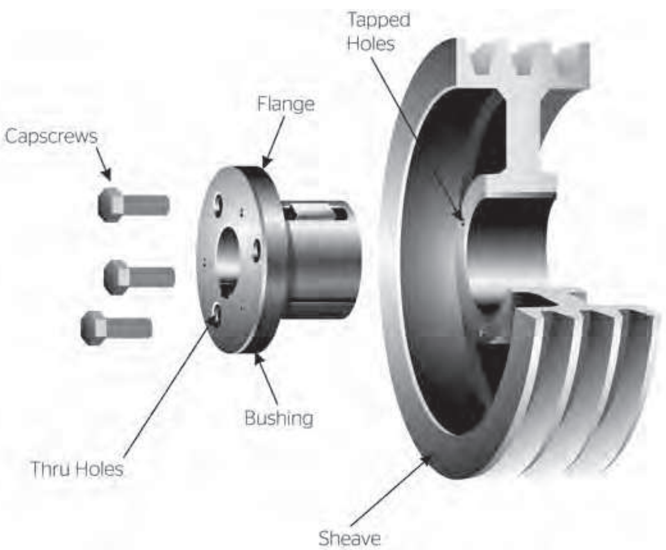
Recheck alignment and completely tighten the setscrew on the shaft.



# Torque Team® V-Belts
Installation Guide

### 4. How to remove a sheave with a QD® hub
Place two of the pull-up bolts in the tapped holes in the sheave.

Turn the bolts alternately and evenly. They will push against the bushing flange and act as jackscrews to break the grip between the bushing and the tub.




## Split Taper Bushing

If the sheaves are made for split taper bushings, follow these installation and removal instructions:

### 5. How to install split taper bushing sheaves
Put the bushing loosely in the sheave and start the capscrews.

Place the assembly on the shaft. Align both edges of the sheave with the edges of its mating sheave (example: the sheave on the driven shaft).

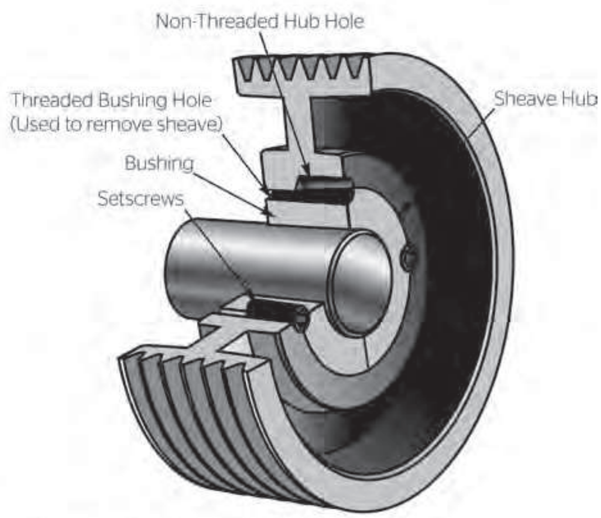
Tighten the capscrews according to the instructions furnished with the bushings.

### 6. How to remove split taper bushing sheaves
Remove all capscrews.

Put two of the capscrews in the tapped holes in the flange of the bushing.

Turn the bolts alternately and evenly until the sheave has loosened.

Remove the sheave/flange assembly from the shaft.




*Taper-Lock: TM Reliance Electric Company

## Taper-Lock Bushing

### 7. How to install a sheave made with a taper-lock hub
Look at the bushing and the hub. Each has a set of half-holes.

The threaded holes in the hub are the mates to the non-threaded holes in the bushing.

Insert the bushing in the hub and slide it onto the shaft. Align a threaded hub hole with non-threaded bushing hole.

Start the setscrews into the holes that are threaded in the hub only. Do not tighten the setscrews yet.

Align both edges of the sheave with the edges of its mating sheave.

Tighten the screws alternately and evenly. This procedure will wedge the bushing inward and cause it to contract evenly and grip the shaft.

## 8. How to remove a sheave made with a taper-lock hub

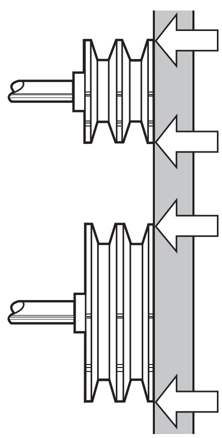
Remove all the setscrews.

Place two of the setscrews in the holes that are threaded in the bushing only.

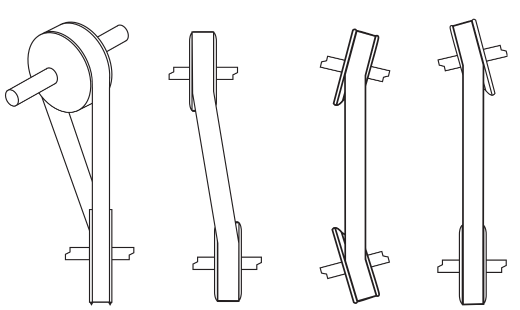
Turn the setscrews alternately and evenly. This movement will unlock the grip and permit easy removal of the assembly with no shock to the bearings or machinery.

## 9. Check alignment

Proper alignment is essential for long Torque Team® V-belt life. Check belt alignment whenever you maintain or replace belts or whenever you remove or install sheaves. Limit misalignment to 1/2 degree or approximately 1/10 inch per foot of center distance.



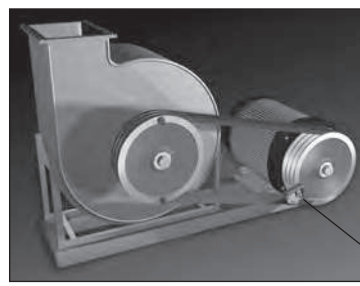
The illustration above shows the correct way to check alignment between two sheaves with a straight edge. Check both front and back alignment. Straight edge should touch sheaves at the four points indicated.



Non-parallel shafts or sheaves not aligned axially can cause angular misalignment.

# Laser Alignment Tool

With our Laser Alignment Tool, you can quickly align drive components to improve efficiency and reduce costly maintenance. Much easier to use than a straight edge, it attaches in seconds and when the highly-visible sight line lies within the target openings, the pulley/sprockets are aligned.



*Misaligned* Aligned

## 10. Identify correct belt

Always select belts to match sheave grooves. Use a sheave groove gauge to determine the proper belt cross section (Figure A). Make sure that the space between the grooves in the sheaves matches the spacing between belt ribs. Do not use Torque Team® belts in deep groove sheaves; such sheaves could cut through the backing that holds the ribs together.

Use a belt gauge to verify the old belt cross section when belt identification is no longer legible (Figure B).

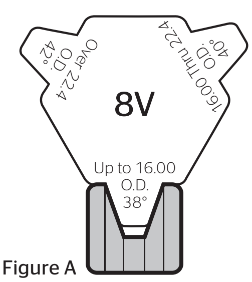



Figure A

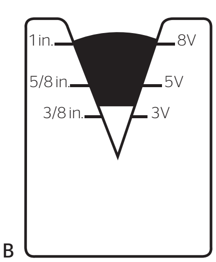



Figure B

# Torque Team® V-Belts
Installation Guide

## 11. Matching belts

Banded Torque Team® V-belts eliminate belt whip and turnover problems experienced with multiple V-belt sets under certain drive conditions. The individual ribs in the Torque Team® belts are produced at the same time and bonded together. Thus, ordering matched sets of individual V-belts is unnecessary.

Using more than one set of Torque Team® belts on the same drive is possible. For example, 2/5V1250 and 3/5V1250 Torque Team® belts will transmit the same power as five individual 5V1250 V-belts. The 2/5V1250 identification describes a Torque Team® belt with two 5V1250 individual V-belts joined together.

DO NOT mix belt brands.

DO NOT use sets from different manufacturers together as they may have different performance characteristics.

DO NOT use new and used Torque Team® belts in combined sets.

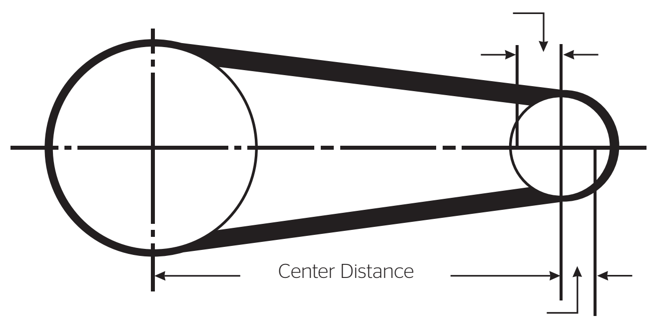
DO NOT use Torque Team Plus® belts in combined sets unless they are matched by the factory.

## 12. How to install Torque Team® belts

Never force Torque Team® belts into a sheave. Instead, decrease the center distance between the sheaves, allowing the belt to slip easily into the sheave grooves.

To tension a newly-installed Torque Team® belt, increase the center distance between the sheaves. Tables 8 and 9 (below and page 20) detail center distance allowances for installation and tensioning of Classical and HY-T® Wedge Torque Team® belts. For example, a 5/5V1250 Torque Team® belt requires decreasing the center distance 2.1 inches to install the belt and increasing the center distance 1.8 inches to maintain sufficient tension.

Shorter Center Distance for V-Belt Installation




Longer Center Distance for V-Belt Take-Up

Table 8 HY-T® Plus V-Belts

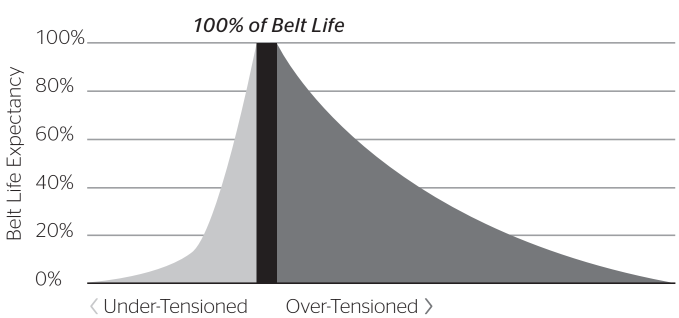
| | Minimum Allowance Below Standard Center Distance for Installation of Belts (in.) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Standard Length Designation** | **A** | **B** | **B Torque Team®** | **C** | **C Torque Team®** | **D** | **D Torque Team®** | **E** | **Minimum Allowance Above Standard Center Distance for Maintaining Tension All Cross Sections** |
| Up to and including 35 | 0.75 | 1.00 | 1.50 | | | | | | 1.00 |
| Over 35 to and including 55 | 0.75 | 1.00 | 1.50 | 1.50 | 2.00 | | | | 1.50 |
| Over 55 to and including 85 | 0.75 | 1.25 | 1.60 | 1.50 | 2.00 | | | | 2.00 |
| Over 85 to and including 112 | 1.00 | 1.25 | 1.60 | 1.50 | 2.00 | | | | 2.50 |
| Over 112 to and including 144 | 1.00 | 1.25 | 1.80 | 1.50 | 2.10 | 2.00 | 2.90 | | 3.00 |
| Over 144 to and including 180 | | 1.25 | 1.80 | 2.00 | 2.20 | 2.00 | 3.00 | 2.50 | 3.50 |
| Over 180 to and including 210 | | 1.50 | 1.90 | 2.00 | 2.30 | 2.00 | 3.20 | 2.50 | 4.00 |
| Over 210 to and including 240 | | 1.50 | 2.00 | 2.00 | 2.50 | 2.50 | 3.20 | 2.50 | 4.50 |
| Over 240 to and including 300 | | 1.50 | 2.20 | 2.00 | 2.50 | 2.50 | 3.50 | 3.00 | 5.00 |
| Over 300 to and including 390 | | | | 2.00 | 2.70 | 2.60 | 3.60 | 3.00 | 6.00 |
| Over 390 | | | | 2.50 | 2.90 | 3.00 | 4.10 | 3.50 | 1.5% of belt length |

Table 9 HY-T® Wedge V-Belts

| Standard Length Designation | Minimum Allowance Below Standard Center Distance for Installation of Belts (in.) 3V, 3VT | 3V Torque Team® | 5V, 5VT | 5V Torque Team® | 8V, 8VT | 8V Torque Team® | Minimum Allowance Above Standard Center Distance for Maintaining Tension All Cross Sections |
|---|---|---|---|---|---|---|---|
| Up to and including 475 | 0.5 | 1.2 | | | | | 1.0 |
| Over 475 to and including 710 | 0.8 | 1.4 | 1.0 | 2.1 | | | 1.2 |
| Over 710 to and including 1060 | 0.8 | 1.4 | 1.0 | 2.1 | 1.5 | 3.4 | 1.5 |
| Over 1060 to and including 1250 | 0.8 | 1.4 | 1.0 | 2.1 | 1.5 | 3.4 | 1.8 |
| Over 1250 to and including 1700 | 0.8 | 1.4 | 1.0 | 2.1 | 1.5 | 3.4 | 2.2 |
| Over 1700 to and including 2000 | | | 1.0 | 2.1 | 1.8 | 3.6 | 2.5 |
| Over 2000 to and including 2360 | | | 1.2 | 2.4 | 1.8 | 3.6 | 3.0 |
| Over 2360 to and including 2650 | | | 1.2 | 2.4 | 1.8 | 3.6 | 3.2 |
| Over 2650 to and including 3000 | | | 1.2 | 2.4 | 1.8 | 3.6 | 3.5 |
| Over 3000 to and including 3550 | | | 1.2 | 2.4 | 2.0 | 4.0 | 4.0 |
| Over 3550 to and including 3750 | | | | | 2.0 | 4.0 | 4.5 |
| Over 3750 to and including 5000 | | | | | 2.0 | 4.0 | 5.5 |

## 13. Tension

**Belt Life Expectancy vs. Tension**




Belt Tension

- Optimal Belt Tension
- Under-Tensioned
- Over-Tensioned

Proper tension is essential for maximum belt life and efficiency. Improper belt tension is the primary cause of premature belt failure and increased costs. Under-tensioned belts lead to slippage, overheating, rollover and noise, all of which lead to higher maintenance costs and inefficient transmission of power.

Also, over-tensioning belts leads to premature wear, along with bearing, shaft and sheave problems. The result is more frequent replacement of drive components and costly downtime.

## Common sense rules of V-belt tensioning

The ideal tension is the lowest tension at which the belt will not slip under peak load conditions.

Check the belt tension frequently during the first 24-48 hours of run-in operation.

Do not over-tension belts. Doing so will shorten belt and bearing life.

Keep belts free from foreign materials that may cause slippage. Inspect the V-drive periodically. Re-tension the belts if they are slipping.

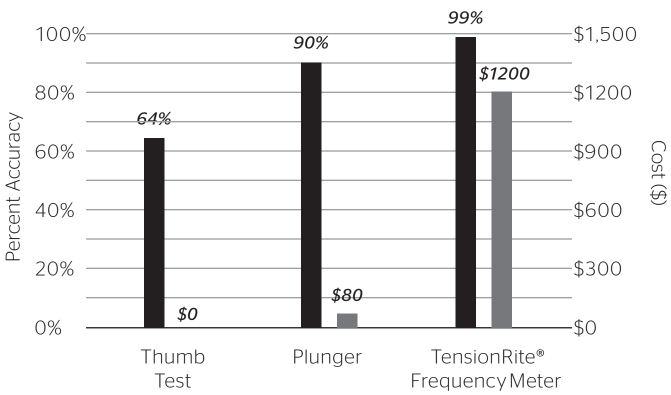
Maintain sheave alignment with a strong straight-edge tool while tensioning V-belts.

# **Torque Team® V-Belts**
# Installation Guide

## Tensioning Methods

When you install belts at optimal tension, you save time and money. To illustrate this point, the figure below compares the cost and accuracy of various V-belt drive tensioning methods.

**Average % Accuracy and Cost of Tensioning Devices**




Comparison of V-Belt Tensioning Methods

Percent Accuracy
Cost ($)

Choose one of two tensioning methods for V-belts:

### TensionRite® Belt Frequency Meter

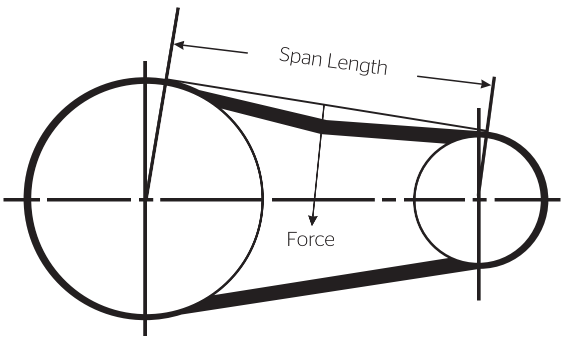
Using advanced optical technology, our TensionRite® Belt Frequency Meter provides a simple, repeatable and reliable method for tensioning belts. It displays the natural vibration frequency of the belt strand so you can closely monitor belt tension. The device works with all industrial transmission belts, including V-belts, synchronous belts, banded belts and Poly-V® belts and calculates the corresponding belt tension in either English or SI units.


### Deflection Principle

Plunger-type gauges utilize the deflection principle to check the tension of a belt drive.


The gauge deflects the center of the belt span and the force of this deflection is compared to a target deflection force for the particular span. Then, one can adjust the belt tension until the actual deflection force equals the target.

## Measuring the Span Length




Deflection 1/64 in. per in. of span

Mark the center of the span. At the center mark, use a tension tester and apply a force perpendicular to the span large enough to deflect the belt 1/64 inch for every inch of span length (example: a 100 inch span requires a deflection of 100/64 inch or 1 9⁄16 inches).

Compare the actual deflection force with the values in Tables 10 and 11 (at right and page 23).

A force below the target value indicates under-tension. A force above the target indicates over-tension.

Table 10 Belt Deflection Force

| | | Belt Deflection (force pounds) | | | |
|---|---|---|---|---|---|
| | | Uncogged HY-T® Belts and Uncogged HY-T® Torque Team® | | Cogged Torque-Flex® and Machined Edge Torque Team® Belts | |
| **Smallest Sheave Diameter Range** | **RPM Range** | **Used Belt** | **New Belt** | **Used Belt** | **New Belt** |
| **A, AX Cross Section** | | | | | |
| 3.0-3.6 | 1000-2500 | 3.7 | 5.5 | 4.1 | 6.1 |
| | 2501-4000 | 2.8 | 4.2 | 3.4 | 5.0 |
| 3.8-4.8 | 1000-2500 | 4.5 | 6.8 | 5.0 | 7.4 |
| | 2501-4000 | 3.8 | 5.7 | 4.3 | 6.4 |
| 5.0-7.0 | 1000-2500 | 5.4 | 8.0 | 5.7 | 9.4 |
| | 2501-4000 | 4.7 | 7.0 | 5.1 | 7.6 |
| **B, BX Cross Section** | | | | | |
| 3.4-4.2 | 860-2500 | | | 4.9 | 7.2 |
| | 2501-4000 | | | 4.2 | 6.2 |
| 4.4-5.6 | 860-2500 | 5.3 | 7.9 | 7.1 | 10.5 |
| | 2501-4000 | 4.5 | 6.7 | 6.2 | 9.1 |
| 5.8-8.6 | 860-2500 | 6.3 | 9.4 | 8.5 | 12.6 |
| | 2501-4000 | 5.5 | 8.2 | 7.3 | 10.9 |
| **C, CX Cross Section** | | | | | |
| 7.0-9.0 | 500-1740 | 11.5 | 17.0 | 14.7 | 21.8 |
| | 1741-3000 | 9.4 | 13.8 | 11.9 | 17.5 |
| 9.5-16.0 | 500-1740 | 14.1 | 21.0 | 15.9 | 23.5 |
| | 1741-3000 | 12.5 | 18.5 | 14.6 | 21.6 |
| **D Cross Section** | | | | | |
| 12.0-16.0 | 200-850 | 24.9 | 37.0 | | |
| | 851-1500 | 21.2 | 31.3 | | |
| 18.0-20.0 | 200-850 | 30.4 | 45.2 | | |
| | 851-1500 | 25.6 | 38.0 | | |

# **Torque Team® V-Belts** Installation Guide

Table 11 Belt Deflection Force

| | | Belt Deflection (force pounds) | | | |
|---|---|---|---|---|---|
| | | Uncogged HY-T® Wedge Belts and Uncogged HY-T® Wedge Torque Team® | | Cogged HY-T® Wedge Belts and HY-T® Wedge Machine Edge Torque Team® | |
| **Smallest Sheave Diameter Range** | **RPM Range** | **Used Belt** | **New Belt** | **Used Belt** | **New Belt** |
| **3V, 3VX Cross Section** | | | | | |
| 2.2-2.4 | 1000-2500 | | | 3.3 | 4.9 |
| | 2501-4000 | | | 2.9 | 4.3 |
| 2.65-3.65 | 1000-2500 | 3.6 | 5.1 | 4.2 | 6.2 |
| | 2501-4000 | 3.0 | 4.4 | 3.8 | 5.6 |
| 4.12-6.90 | 1000-2500 | 4.9 | 7.3 | 5.3 | 7.9 |
| | 2501-4000 | 4.4 | 6.6 | 4.9 | 7.3 |
| **5V, 5VX Cross Section** | | | | | |
| 4.4-6.7 | 500-1749 | | | 10.2 | 15.2 |
| | 1750-3000 | | | 8.8 | 13.2 |
| | 3001-4000 | | | 5.6 | 8.5 |
| 7.1-10.9 | 500-1740 | 12.7 | 18.9 | 14.8 | 22.1 |
| | 1741-3000 | 11.2 | 16.7 | 13.7 | 20.1 |
| 11.8-16.0 | 500-1740 | 15.5 | 23.4 | 17.1 | 25.5 |
| | 1741-3000 | 14.6 | 21.8 | 16.8 | 25.0 |
| **5VF Cross Section** | | | | | |
| 7.1-10.9 | 200-700 | 21.1 | 30.9 | | |
| | 701-1250 | 18.0 | 26.3 | | |
| | 1251-1900 | 16.7 | 23.4 | | |
| | 1901-3000 | 15.8 | 23.0 | | |
| 11.8-16.0 | 200-700 | 26.8 | 39.5 | | |
| | 750-1250 | 23.5 | 34.7 | | |
| | 1251-2100 | 22.7 | 33.3 | | |
| **8V Cross Section** | | | | | |
| 12.5-17.0 | 200-850 | 33.0 | 49.3 | | |
| | 851-1500 | 26.8 | 39.9 | | |
| 18.0-22.4 | 200-850 | 39.6 | 59.2 | | |
| | 851-1500 | 35.3 | 52.7 | | |
| **8VF Cross Section** | | | | | |
| 12.5-20.0 | 200-500 | 44.7 | 65.8 | | |
| | 501-850 | 38.5 | 56.6 | | |
| | 851-1150 | 35.2 | 51.6 | | |
| | 1151-1650 | 33.5 | 49.0 | | |
| 21.2-25.0 | 200-500 | 65.9 | 97.6 | | |
| | 501-850 | 61.2 | 90.6 | | |
| | 851-1200 | 57.0 | 84.3 | | |

## Elongation Method

When the deflection force required for the Deflection Method becomes impractical for large Torque Team® belts, use the elongation method.

Imagine the Torque Team® belt as a very stiff spring, where a known amount of tension results in a known amount of elongation. The modulus of the Torque Team® belt is like the spring constant of a spring and is used to relate the elongation to the tension in the belt. The Elongation Method calculates the belt length associated with the required installation tension.

A gauge length is defined and used as a point of reference for measuring belt elongation. The gauge length could be the outside circumference of the belt or the span (or part of the span) length. The initial gauge length is measured with no belt tension.

The relationship between belt elongation and strand tension for one rib in a Torque Team® belt can be found by using the formula below, where the Modulus Factors are given in Table 12.

$$\text{Belt Length Multiplier} = 1 + \frac{\text{Strand Tension per Rib}}{\text{Modulus Factor}}$$

Table 12 Modulus Factors

| Cross Section | 3V, 3VX | 5V, 5VX | 5VF | 8V | 8VF | B, BX | C, CX | D |
|---|---|---|---|---|---|---|---|---|
| Modulus Factor (lb./in. /in.) | 14270 | 25622 | 160025 | 55548 | 260040 | 28547 | 43440 | 58882 |

Enter the required strand installation tension per rib into the formula, along with the Modulus Factor that corresponds to the cross section of the Torque Team® belt to determine the Belt Length Multiplier.

Multiply the gauge length by the Belt Length Multiplier to determine the final gauge length at the installation tension.

**Example:**
A 5/5V1250 belt is to be installed at 1400 lb.
The Modulus Factor is 25622 lb./in./in. from Table 11.

The installation force is divided by the number of ribs in the Torque Team® (1400/5 = 280 lb.).
The Belt Length Multiplier is calculated next.

Belt Length Multiplier = 1 + 280/25622 = 1.0109

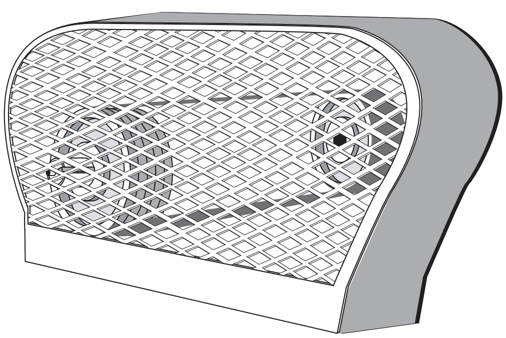
Outside belt circumference at installation tension = 1.0109 x 125 = 126.4 inches.

In other words, the belt is elongated 1.4 inches at installation tension.

These multipliers do not apply to Torque Team Plus® belts.

The following few sections detail other issues that could arise during Torque Team® V-belt drive installation:

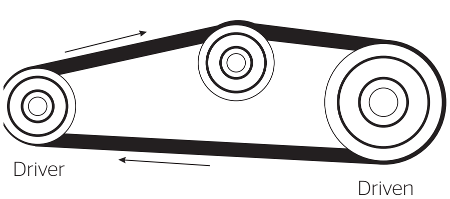
## 14. Belt guards



V-belt drive guards ensure cleanliness and safety. Screened, meshed or grilled guards are preferable because they allow for air circulation and heat escape.

## 15. Idlers

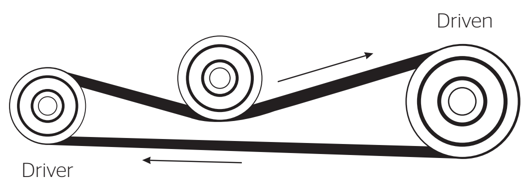
Avoid the use of idlers if at all possible. A properly designed Torque Team® V-belt drive will not require an idler to deliver fully-rated horsepower. Idlers put an additional bending stress point on belts, which reduces a belt's horsepower rating and its life. Also, remember the smaller the idler, the greater the stress and the shorter a belt's life; however, if the drive design requires an idler, observe the following design recommendations.




### Inside idler

A V-grooved idler located on the inside of the belts on the slack side of the drive is preferable to a back side idler. Locate the idler near the large sheave to avoid reduction of the arc of contact with the small sheave.

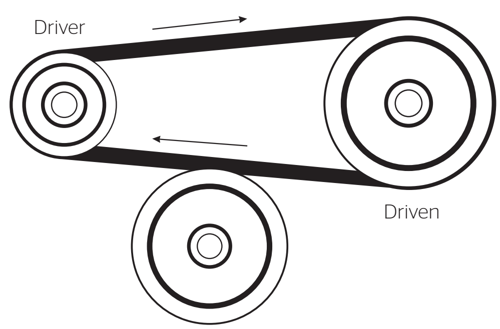
Note that the size of the V-idler pulley should be equal to or larger (preferably) than the diameter of the small sheave.




### Back side idler

A back side idler increases the arc of contact on both sheaves; however, such an idler also forces a backward bend in the V-belt, which contributes to unwanted wear such as bottom cracking and premature failure. If a back side idler is the only option, follow two guidelines:

1. Make sure the diameter of the flat idler pulley is at least 1.5 times the diameter of the small sheave.
**and**
2. Locate the back side idler as close as possible to the small sheave on the slack side.




### Kiss idler

Unlike the back side idler, the kiss idler does not penetrate the belt span and create a back bend. Consequently, the kiss idler does not contribute to premature failure. The kiss idler can help control belt vibration and whip on drives subject to shock and pulsating loads. When using a kiss idler, make sure the diameter of the flat pulley is at least 1.5 times the diameter of the small sheave on the slack side.

# Poly-V® Belts
# Installation Guide

## 1. Inspect sheaves

The following sections outline installation procedures that will ensure maximum life and performance for your Poly-V® belts.

Check sheaves for cleanliness, damage and wear whether you are replacing an existing belt, performing routine maintenance or installing a new drive.

**WARNING**

**Disconnect power supply to the machine before removing or installing sheaves or belts.**

**WARNING**

**Do not reinstall damaged or worn sheaves on equipment.**

## Minimum sheave diameter

If the sheave driver is a standard electric motor, refer to Table 13 to be sure that the sheave diameter selected will meet the National Electrical Manufacturers Association Standard for minimum sheave diameters for electric motors. If the motor sheave is smaller than the minimum diameter shown in this table, increase the sheave diameter so that the motor sheave will conform with the chart unless either an oversize or outboard bearing is installed.

Perform further inspection if possible. Use Table 14 (on page 26) to determine if excessive wear has occurred or to select replacement belts and sprocket cross sections.

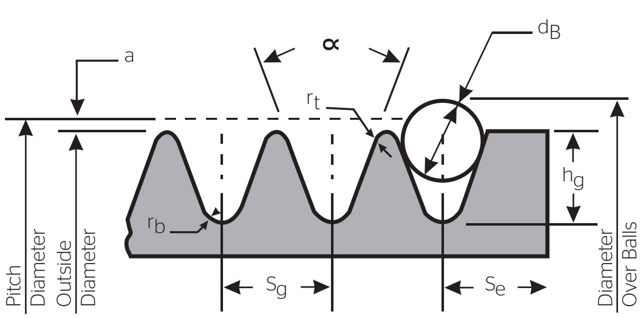



Table 13 Small Sheave Diameters for Electric Motors

For example, if you are installing a 220J8, the minimum allowance below center distance is 1/2 in. If you are working to maintain tension, the minimum allowance above center distance for belt take-up is also 1/2 in.

| **Motor Nameplate Horsepower** | **Standard Motor RPM** | | | | | |
|---|---|---|---|---|---|---|
| | **3450** | **1750** | **1160** | **870** | **675** | **575** |
| | **Small Sheave Diameters (in.)** | | | | | |
| .12 or less | 1.25 | 1.50 | 1.50 | | | |
| .25 | 1.25 | 1.25 | 1.50 | | | |
| .33 | 1.50 | 1.50 | 2.00 | | | |
| .50 | 2.00 | 2.00 | 2.50 | | | |
| .75 | 2.25 | 2.25 | 2.50 | 3.00 | 3.00 | 3.00 |
| 1 | 2.25 | 2.25 | 2.50 | 3.00 | 3.00 | 3.00 |
| 1.5 | 2.25 | 2.50 | 2.50 | 3.00 | 3.00 | 3.00 |
| 2 | 2.50 | 2.50 | 2.50 | 3.00 | 3.00 | 3.75 |
| 3 | 2.50 | 2.50 | 3.00 | 3.00 | 3.75 | 4.50 |
| 5 | 2.50 | 3.00 | 3.00 | 3.75 | 4.50 | 4.50 |
| 7.5 | 3.00 | 3.00 | 3.75 | 4.50 | 4.50 | 5.25 |
| 10 | 3.00 | 3.75 | 4.50 | 4.50 | 5.25 | 6.00 |
| 15 | 3.75 | 4.50 | 4.50 | 5.25 | 6.00 | 6.75 |
| 20 | 4.50 | 4.50 | 5.25 | 6.00 | 6.75 | 8.25 |
| 25 | 4.50 | 4.50 | 6.00 | 6.75 | 8.25 | 9.00 |
| 30 | | 5.25 | 6.75 | 6.75 | 9.00 | 10.00 |
| 40 | | 6.00 | 6.75 | 8.25 | 10.00 | 10.00 |
| 50 | | 7.00 | 8.38 | 9.00 | 10.00 | 11.00 |
| 60 | | 7.63 | 9.00 | 10.00 | 11.00 | 12.00 |
| 75 | | 9.00 | 10.00 | 10.00 | 13.00 | 14.00 |
| 100 | | 10.00 | 13.00 | 13.00 | 15.00 | 18.00 |
| 125 | | 11.00 | 13.00 | 15.00 | 18.00 | 20.00 |
| 150 | | | 13.00 | 18.00 | 20.00 | 22.00 |
| 200 | | | | 22.00 | 22.00 | 22.00 |
| 250 | | | | | 22.00 | 22.00 |
| 300 | | | | | 27.00 | 27.00 |

Table 14 Groove Dimensions

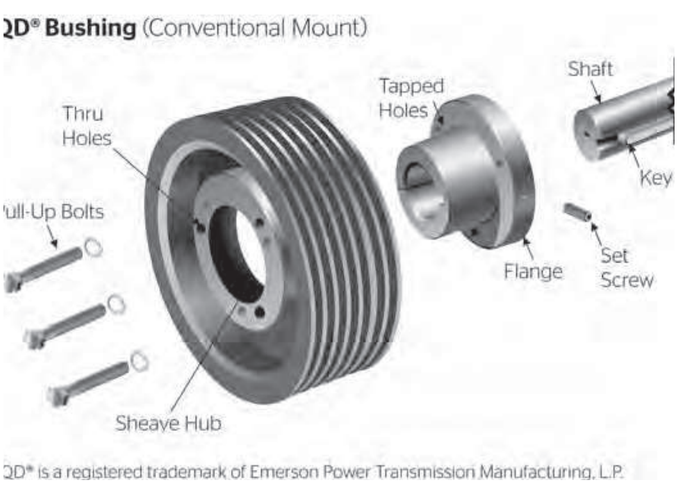
| | | | Groove Dimensions (in.) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Cross Section** | **Minimum Recommended Outisde Diameter (in.)** | **Angle Groove ∝ ±0.50 Degrees** | **$S_g$*** | **$r_t$ +0.005 - 0.000** | **a** | **$r_b$** | **$h_g$ Minimum** | **$d_g$ ±0.0004** | **$S_e$** |
| H | 0.50 | 40 | 0.063 ±0.001 | 0.005 | 0.020 | 0.013 +0.000 -0.005 | 0.041 | 0.0469 | 0.080 +0.020 -0.010 |
| J | 0.80 | 40 | 0.092 ±0.001 | 0.008 | 0.030 | 0.015 +0.000 -0.005 | 0.071 | 0.125 0.0625 -0.015 | 0.125 +0.030 -0.015 |
| K | 1.50 | 40 | 0.140 ±0.002 | 0.010 | 0.038 | 0.020 +0.000 -0.005 | 0.122 | 0.125 0.1093 0.00 | 0.125 +0.050 0.000 |
| L | 3.00 | 40 | 0.185 ±0.002 | 0.015 | 0.058 | 0.015 +0.000 -0.005 | 0.183 | 0.375 0.1406 -0.030 | 0.375 +0.075 -0.030 |
| M | 7.00 | 40 | 0.370 ±0.002 | 0.030 | 0.116 | 0.030 +0.000 -0.010 | 0.377 | 0.500 0.2812 -0.040 | 0.500 +0.100 -0.040 |

*Summation of the deviations from"$S_g$" for all grooves in any one sheave shall not exceed ±0.010 in.

## 2. Installation

Before performing any installation, follow correct lockout procedures to prevent any accidents.

IMPORTANT: Disconnect power supply to machine **before doing ANY work**.



# **Poly-V® Belts**
Installation Guide

## QD® Bushing

If the sheaves are made with a QD® hub, follow these installation and removal instructions:

### 3. How to install a sheave with a QD® hub

Insert the bushing in the hub and line up bolt holes.

Insert the pull-up bolts and turn until finger tight.

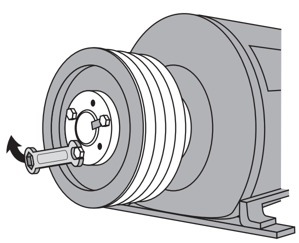
Hold the loosely-assembled unit so the bushing flange points toward the shaft bearings. Reverse mounting the QD® bushing can be advantageous for some applications.

Slip the unit onto the shaft and align the hub in the desired position.

Tighten the setscrew in the flange only enough to hold the assembly in position.

Tighten each pull-up bolt alternately and evenly.

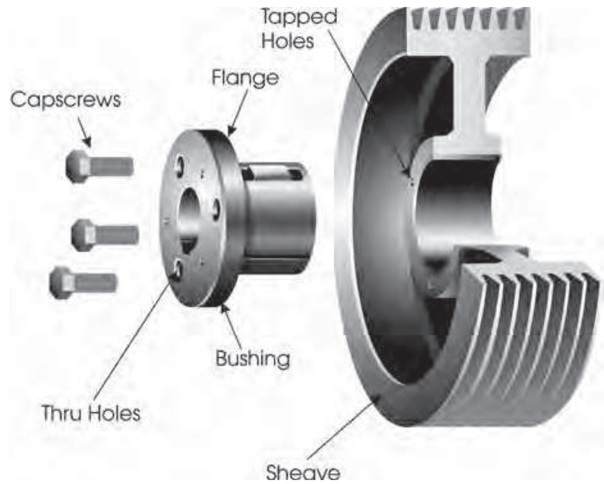
Recheck alignment and completely tighten the setscrew on the shaft.



### 4. How to remove a sheave with a QD® hub

Place two of the pull-up bolts in the tapped holes in the sheave.

Turn the bolts alternately and evenly. They will push against the bushing flange and act as jackscrews to break the grip between the bushing and the tub.




## Split Taper Bushing

If the sheaves are made for split taper bushings, follow these installation and removal instructions:

### 5. How to install split taper bushing sheaves

Put the bushing loosely in the sheave and start the capscrews.

Place the assembly on the shaft. Align both edges of the sheave with the edges of its mating sheave (example: the sheave on the driven shaft).

Tighten the capscrews according to the instructions furnished with the bushings.

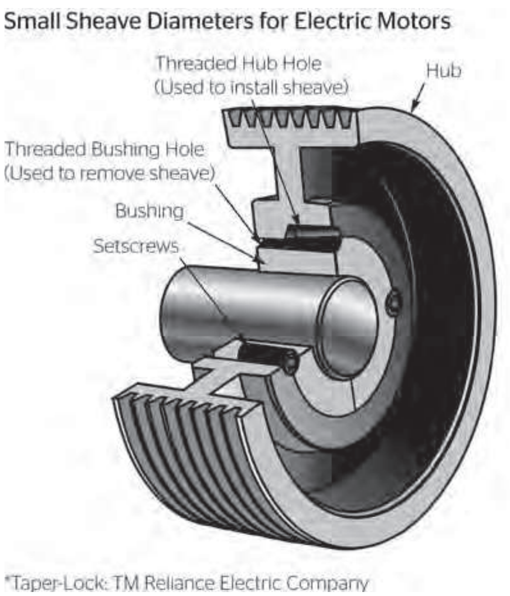
### 6. How to remove split taper bushing sheaves

Remove all capscrews.

Put two of the capscrews in the tapped holes in the flange of the bushing.

Turn the bolts alternately and evenly until the sheave has loosened.

Remove the sheave/flange assembly from the shaft.




# Taper-Lock Bushing

## 7. How to install a sheave made with a taper-lock hub

Look at the bushing and the hub. Each has a set of half-holes.

The threaded holes in the hub are the mates to the non-threaded holes in the bushing.

Insert the bushing in the hub and slide it onto the shaft. Align a threaded hub hole with non-threaded bushing hole.

Start the setscrews into the holes that are threaded in the hub only. Do not tighten the setscrews yet.

Align both edges of the sheave with the edges of its mating sheave.

Tighten the screws alternately and evenly. This procedure will wedge the bushing inward and cause it to contract evenly and grip the shaft.

## 8. How to remove a sheave made with a taper-lock hub

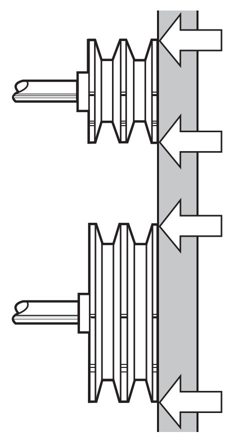
Remove all the setscrews.

Place two of the setscrews in the holes that are threaded in the bushing only.

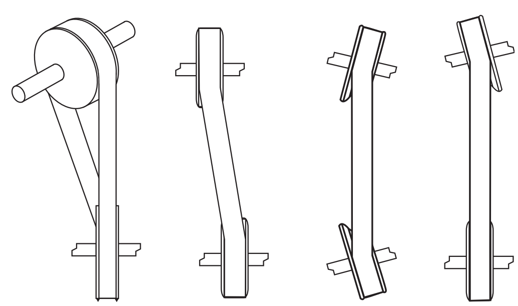
Turn the setscrews alternately and evenly. This movement will unlock the grip and permit easy removal of the assembly with no shock to the bearings or machinery.

## 9. Check alignment

Proper alignment is essential for long Poly-V® belt life. Check belt alignment whenever you maintain or replace belts or whenever you remove or install sheaves. Limit misalignment to 1/4 degree or approximately 1/16 inch per foot of center distance.



The illustration above shows the correct way to check alignment between two sheaves with a straight edge. Check both front and back alignment. Straight edge should touch sheaves at the four points indicated.

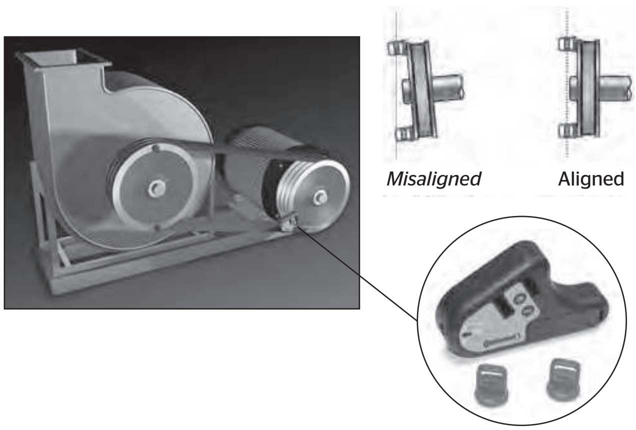


Non-parallel shafts or sheaves not aligned axially can cause angular misalignment.

# **Poly-V® Belts**
# Installation Guide

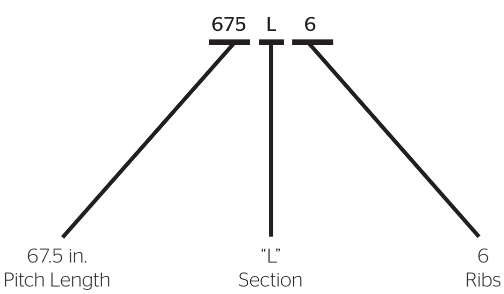
## Laser Alignment Tool

With our Laser Alignment Tool, you can quickly align drive components to improve efficiency and reduce costly maintenance. Much easier to use than a straight edge, it attaches in seconds. When the highly-visible sight line lies within the target openings, the pulley/sprockets are aligned.

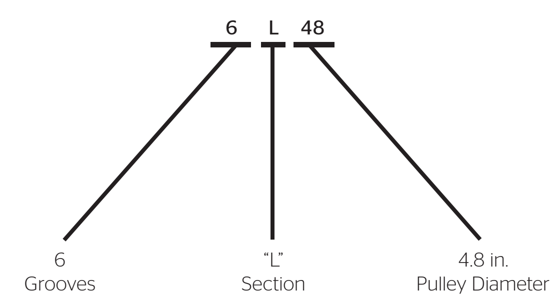



### 10. Identify correct belt
Always select belts to match sheave grooves.

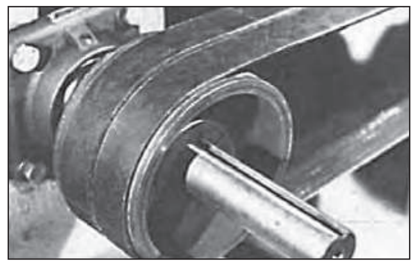
Size Designation Belt




Pulley




### 11. Matching belts
Matching multiple belts is not necessary for most Poly-V® belt drives. If you encounter a special application calling for matching, specify "matched belts" on the order.

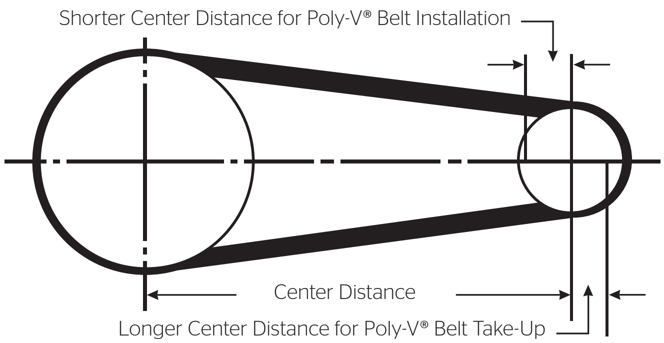


### 12. How to install belts
After you correctly install and align the sheaves, you can install the belts.

Always move the drive unit so you can easily slip the belts into the grooves without force.

Never force belts into a sheave with a tool such as a screwdriver or a wedge. Doing so may damage the ribs or break the cords.

Refer to Table 15 (on page 30) to determine if enough clearance exists for belt installation and take-up.




For example, if you are installing a 220J8, the minimum allowance below center distance is 1/2 inch. If you are working to maintain tension, the minimum allowance above center distance for belt take-up is also 1/2 inch.

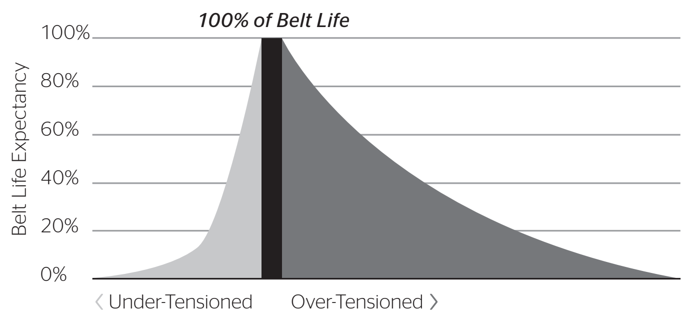
Table 15 Poly-V® Belt Recommended Installation and Take-Up Allowances

**Recommended Installation and Take-Up Allowances (in.)**

| **Standard Effective Length** | **Minimum Allowance Below Standard Center Distance for Installation of Belts** | | | **Minimum Allowance Above Standard Center Distance for Maintaining Tension, All Cross Selections** |
|---|---|---|---|---|
| | **J** | **L** | **M** | |
| Up to and including 20.0 | 0.4 | | | 0.3 |
| Over 20.0 to and including 40.0 | 0.5 | | | 0.5 |
| Over 40.0 to and including 60.0 | 0.6 | 0.9 | | 0.7 |
| Over 60.0 to and including 80.0 | 0.6 | 0.9 | | 0.9 |
| Over 80.0 to and including 100.0 | 0.7 | 1.0 | 1.5 | 1.1 |
| Over 100.0 to and including 120.0 | 0.8 | 1.1 | 1.6 | 1.3 |
| Over 120.0 to and including 160.0 | | 1.2 | 1.7 | 1.7 |
| Over 160.0 to and including 200.0 | | 1.3 | 1.8 | 2.2 |
| Over 200.0 to and including 240.0 | | 1.4 | 1.9 | 2.6 |
| Over 240.0 to and including 300.0 | | | 2.2 | 3.3 |
| Over 300.0 to and including 360.0 | | | 2.3 | 3.9 |
| Over 360.0 to and including 420.0 | | | 2.6 | 4.6 |
| Over 420.0 to and including 480.0 | | | 2.9 | 5.2 |
| Over 480.0 to and including 540.0 | | | 3.2 | 5.8 |
| Over 540.0 to and including 600.0 | | | 3.6 | 6.5 |

## 13. Tension

**Belt Life Expectancy vs. Tension**




Belt Tension

- Optimal Belt Tension
- Under-Tensioned
- Over-Tensioned

Proper tension is essential for maximum belt life and efficiency. Improper belt tension is the primary cause of premature belt failure and increased costs. Under-tensioned belts lead to slippage, overheating and noise, all of which lead to higher maintenance costs and inefficient transmission of power. Also, over-tensioning belts leads to premature wear, along with bearing, shaft and pulley problems. The result is more frequent replacement of drive components and costly downtime.

## Common sense rules of Poly-V® belt tensioning

The ideal tension is the lowest tension at which the belt will not slip under peak load conditions.

Check the belt tension frequently during the first 24-48 hours of run-in operation.

Do not over-tension belts. Doing so will shorten belt and bearing life.

Keep belts free from foreign materials that may cause slippage. Inspect the Poly-V® drive periodically. Re-tension the belts if they are slipping.

Maintain sheave alignment with a strong straight-edge tool while tensioning Poly-V® belts.

# **Poly-V® Belts**
Installation Guide

## Tensioning Methods

Choose one of two tensioning methods for Poly-V® belts:

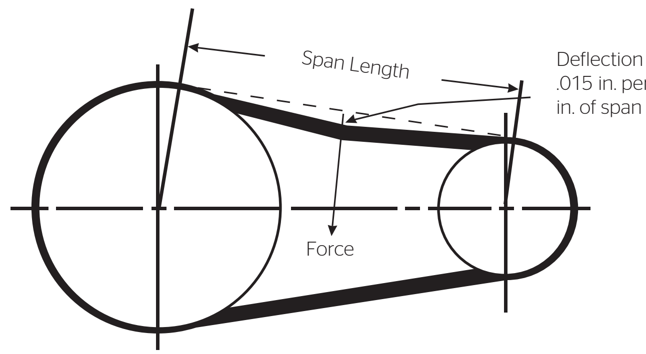
### TensionRite® Belt Frequency Meter

Using advanced optical technology, our TensionRite® Belt Frequency Meter provides a simple, repeatable and reliable method for tensioning belts. It displays the natural vibration frequency of the belt strand so you can closely monitor belt tension. The device works with all industrial transmission belts, including V-belts, synchronous belts, banded belts and Poly-V® belts and calculates the corresponding belt tension in either English or SI units.


### Deflection Principle

Plunger-type gauges utilize the Deflection Principle to check the tension of a belt drive.


The gauge deflects the center of the belt span and the force of this deflection is compared to a target deflection force for the particular span. Then, one can adjust the belt tension until the actual deflection force equals the target.




Run the drive briefly to properly seat the belt. At least one sheave should rotate freely during the tensioning procedure.

Measure the span length (see illustration).

Mark the center of span. At the center point, use a tension tester and apply a force perpendicular to the span large enough to deflect the belt 1/64 inch for every inch of span length (example: a 100 inch span requires a deflection of 100/64 inch or $1\frac{9}{16}$ inches).

Compare the actual deflection force with the values in Table 16 below.

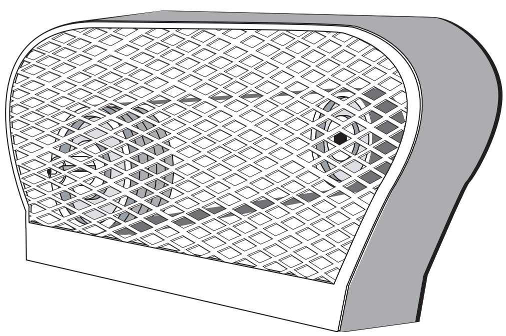
A force below the target value indicates under-tension; a force above the target indicates over-tension.

Table 16 Belt Deflection Force

| **Belt Cross Section** | **Small Sheave Diameter Range** | **Force "F" (lb. per rib)** |
|---|---|---|
| J | 1.32-1.67 | 0.4 |
| J | 1.77-2.20 | 0.5 |
| J | 2.36-2.95 | 0.6 |
| L | 2.95-3.74 | 1.7 |
| L | 3.94-4.92 | 2.1 |
| L | 5.20-6.69 | 2.5 |
| M | 7.09-8.82 | 6.4 |
| M | 9.29-11.81 | 7.7 |
| M | 12.40-15.75 | 8.8 |

The following few sections detail other issues that could arise during a Poly-V® belt drive installation:

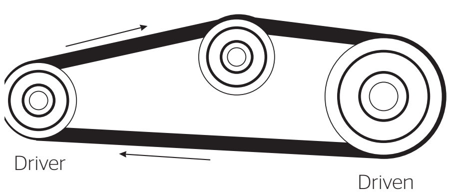
## 14. Belt guards



Poly-V® belt drive guards ensure cleanliness and safety. Screened, meshed or grilled guards are preferable because they allow for air circulation and heat escape.

## 15. Idlers

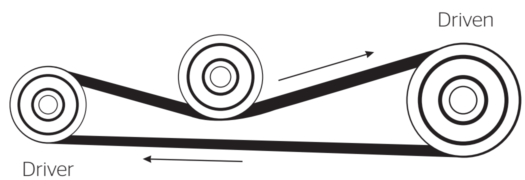
Even though Poly-V® belts are designed to handle idlers better than most other power transmission belts, idlers will reduce belt life and should be avoided. Idlers put an additional bending stress point on the belts, which reduces the belt's horsepower rating and its life. The smaller the idler, the greater this stress and the shorter the belt's life. If the drive design requires an idler, observe the following design recommendations.




### Inside idler

A V-grooved idler located on the inside of the belts on the slack side of the drive is preferable to a back side idler. Locate the idler near the large sheave to avoid reduction of the arc of contact with the small sheave.

Note that the size of the V-idler pulley should be equal to or larger (preferably) than the diameter of the small sheave.



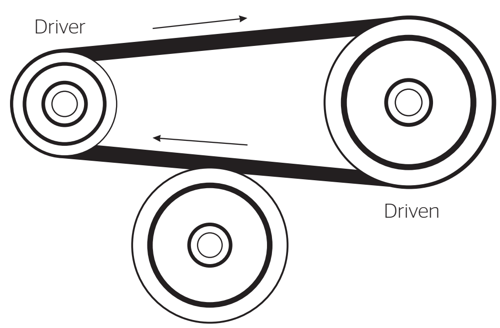

### Back side idler

A back side idler increases the arc of contact on both sheaves; however, such an idler also forces a backward bend in the Poly-V® belt, which contributes to unwanted wear such as rib cracking and premature failure. If a back side idler is the only option, follow two guidelines:

1. Make sure the diameter of the flat idler pulley is at least 1.5 times the diameter of the small sheave.

**and**

2. Locate the back side idler as close as possible to the small sheave.




### Kiss idler

Unlike the back side idler, the kiss idler does not penetrate the belt span and create a back bend. Consequently, the kiss idler does not contribute to premature failure. The kiss idler can help control belt vibration and whip on drives subject to shock and pulsating loads. When using a kiss idler, make sure the diameter of the flat pulley is at least 1.5 times the diameter of the small sheave.

# **Variable Speed Belts**
Installation Guide

## 1. Inspect sheaves

The following sections outline installation procedures that will ensure maximum life and performance for your Variable Speed belts.

Check sheaves for cleanliness, damage and wear whether you are replacing an existing belt, performing routine maintenance or installing a new drive.

**WARNING**

**Disconnect power supply to the machine before removing or installing sheaves or belts.**

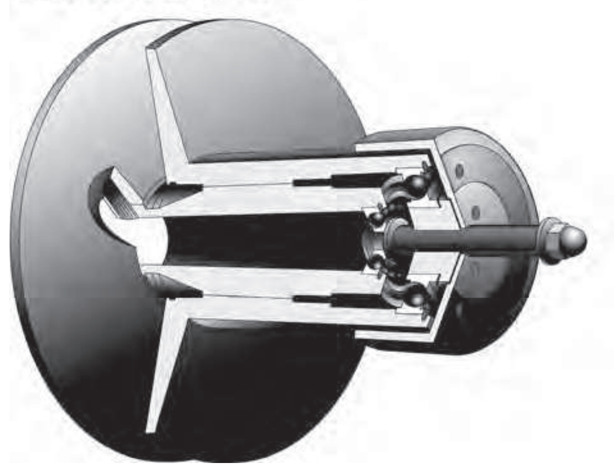
**WARNING**

**Do not reinstall damaged or worn sheaves on equipment.**

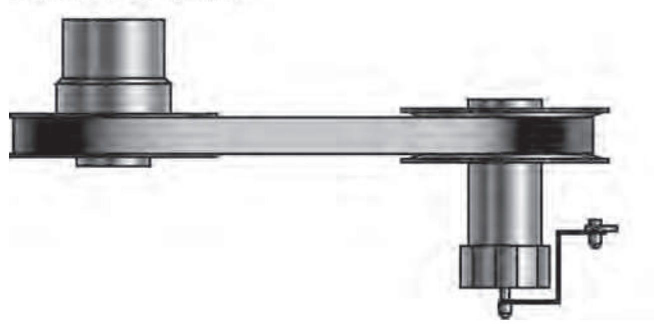
Worn sidewalls also interfere with the shifting action. Nicks or gouges can cut the belt. Dirt on the belt and in the grooves can abrade the belt and oil can attack the belt materials. Use a stiff brush to clean off rust and dirt. Wipe off any oil and grease. Worn moving parts cause vibration and reduce belt life.

## Types of Variable Speed Drives

Variable to Fixed Sheave



Both Sheaves Variable



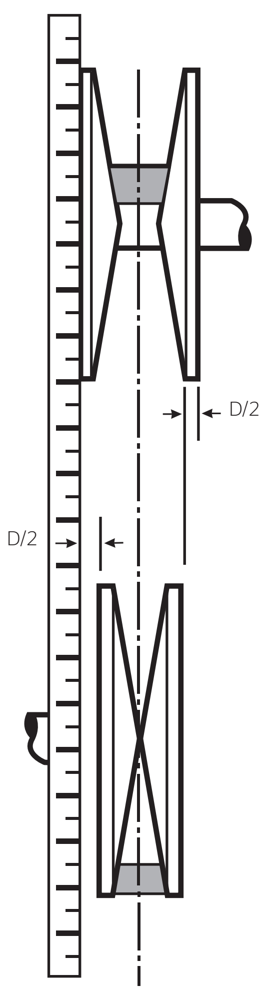
## 2. Check alignment

Proper alignment is more critical for variable speed drive sheaves than for conventional V-belt drives. Check belt alignment whenever you maintain or replace belts or remove or install sheaves.

This illustration (Figure A), shows the correct way to check alignment between two variable speed drive sheaves.

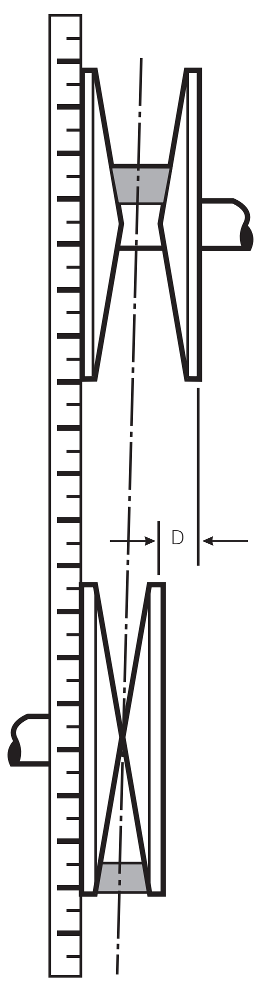
Another illustration (Figure B), shows a belt misaligned. To correct the alignment, move one sheave so that the straight edge is equidistant from both sides of the narrow sheave. The belt edges should also be equidistant from the straight edge.

Figure A: Properly Aligned




**RIGHT**
The belt is parallel to the straight edge

Figure B: *Misaligned*

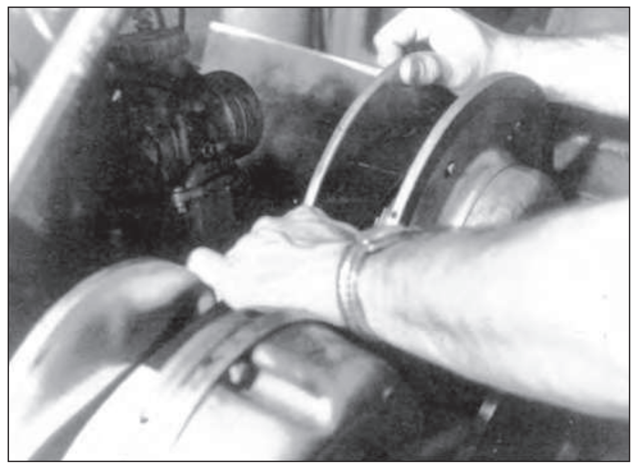



**WRONG**
Check for misalignment and offset distance "D"

## 3. Identify correct belt

To select the correct belt, refer to the drive manufacturer's recommendations. The belt length is most critical on fixed center drives with both pulleys variable since accurate length is required to achieve precise drive speed variations. Belt length with one variable and one fixed pulley is also critical as it affects the allowable increase and decrease in center distances.

## 4. How to install belt



Take special care during the installation of variable speed belts to avoid damage to the belts and sheaves. You may have to open variator sheaves fully to facilitate installation. You may also have to shorten the drive center distance to allow for easy installation. Also, you may have to remove sheaves. After assembly, return the drive center distance to normal and recheck drive alignment.

## 5. Tension

Spring loaded sheaves, which apply the tension required to handle the design load, govern variable speed belt tensioning.

## 6. Belt guards

Belt guards ensure cleanliness and safety. Screened, meshed or grilled guards are preferable because they allow for air circulation and heat escape. Note: refer to www.osha.org.

## 7. Idlers

Idlers are not recommended for variable speed drives.

# **Synchronous Belts**
# Installation Guide

## 1. Inspect sprockets

The following sections outline installation procedures that will ensure maximum life and performance for your Continental ContiTech synchronous belts such as Hawk Pd,® Blackhawk Pd,® Falcon Pd® and SilentSync® belts.

**WARNING**

**Disconnect power supply to the machine before removing or installing sheaves or belts.**

**WARNING**

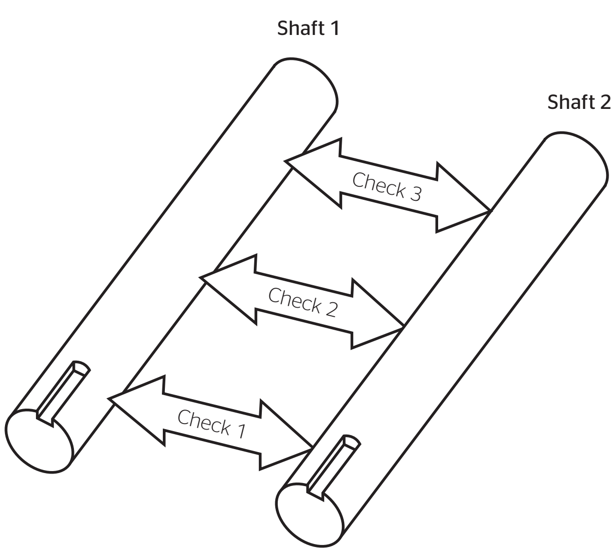
**Do not reinstall damaged or worn sheaves on equipment.**

Worn teeth will cause belt wear and/or damage. Nicks or gouges can cut the belt. Dirt on the teeth and in the grooves can abrade the belt and oil can attack belt materials.

Use a stiff brush to remove rust and dirt. Use a soft cloth to wipe off oil and grease.

Make sure the components are ready for installation. Clean all shafts, removing any nicks or burrs. Clean all mating surfaces of the sprocket, bushing and shaft. Do not use lubrication or anti-seize solution on any of these surfaces.

Make sure the shafts are true and parallel by accurately measuring the distance between the shafts at three points along the shaft. The distance between the shafts should be the same at all three points as shown.




Also, make sure the shafts are rigidly mounted. Shafts should not deflect when the belt is tensioned.

## 2. Install hardware

Correct sprocket selection and installation is important. Before performing any installation, follow correct lockout procedures to prevent any accidents.

IMPORTANT: Disconnect power supply to machine **before doing ANY work**.


# QD® Bushing

If the sheaves are made with a QD® hub, follow these installation and removal instructions:

## 3. How to install a sprocket with a QD® hub

For conventional mounting, insert bushing into the sprocket, aligning the tapped holes in the bushing flange with the thru holes in the sprocket hub.

Insert capscrews through the thru holes and into the tapped holes.

Insert the key into the keyseat of the shaft.

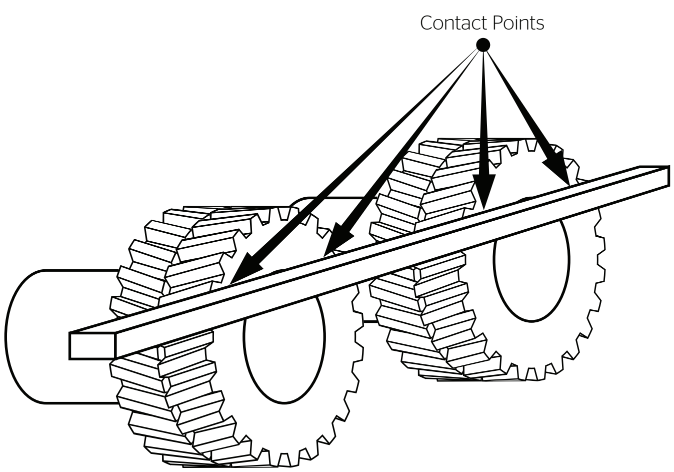
With capscrews to the outside, place the sprocket and bushing assembly on the shaft, positioning the assembly with the bushing flange towards the shaft bearings. Reverse mounting the QD® bushing can be advantageous for some applications.

Mount the other sprocket in a similar manner.

**Check that the teeth of both sprockets are pointing in the same direction when installing SilentSync® sprockets.**

Snug the capscrews so that the sprocket/bushing assembly can still move on the shaft.

Align the sprockets using a straight edge. Check for contact in four places as shown. Do not use bearings or drive shafts as reference points for sprocket alignment.




Using a torque wrench, tighten the capscrews to the torque values listed below. If there is not a gap of 1/8 inch to 1/4 inch between the bushing flange and the sprocket hub then disassemble the parts and determine the reason for the faulty assembly.

The sprocket will draw onto the bushing during tightening. Always recheck alignment after tightening the capscrews. If alignment has changed, loosen the capscrews and move sprocket/bushing assembly on shaft to realign. Tighten the setscrews over the keyway to the torque values listed in the table.

If the sprockets are straight bore, use the above alignment procedure and then tighten the setscrews to the correct torque for the setscrew size as listed in Table 17.

QD® bushings can be installed with the capscrews on either side, excluding QT, M and N sizes. Drives with opposing shafts require one of the sprockets to be mounted with the capscrew on the flange side and one with the capscrews on the hub side.

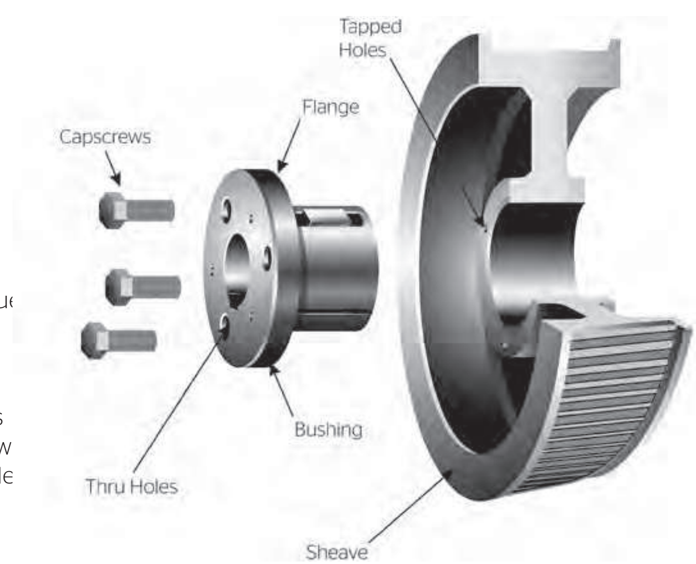
Table 17 Torque Specifications

| | **Capscrew Torque** | | **Setscrew Torque** | **Setscrew Size** |
|---|---|---|---|---|
| **Bushing** | **(in.-lb.)** | **(ft.-lb.)** | **(in.-lb.)** | **(in.)** |
| H | 108 | 9 | | |
| SH | 108 | 9 | 87 | 1/4 |
| SDS | 108 | 9 | 87 | 1/4 |
| SK | 180 | 15 | 87 | 1/4 |
| SF | 360 | 30 | 165 | 5/16 |
| E | 720 | 60 | 290 | 3/8 |
| F | 900 | 75 | 290 | 3/8 |
| J | 1620 | 135 | 290 | 3/8 |
| M | 2700 | 225 | 290 | 3/8 |
| N | 3600 | 300 | 620 | 1/2 |

## 4. How to remove a sprocket with a QD® hub

Place two of the pull-up bolts in the tapped holes in the sprocket.

Turn the bolts alternately and evenly. They will push against the bushing flange and act as jackscrews to break the grip between the bushing and the hub.



# **Synchronous Belts**
Installation Guide

## Split Taper Bushing

If the sprockets are made for split taper bushings, follow these installation and removal instructions:

### 5. How to install split taper bushing sprockets
Put the bushing loosely in the sprocket and start the capscrews.

Place the assembly on the shaft. Align both edges of the sprocket with the edges of its mating sprocket (example: the sprocket on the driven shaft).

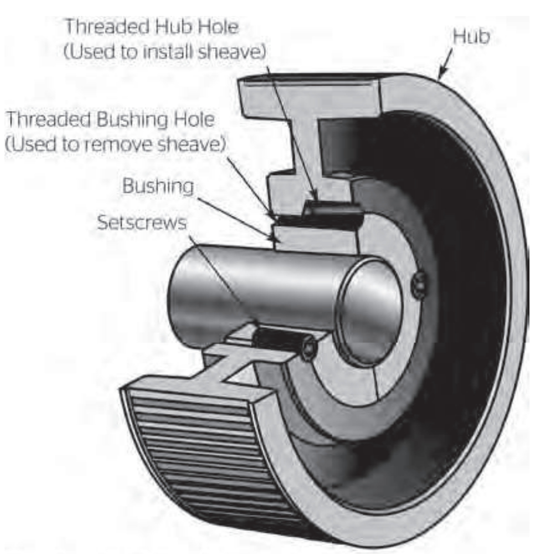
Tighten the capscrews according to the instructions furnished with the bushings.

### 6. How to remove split taper bushing sprockets
Remove all capscrews.

Put two of the capscrews in the tapped holes in the flange of the bushing.

Turn the bolts alternately and evenly until the sprocket has loosened.

Remove the sprocket/bushing assembly from the shaft.




*Taper-Lock: TM Reliance Electric Company

## Taper-Lock Bushing

The following instructions illustrate how to install a sprocket made with a taper-lock hub:

### 7. How to install a sprocket made with a taper-lock hub
Look at the bushing and the hub. Each has a set of half-holes.

The threaded holes in the hub are the mates to the non-threaded holes in the bushing.

Insert the bushing in the hub and slide it onto the shaft. Align a threaded hub hole with non-threaded bushing hole.

Start the setscrews into the holes that are threaded in the hub only. Do not tighten the setscrews yet.

Align both edges of the sprocket with the edges of its mating sprocket.

Tighten the screws alternately and evenly. This procedure will wedge the bushing inward and cause it to contract evenly and grip the shaft.

### 8. How to remove a sprocket made with a taper-lock hub
Remove all the setscrews.

Place two of the setscrews in the holes that are threaded in the bushing only.

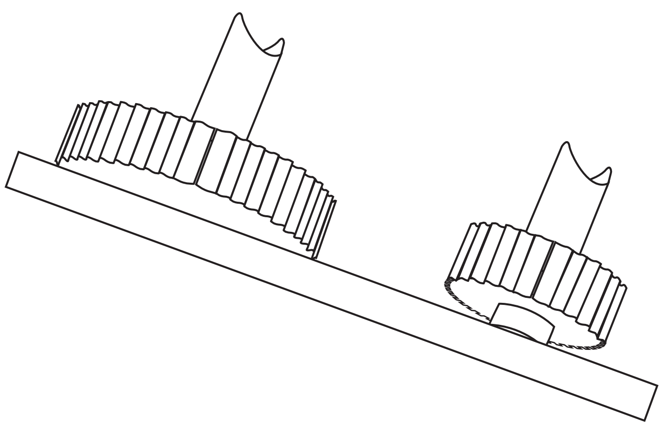
Turn the setscrews alternately and evenly. This movement will unlock the grip and permit easy removal of the assembly with no shock to the bearings or machinery.

9. Check Alignment

# Drive Alignment

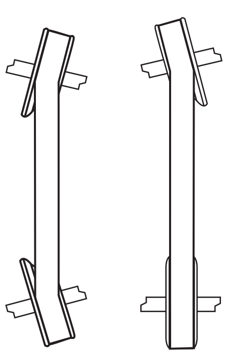
Synchronous belts are very sensitive to misalignment.
The tension carrying member has a high tensile strength and resistance to elongation, resulting in a very stable belt product. Any misalignment will lead to inconsistent belt wear, uneven load distribution and premature tensile failure. In general, synchronous drives should not be used where misalignment is a problem. Limit misalignment to 1/4 degree or approximately 1/16 inch per foot of center distance. With parallel shafts, misalignment occurs when there is an offset between the sprocket faces as in Figure A.

Figure A



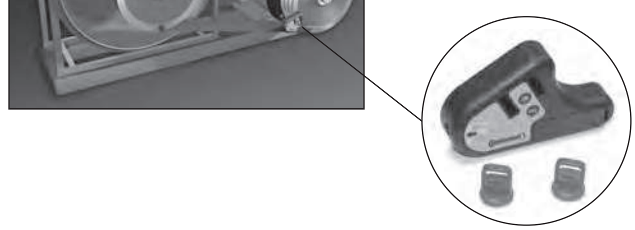
Misalignment also occurs when the shafts are not parallel as in Figure B.

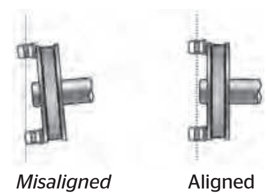
Figure B



# Laser Alignment Tool

With our Laser Alignment Tool, you can quickly align drive components to improve efficiency and reduce costly maintenance. Much easier to use than a straight edge, it attaches in seconds and when the highly-visible sight line lies within the target openings, the pulley/sprockets are aligned.






## 10. Identify correct belts

Always select belts to match sprocket profile. SilentSync® belts and sprockets are identified with a unique Color Spectrum System. The seven colors used for identification are: Yellow, White, Purple, Blue, Green, Orange and Red. Each color represents a different size so that Blue belts are made to operate with Blue sprockets. Make sure to obtain the same color belt and sprockets. When installing other synchronous belts, use the correct sprocket width.

## 11. Matching belts

Drives using synchronous belts are not recommended to run in matched sets. If a special application requires matching, specify “matched belts” on the order. Note: such requests require additional order lead time. Also, matching code numbers will not appear on the belts.

# **Synchronous Belts** Installation Guide

## 12. How to install belts

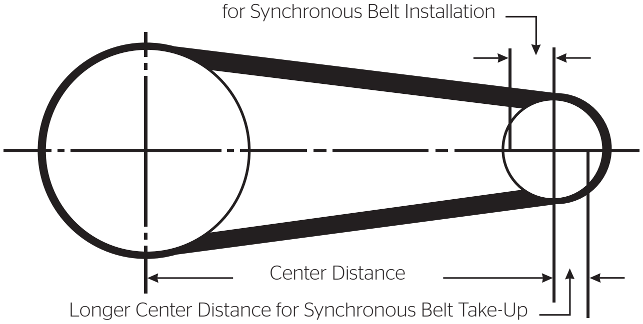
Before installation, inspect the belt for damage. Belts should never appear crimped or bent to a diameter less than the minimum recommended sprocket diameter.

Always move the drive unit so you can easily slip the belts into the grooves without force.

Shorten the center distance or release the tensioning idler to install the belt. Do not pry the belt on the sprocket. Refer to the following Center Distance Allowance tables for the required center distance adjustment.

Place the belt on each sprocket and ensure proper engagement between the sprocket and belt teeth.

Lengthen the center distance or adjust the tensioning idler to remove any belt slack.




Apply the following center distance allowances for Hawk Pd® and Falcon Pd® A center distance adjustment or decrease in center distance, is necessary to install a belt. In addition, an increase in center distance will be necessary for proper tensioning. If you install a belt together with sprockets, allow the following decrease in center distance for installation and an increase in center distance for tensioning.

| | **Allowance (decrease) for Installation** | **Allowance (increase) for Take-Up** |
|---|---|---|
| **Pitch Length Range (mm)** | **8m, 14m Belts (mm/in.)** | **8m, 14m Belts (mm/in.)** |
| Less than 1525 | 2.5/0.1 | 2.5/0.1 |
| 1525-3050 | 5.0/0.2 | 5.0/0.2 |
| Greater than 3050 | 7.5/0.3 | 7.5/0.3 |

If you install a belt over one flanged sprocket and one unflanged sprocket with the sprockets already installed on the drive, allow the following decrease in center distance for installation and increase in center distance for tensioning.

| | **Allowance (decrease) for Installation** | | **Allowance (increase) for Take-Up** |
|---|---|---|---|
| **Pitch Length Range (mm)** | **8m Belts (mm/in.)** | **14m Belts (mm/in.)** | **8m, 14m Belts (mm/in.)** |
| Less than 1525 | 22.5/0.9 | 36.5/1.4 | 2.5/0.1 |
| 1525-3050 | 25.0/1.0 | 39.0/1.5 | 5.0/0.2 |
| Greater than 3050 | 27.5/1.1 | 41.5/1.6 | 7.5/0.3 |

If you install the belt over two flanged sprockets that are already installed on the drive, allow the following decrease in center distance for installation and increase in center distance for tensioning:

| | **Allowance (decrease) for Installation** | | **Allowance (increase) for Take-Up** |
|---|---|---|---|
| **Pitch Length Range (mm)** | **8m Belts (mm/in.)** | **14m Belts (mm/in.)** | **8m, 14m Belts (mm/in.)** |
| Less than 1525 | 34.5/1.4 | 59.2/2.3 | 2.5/0.1 |
| 1525-3050 | 37.0/1.5 | 62.0/2.4 | 5.0/0.2 |
| Greater than 3050 | 39.5/1.6 | 64.5/2.5 | 7.5/0.3 |

Consider the following center distance allowances when installing SilentSync® sprockets.

Since flanges are not necessary on SilentSync® drives, only one table of center distance allowances is provided.

| | **Allowance (decrease) for Installation** | | **Allowance (increase) for Take-Up** |
|---|---|---|---|
| **Pitch Length Range (mm)** | **Yellow, White, Purple Belts (mm/in.)** | **Blue, Green, Orange, Red (mm/in.)** | **8m, 14m Belts (mm/in.)** |
| Less than 1525 | 10.1/0.4 | 15.2/0.6 | 2.5/0.1 |
| Greater than 1525 | 15.2/0.6 | 17.8/0.7 | 5.0/0.2 |

## 13. Tension

Install and tension synchronous belts properly to ensure optimum performance.

Proper tension is essential for maximum belt life and efficiency. Improper belt tension is the primary cause of premature belt failure and increased costs. Under-tensioned belts lead to ratcheting and excessive tooth loading, both of which lead to higher maintenance costs and inefficient transmission of power. Also, over-tensioning belts leads to premature wear, along with bearing, shaft and sprocket problems. The result is more frequent replacement of drive components and costly downtime.

# Tensioning Methods

Choose one of two tensioning methods for Synchronous belts:

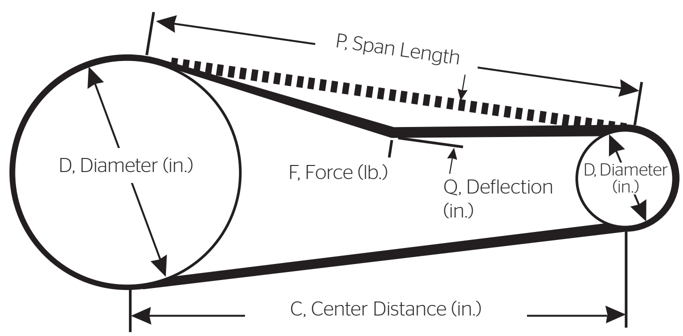
### TensionRite® Belt Frequency Meter

Using advanced optical technology, our TensionRite® Belt Frequency Meter provides a simple, repeatable and reliable method for tensioning belts. It displays the natural vibration frequency of the belt strand so you can closely monitor belt tension. The device works with all industrial transmission belts including V-belts, synchronous belts, banded belts and Poly-V® belts and calculates the corresponding belt tension in either English or SI units.


### Deflection Principle

Plunger-type gauges utilize the deflection principle to check the tension of a belt drive.


The gauge deflects the center of the belt span and the force of this deflection is compared to a target deflection force for the particular span. Then, one can adjust the belt tension until the actual deflection force equals the target.




$$P = \frac{D-d}{2\tan\left[\sin^{-1}\left(\frac{D-d}{2C}\right)\right]}$$

| | (in.) |
|---|---|
| Where: | P = Span length |
| | C = Center distance |
| | D = Large pulley pitch diameter |
| | d = Small pulley pitch diameter |

# **Synchronous Belts**
# Installation Guide

First, determine the proper deflection force to tension the belt. Deflection forces are listed in Table 18. Deflection forces are also given on the output of the MaximizerPro™ computer drive analysis.

If using a tension gauge, the deflection scale is calibrated in inches of span length. Check the force required to deflect the belt the proper amount. There is an O-ring to help record the force. If the measured force is less than the required deflection force, lengthen the center distance. If the measured force is greater than the required deflection force, shorten the center distance.

If using other means to apply force to the belt, adjust the center distance so that the belt is deflected 1/64 inch per inch of span length when the proper force is applied. After the belt is properly tensioned, lock down the center distance adjustments and recheck the sprocket alignment.

If possible, run the drive for approximately 5 minutes with or without load. Stop the drive, lock out the power source and examine alignment, capscrew torque and belt tension of the drive. Adjust the center distance to increase the belt tension to the "new" value in the Deflection Force Tables. Lock down the drive adjustments and recheck tension. Recheck the belt tension, alignment and capscrew torque after 8 hours of operation to ensure the drive has not shifted.

Table 18 Deflection Forces for Belt Tensioning

**Deflection Forces for Belt Tensioning (lb.)**

| | **0-100 RPM** | | **101-1000 RPM** | | **1000-Up RPM** | |
|---|---|---|---|---|---|---|
| **Belt Type** | **New Belt** | **Used Belt** | **New Belt** | **Used Belt** | **New Belt** | **Used Belt** |
| **SilentSync®** | | | | | | |
| Yellow | 15 | 11 | 12 | 8 | 9 | 7 |
| White | 30 | 21 | 24 | 17 | 19 | 13 |
| Purple | 60 | 43 | 47 | 34 | 38 | 27 |
| Blue | 54 | 38 | 44 | 31 | 38 | 27 |
| Green | 60 | 57 | 66 | 47 | 57 | 41 |
| Orange | 107 | 76 | 88 | 63 | 76 | 55 |
| Red | 161 | 115 | 131 | 94 | 115 | 82 |
| **Falcon Pd®** | | | | | | |
| 8GTR 12 | 24 | 17 | 14 | 10 | 9 | 7 |
| 8GTR 21 | 42 | 30 | 25 | 18 | 16 | 12 |
| 8GTR 36 | 72 | 51 | 42 | 30 | 27 | 21 |
| 8GTR 62 | 124 | 88 | 72 | 52 | 47 | 36 |
| 14GTR 20 | 38 | 29 | 31 | 23 | 28 | 21 |
| 14GTR 37 | 70 | 54 | 57 | 43 | 52 | 39 |
| 14GTR 68 | 129 | 99 | 105 | 78 | 95 | 71 |
| 14GTR 90 | 171 | 131 | 140 | 104 | 126 | 95 |
| 14GTR 125 | 238 | 181 | 194 | 144 | 175 | 131 |
| **Blackhawk Pd®** | | | | | | |
| 8MBH12 | 12 | 9 | 9 | 7 | 7 | 5 |
| 8MBH 22 | 23 | 17 | 16 | 12 | 13 | 10 |
| 8MBH 35 | 36 | 26 | 26 | 19 | 21 | 16 |
| 8MBH 60 | 62 | 45 | 45 | 33 | 36 | 27 |
| 14MBH 20 | 36 | 26 | 27 | 20 | 23 | 17 |
| 14MBH 42 | 76 | 55 | 57 | 42 | 49 | 36 |
| 14MBH 65 | 117 | 85 | 89 | 65 | 76 | 55 |
| 14MBH 90 | 162 | 118 | 123 | 90 | 105 | 77 |
| 14MBH 120 | 217 | 157 | 164 | 119 | 139 | 102 |
| **Hawk Pd®** | | | | | | |
| 8M 20 | 15 | 11 | 13 | 10 | 12 | 9 |
| 8M 30 | 23 | 17 | 20 | 15 | 19 | 14 |
| 8M 50 | 39 | 29 | 35 | 26 | 32 | 24 |
| 8M 85 | 69 | 50 | 61 | 45 | 56 | 41 |
| 14M 40 | 47 | 34 | 38 | 28 | 32 | 24 |
| 14M 55 | 70 | 51 | 56 | 41 | 48 | 35 |
| 14M 85 | 116 | 84 | 93 | 68 | 79 | 58 |
| 14M 115 | 162 | 118 | 130 | 95 | 110 | 80 |
| 14M 170 | 249 | 181 | 201 | 146 | 171 | 125 |

The following few sections detail other issues that could arise during synchronous belt installation:

## 14. Using a fixed center distance

A fixed center distance drive has no adjustment for tensioning or installing the belt. Due to the tolerances of drive components, including sprocket, belt and drive geometry, a drive with a Fixed Center Distance is not recommended as adequate belt tension cannot be assured. Proper belt installation requires a minimum center to center adjustment (refer to belt installation for center to center adjustment on page 39). In some cases, fixed center drives cannot be avoided and should be used only with the understanding that belt life will be reduced.

## 15. Design factors

To ensure proper belt selection, consult the appropriate design manual for SilentSync,® Blackhawk Pd,® Falcon Pd® or Hawk Pd® Due to the high load capacity of these belts, make sure that all of the drive components are adequately designed. Consult sprocket and other component manufacturers for design assistance or if verification of application is needed.

## 16. Belt guards

Belt guards ensure cleanliness and safety. Screened, meshed, or grilled guards are preferable because they allow for air circulation and heat escape.

## 17. Idlers

Use idlers either inside or outside of the belt, preferably outside. Idlers often function as a tensioning mechanism when the drive has a fixed center distance. When an idler is necessary, follow several general rules:

Locate the idler on the slack side of the belt.

Small, inside idlers should be grooved (up to 40 teeth).

Outside idlers should be flat, not crowned.

Minimum idler diameter should be 4 inches on 8mm pitch drives and 8 inches on 14mm pitch drives.

Hold idler arc of contact to a minimum.

Do not use spring loaded tensioners.

Lock idlers firmly in place to minimize movement or deflection during drive start-up and operation.

## 18. Teeth in mesh

Sprockets with low belt angle of less than 60 degrees or less than six teeth in mesh (TIM) will not transmit the full rated load. Should drives be designed using less than six teeth in mesh, the service life of the belt will be reduced.

## 19. Flanged sprockets

Use flanges to keep the belt in the sprocket and prevent “rideoff” as each belt has its own tracking characteristics. Even belts with perfect drive alignment can have a tracking problem.

Synchronous belts will have an inherent side thrust while in motion and can be controlled with flanged sprockets. If side thrust is severe, check the drive for sprocket alignment, parallel shafts and shaft deflection.

**For a two sprocket drive:**

A minimum requirement should be two flanges on one sprocket for economical reasons; the smaller sprocket is usually flanged.

When the center distance of the drive exceeds eight times the diameter of the smaller sprocket, it is suggested that flanges be included on both sides of each sprocket.

On vertical shaft drives, one sprocket should be flanged on both sides and one sprocket flanged on bottom side only.

**For a multiple sprocket drive:**

Two flanges are required on every other sprocket or a single flange on every sprocket, altering sides.

## 20. Multiple sprocket drives

Multiple sprocket drives typically have one DriveR and two or more DriveN sprockets. In these cases, it is acceptable to size the drive based on the most severely loaded shaft. This is usually the DriveR shaft since the load of all the DriveN shafts must be transmitted through one DriveR shaft. Sprockets with a low belt wrap angle, less than 60 degrees and/or a low number of teeth in mesh, less than six teeth, will not transmit full rated load and service life of the belt will be reduced.
The number of teeth in mesh is equal to Belt Wrap in mm/Pitch in mm. Backside idlers can be used to increase belt wrap (see Table 17 on page 36). For detailed multiple sprocket drive design, contact a drive design specialist at Continental ContiTech.

## 21. Bearing loads

On many drives, bearing life is a concern. Reducing the bearing load will increase bearing life. Bearing loads can be reduced in the following ways:

Calculate the belt tension instead of using the belt tensioning tables. The tables are general and may specify higher belt tension than is necessary on some drives. Contact your Distributor to assist in calculating actual belt tension requirements for your drive.

Larger diameter sprockets will require less belt tension on any given drive.

Always position the sprockets close to the bearings. This positioning will reduce the effect of the "overhung" bearing load. Be sure not to install a belt at less than the recommended tension. A belt that is under-tensioned will have a reduced service life.

# Maintenance
Installation Guide

Belt drives are a reliable and efficient means of power transmission. Since they are essentially trouble-free, they are ignored often and do not receive the minimal attention they require for the full delivery of benefits over the course of a long life of use.

Belt drive maintenance is neither complicated nor does it require a great deal of time or a large variety of special tools. Primarily, good maintenance requires that you look at and listen to the drive to discover and correct any problems.

## What to look for:

### Oil and grease
Police a drive well. Immediately repair leaky bearings as excess oil on a bearing will splash on the belts. If you cannot correct these conditions without sacrificing adequate lubrication, use oil-resistant belts as too little lubrication will cause bearing failure, which may also cause belt failure when drag becomes excessive.

### Dirt
No equipment operates best when it is dirty. Belts are no exception. Dirt accelerates belt wear and dirt build-up in a V-belt sheave groove impairs traction.

### Added loads
Check to see that no additional loads have been added since the original drive was selected.

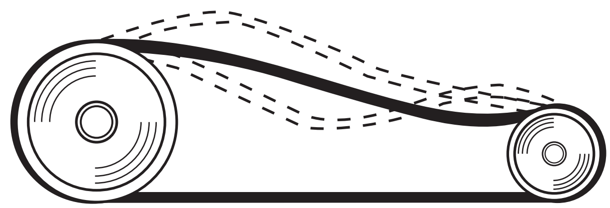
### Belt guards
Belt guards ensure that large debris does not enter the drive.

### Cracking
Reduce V-belt bottom cracking by using larger sheaves and larger reverse bend idler sheaves; however, tooth cracking on synchronous belts is an early indicator of tooth shear, and therefore, the belt should be replaced. See Troubleshooting charts for corrective action.

### Belt dressing
Belt dressing is seldom beneficial to belt drives. This tackiness actually accelerates the time to failure of V-belts. If V-belts slip or squeak, identify and correct the problem. Never use belt dressing on synchronous belts.

### Vibration
Excessive vibration should be minimized. This is often due to low tension or damaged tensile member. In extreme cases, a back side kiss idler may need to be added in the vibrating span.

**Prevent Belt Whipping**



### Tension
Tension is critical in belt drives. For V-belts, the ideal tension is the lowest tension at which the belts will not slip under peak load conditions. For synchronous belts, under-tensioning leads to ratcheting and excessive tooth loading. Adjust tension to the values shown in the tables provided in this guide. See section on “Installation” for the type of belt involved for additional information.

### Heat
High temperatures cause heat-aging and shorten belt life. Check frequently belts operating in temperatures above 180ºF (82.2ºC) and consider special heat-resistant construction if belt life is not satisfactory.

### Belt turn over
Turned over V-belts indicate drive misalignment, worn sheaves or excessive vibration.

### Change in ride out
Ride out is the position of the top of the V-belt to the outside diameter of the sheave. A change in ride out over time indicates uneven belt wear or worn sheaves.

### Lateral vibration
Don’t allow belts to snake.

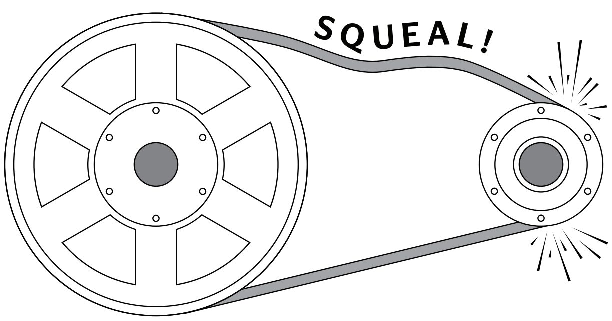
### Belt wear
Wear on V-belt sidewalls indicates consistent slippage, excessive dust or rough sheaves. Tooth wear on synchronous belts is an indication of improper tooth meshing. See Troubleshooting (on pages 46-48) for possible causes and corrections.

### Debris
Broken belts or excessive vibration can result from the presence of foreign material on the belts or in the sheaves or sprockets.

# **Maintenance**
Installation Guide

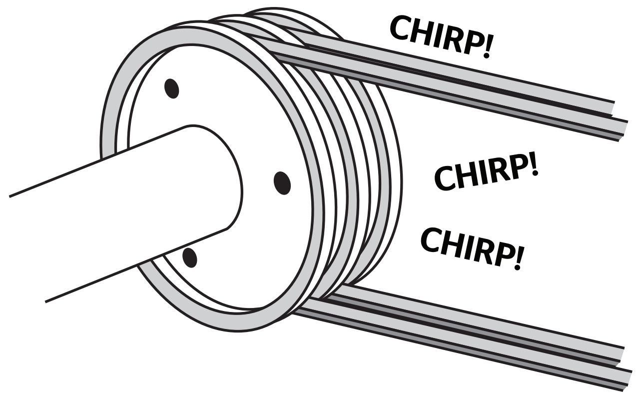
## What to listen for:

### Squeal



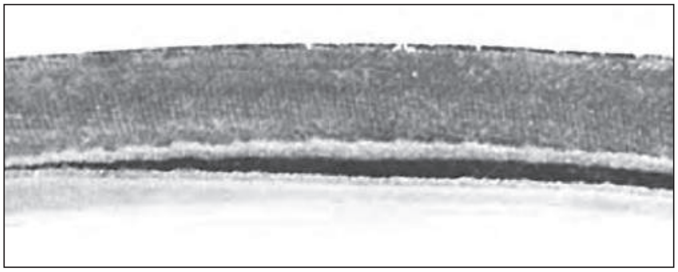

Squeal is usually a result of insufficient belt tension requiring prompt investigation. If squeal persists after checking all belts and adjusting tension, examine the drive itself for overloading.

### Chirp



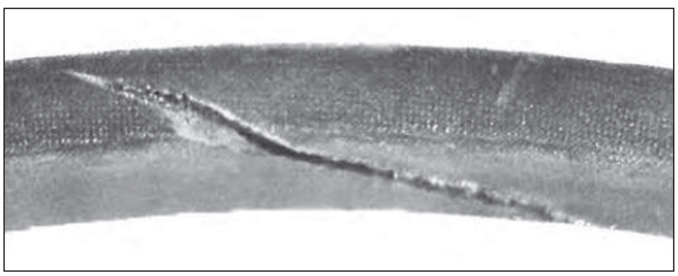

Chirp, a sound like that of a chirping bird, can occur on all types of belt drives. Never apply dressing or oil to a belt in an effort to eliminate chirps or squeaks. Realignment of an idler may help.

# Troubleshooting
## V-Belts Performance Analysis



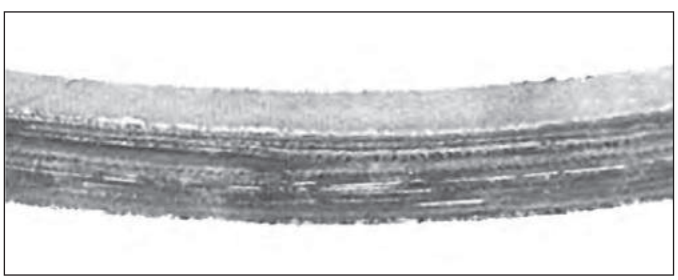
**Cause of Failure** – Excessive exposure to oil or grease has caused the belt to swell, become soft and the bottom envelope seam to "open up."

**Correction** – Provide splash guards, do not over lubricate and clean belts and sheaves with gasoline.



**Cause of Failure** – Cut bottom and sidewall indicate belt was pried over sheave and damaged during installation.

**Correction** – Be sure to use proper length belt and move tensioning all the way "in" when installing belt.



**Cause of Failure** – Constant slippage caused by insufficient tension in belt.

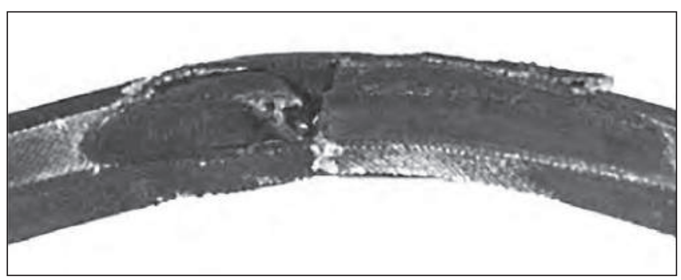
**Correction** – Tension drive in accordance with the recommendations of the equipment manufacturer and this manual.

**Cause of Failure** – Belt has evenly spaced deep bottom cracks from use of a substandard backside idler.

**Correction** – Replace backside idler with the minimum size recommendation.

**Cause of Failure** – Weathering or "crazing" caused by the elements and aggravated by small sheaves.

**Correction** – Provide protection for the drive and replace belt or belts.



**Cause of Failure** – Severe localized wear caused by a frozen or locked driven sheave.

**Correction** – Determine that the drive components turn freely and tighten belt, if necessary.

# **Troubleshooting**
## V-Belts Performance Analysis

**Cause of Failure** – Split on side at the belt pitch line indicates use of a sheave with a substandard diameter.

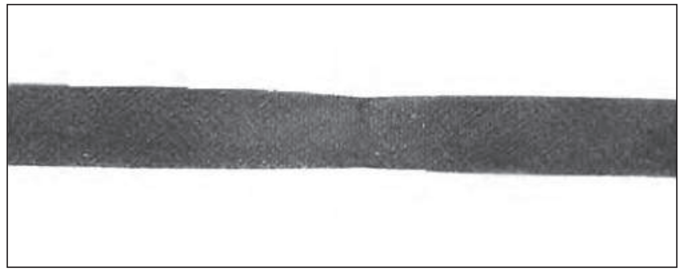
**Correction** – Redesigning drive to utlilize proper size sheaves.

**Cause of Failure** – Rough sheave sidewalls cause the cover to wear off in an uneven pattern.

**Correction** – File or machine out the rough spot on the sheave groove. If beyond repair, replace the sheave.

**Cause of Failure** – Ply separation caused by substandard sheave diameter.

**Correction** – Redesign drive to use proper-sized sheaves.

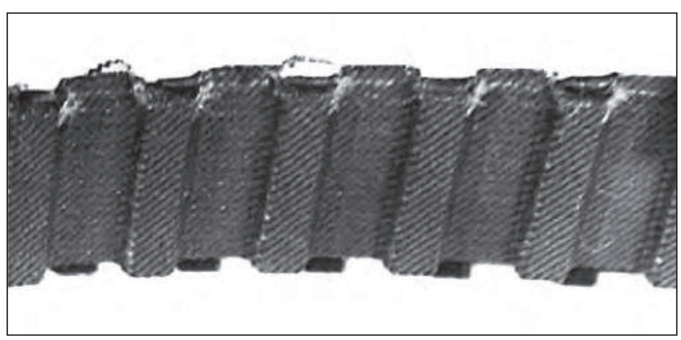


**Cause of Failure** – The load carrying member has been broken by a shock load or damage during installation.

**Correction** – Maintain proper tensioning and observe proper installation procedures.

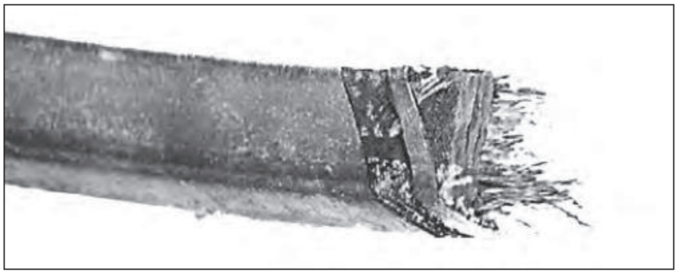
**Cause of Failure** – Excessive dust and rough sheaves combine to cause severe envelope wear and early belt failure.

**Correction** – Maintain sheave condition, alignment and attempt to protect drive from excessive dust exposure.



**Cause of Failure** – Flange wear on Pd synchronous belt.

**Correction** – Adjust and maintain proper pulley alignment.



**Cause of Failure** – Tensile breaks can be caused by high shock loads, foreign object between the bottom of the sheave and the bottom of the belt or damage during installation.

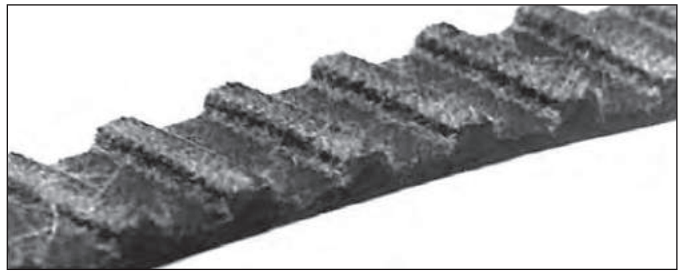
**Correction** – Maintain proper drive tension and installation procedures. Provide guard to keep foreign material from coming in contact with the drive.

**Cause of Failure** – Back of the belt has been rubbing on a belt guard or other appurtenance.

**Correction** – Provide adequate clearance between belt and guard or any appurtenances.

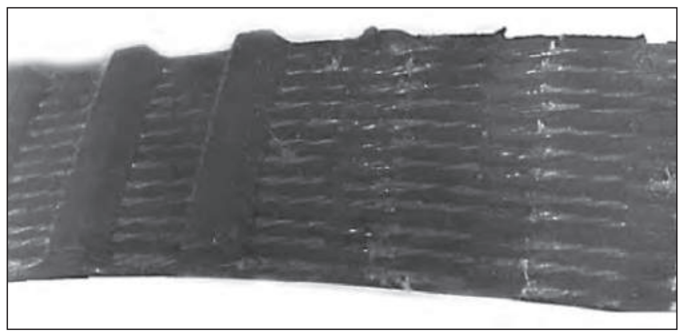
**Cause of Failure** – Worn sheave grooves allow the joined belt to ride too low cutting through to the top band.

**Correction** – Replace sheaves and maintain proper belt tension and sheave alignment.



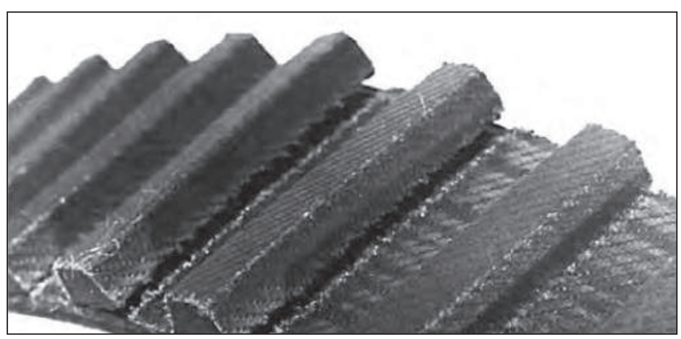
**Cause of Failure** – Tooth shear caused by belt overload condition from improper application or shock loads.

**Correction** – Consult engineering manual to proper application and maintain proper belt tension.



**Cause of Failure** – Web fabric wear caused by improper belt and pulley fit.

**Correction** – Check belt/pulley fit and replace worn or out-of-spec pulleys.



**Cause of Failure** – Fabric wear caused by insufficient belt tension or pulleys which are not to the standard Pd pulley dimensions and tolerances.

**Correction** – Maintain proper tension and replace the out-of-spec pulleys.

# Troubleshooting
## V-Belts Systems

| | Problem | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cut Thru on Top (Joined Belts) | Mismatched Belts at Installation | Belts too Short at Installation | Belts too Long at Installation | Excessive Vibration | Excessive Stretch | Belt Squeal | Hardening & Premature Cracking | Belts Turn Over |
| **Possible Causes** | | | | | | | | | |
| Excessive Oil | | | | | | | | | ■ |
| Exposure to Elements | | | | | | | | ■ | |
| Pried Over Sheaves | | | | | | | | | |
| Contact with Obstruction | | | | | | | | | |
| Insufficient Tension | | | | | ■ | | ■ | ■ | |
| Stalled Drive Sheaves | | | | | | | | | |
| Constant Slippage | | | | | | | | | |
| Rough Sheaves | | | | | | | | | |
| Substandard Sheaves | | | | | | | | | |
| Excessive Tension | | | | | | | | | |
| Shock Load | | | | | | | | | |
| Foreign Material | | | | | | | | | |
| Excessive Dust | | | | | | | | | |
| Drive Misalignment | | | | | | | | | ■ |
| Worn Sheaves | ■ | ■ | | | | | | | ■ |
| Excessive Vibration | | | | | | | | | ■ |
| High Ambient Temperature | | | | | | | | ■ | ■ |
| Drive Underbelted | | | | | | | | | |
| Damaged Tensile Member | | | | | ■ | | | | |
| Incorrect Belts | | | ■ | ■ | | | | | |
| Incorrect Drive Set-Up | | | ■ | ■ | | | | | |
| Insufficient Take-Up | | | ■ | ■ | | | | | |
| Improper Matching | | | | | | ■ | | | |
| Mixed Old and New Belts | | | | | | ■ | | | |
| Non-Parallel Shafts | | | | | | ■ | | | |
| Different Manufacturers | | ■ | | | | ■ | | | |
| Belt/Pulley, Incompatible | ■ | | | | | ■ | | | |
| **Corrective Action** | | | | | | | | | |
| Lubricate properly | | | | | | | | | |
| Clean sheaves and belt | | | | | | | | | |
| Replace belts | | ■ | | | ■ | | | | |
| Provide protection | | | | | | | | | |
| Install properly | | | | | ■ | | | | |
| Check for belt length | | | | | | | | | |
| Remove obstruction | | | | | | | | | |
| Tension properly | | | | | ■ | ■ | ■ | ■ | ■ |
| Free sheaves | | | | | | | | | |
| Replace sheaves | ■ | ■ | | | | ■ | | | ■ |
| File smooth | | | | | | | | | |
| Redesign drive | | | | | | | | | |
| Operate properly | | | | | | | | | |
| Align drive | | ■ | | | | | | | ■ |
| Provide ventilation | | | | | | | | ■ | |
| Check for proper belt | | | ■ | ■ | | ■ | | | |
| Check machinery | | | ■ | ■ | | | | | |
| Use only new belts | | ■ | | | | | | | |
| Use single source | | ■ | | | | | | | |
| Check fit | | | | | | | | | |
| Replace pulleys | | | | | | | | | |

continued on page 50

## Problem (continued)

| | Broken Belts | Side Split | Ply Separation | Uneven Envelope Wear | Envelope Wear | Spin Burn | Gouges | Weathering or "Craze" Cracks | Loose Cover and Swell |
|---|---|---|---|---|---|---|---|---|---|
| **Possible Causes** | | | | | | | | | |
| Excessive Oil | | | | | | | | | ■ |
| Exposure to Elements | | | | | | | | ■ | |
| Pried Over Sheaves | ■ | | | | | | ■ | | |
| Contact with Obstruction | | | | | | | ■ | | |
| Insufficient Tension | | | | | | ■ | | | |
| Stalled Drive Sheaves | | | | | | ■ | | | |
| Constant Slippage | | | | | ■ | | | | |
| Rough Sheaves | | | | ■ | | | | | |
| Substandard Sheaves | | ■ | ■ | | | | | | |
| Excessive Tension | | | ■ | | | | | | |
| Shock Load | ■ | | | | | | | | |
| Foreign Material | ■ | | | | | | | | |
| Excessive Dust | | | | | ■ | | | | |
| Drive Misalignment | | | | ■ | | | | | |
| Worn Sheaves | | | | ■ | | | | | |
| Excessive Vibration | | | | | | | | | |
| High Ambient Temperature | | | | | | | | | |
| Drive Underbelted | | | | | | | | | |
| Damaged Tensile Member | ■ | | | | | | | | |
| Incorrect Belts | | | | | | | | | |
| Incorrect Drive Set-Up | | | | | | | | | |
| Insufficient Take-Up | | | | | | | | | |
| Improper Matching | | | | | | | | | |
| Mixed Old and New Belts | | | | | | | | | |
| Non-Parallel Shafts | | | | ■ | | | | | |
| Different Manufacturers | | | | | | | | | |
| Belt/Pulley, Incompatible | | | | | | | | | |
| **Corrective Action** | | | | | | | | | |
| Lubricate properly | | | | | | ■ | | | ■ |
| Clean sheaves and belt | | | | | | | | | ■ |
| Replace belts | | | | | | | | ■ | |
| Provide protection | ■ | | | | ■ | | | ■ | |
| Install properly | ■ | | ■ | | | | ■ | | |
| Check for belt length | | | | | | | ■ | | |
| Remove obstruction | | | | | | | ■ | | |
| Tension properly | | | | | ■ | ■ | | | |
| Free sheaves | | | | | | ■ | | | |
| Replace sheaves | | | ■ | ■ | | | | | |
| File smooth | | | | ■ | | | | | |
| Redesign drive | | ■ | | | | | | | |
| Operate properly | ■ | | | | | | | | |
| Align drive | | | | ■ | ■ | | | | |
| Provide ventilation | | | | | | | | | |
| Check for proper belt | ■ | | | | | | | | |
| Check machinery | | | | | | | | | |
| Use only new belts | | | | | | | | | |
| Use single source | | | | | | | | | |
| Check fit | | | | | | | | | |
| Replace pulleys | | | | | | | | | |

# Troubleshooting
## Synchronous Belts Systems

**Types of Failure**

| Possible Cause of Failure | Excessive Edge Wear | Excessive Tooth Wear | Uneven Tooth Wear | Apparent Belt Stretch | Cracks in Backing | Tooth Shear | Tensile Failure | Excessive Drive Noise | Tooth Skipping (Ratcheting) | Belt Tracking | Excessive Sprocket Wear | Excessive Drive Vibration |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Belt Hitting Obstruction | Primary Cause | Could Cause But Not Likely | Possible Cause | | | | | Could Cause But Not Likely | | | | Could Cause But Not Likely |
| Excessive Load | | Possible Cause | | | | Primary Cause | Primary Cause | | | | | |
| Belt Overtensioned | | Could Cause But Not Likely | | | | | Possible Cause | Possible Cause | | | Could Cause But Not Likely | Could Cause But Not Likely |
| Belt Undertensioned | | Primary Cause | Possible Cause | Could Cause But Not Likely | | | | Possible Cause | Primary Cause | | | Could Cause But Not Likely |
| Rough or Damaged Sprocket | | Possible Cause | Possible Cause | | | | | | | | | Could Cause But Not Likely |
| Misalignment | | Primary Cause | Primary Cause | | | Possible Cause | Primary Cause | | | Primary Cause | Could Cause But Not Likely | |
| Worn Sprocket | | Possible Cause | Possible Cause | | | Could Cause But Not Likely | | | Could Cause But Not Likely | | | |
| Sprocket Out of Tolerance | | Could Cause But Not Likely | Could Cause But Not Likely | | | Could Cause But Not Likely | | | Could Cause But Not Likely | Could Cause But Not Likely | Could Cause But Not Likely | Could Cause But Not Likely |
| Soft Sprocket Material | | | | | | | | | | | Primary Cause | |
| Debris in Sprocket or Drive | | Possible Cause | Could Cause But Not Likely | | | Could Cause But Not Likely | Possible Cause | | Possible Cause | Possible Cause | Primary Cause | Possible Cause |
| Center Distance Changed | | Could Cause But Not Likely | | Primary Cause | | | | | Possible Cause | | | |
| Weak Drive Structure | | Could Cause But Not Likely | | Primary Cause | | | | Could Cause But Not Likely | Possible Cause | Possible Cause | | Primary Cause |
| Excessive Low Temperature | | | | | Primary Cause | Could Cause But Not Likely | | | | | | |
| Excessive High Temperature | | | | Could Cause But Not Likely | Primary Cause | Could Cause But Not Likely | | | | | | Could Cause But Not Likely |
| Exposure to Oil, Solvents, Chemicals | | | | Possible Cause | Possible Cause | Could Cause But Not Likely | Could Cause But Not Likely | Could Cause But Not Likely | Could Cause But Not Likely | | Could Cause But Not Likely | |
| Sprocket Diameter Sub Minimum | | | | Could Cause But Not Likely | Primary Cause | | Possible Cause | | | | | |
| Back Side Idler | | | | | Possible Cause | | | | | | | |
| Shock Loading | | | | | Possible Cause | Primary Cause | Possible Cause | | Possible Cause | | | |
| Less than 6 Teeth in Mesh | | Could Cause But Not Likely | Could Cause But Not Likely | | | Possible Cause | | | | | | |
| Excessive Sprocket Runout | | | | | | | Could Cause But Not Likely | | | | | Possible Cause |
| Damage Due to Handling | | | | | | | Primary Cause | | | | Could Cause But Not Likely | |
| Vibrating Bearings/ Mountings | | | | | | | | | | | | Possible Cause |
| Center Distance Greater than 8x Small Sprocket Diameter | | | | | | | | | | Possible Cause | | |
| Sprocket Not Properly Balanced | | | | | | | | Possible Cause | | | | Primary Cause |
| Belt/Sprocket Incompatible | | Possible Cause | | | | Possible Cause | | Possible Cause | | | Possible Cause | Possible Cause |

Legend
Primary Cause · Possible Cause · Could Cause But Not Likely

continued on page 52

## Types of Failure (continued)

| Corrective Action | Excessive Edge Wear | Excessive Tooth Wear | Uneven Tooth Wear | Apparent Belt Stretch | Cracks in Backing | Tooth Shear | Tensile Failure | Excessive Drive Noise | Tooth Skipping (Ratcheting) | Belt Tracking | Excessive Sprocket Wear | Excessive Drive Vibration |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Remove obstruction or use idler to reroute belt | Primary Cause | Could Cause But Not Likely | Possible Cause | | | | | Could Cause But Not Likely | | | | Could Cause But Not Likely |
| Redesign drive | | Possible Cause | | | | Primary Cause | Primary Cause | | | | | |
| Use tensioning gauge to set proper tension | | Could Cause But Not Likely | | | | | Possible Cause | Possible Cause | | | Could Cause But Not Likely | Could Cause But Not Likely |
| Use tensioning gauge to set proper tension | | Primary Cause | Possible Cause | Could Cause But Not Likely | | | | Possible Cause | Primary Cause | | | Could Cause But Not Likely |
| Replace sprocket | | Possible Cause | Possible Cause | | | | | | | | | Could Cause But Not Likely |
| Align shafts and sprockets | | Primary Cause | Primary Cause | | | Possible Cause | Primary Cause | | | Primary Cause | Could Cause But Not Likely | |
| Replace sprocket | | Possible Cause | Possible Cause | | | Could Cause But Not Likely | | | Could Cause But Not Likely | | | |
| Replace sprocket, never attempt to remachine | | Could Cause But Not Likely | Could Cause But Not Likely | | | Could Cause But Not Likely | | | Could Cause But Not Likely | Could Cause But Not Likely | Could Cause But Not Likely | Could Cause But Not Likely |
| Use harder sprocket material | | | | | | | | | | | Primary Cause | |
| Shield drive | | Possible Cause | Could Cause But Not Likely | | | Could Cause But Not Likely | Possible Cause | | Possible Cause | Possible Cause | Primary Cause | Possible Cause |
| Check lock down bolts on motors and shafts | | Could Cause But Not Likely | | Primary Cause | | | | | Possible Cause | | | |
| Reinforce drive structure | | Could Cause But Not Likely | | Primary Cause | | | | Could Cause But Not Likely | Possible Cause | Possible Cause | | Primary Cause |
| Moderate temperature, especially at startup | | | | | Primary Cause | Could Cause But Not Likely | | | | | | |
| Moderate temperature, shield drive | | | | Could Cause But Not Likely | Primary Cause | Could Cause But Not Likely | | | | | | Could Cause But Not Likely |
| Shield drive, eliminate chemicals | | | | Possible Cause | Possible Cause | Could Cause But Not Likely | Could Cause But Not Likely | | Could Cause But Not Likely | | Could Cause But Not Likely | |
| Redesign drive to increased sprocket diameters | | | | Could Cause But Not Likely | Primary Cause | | Possible Cause | | | | | |
| Redesign to reduce wrap on backside idler | | | | | Possible Cause | | | | | | | |
| Eliminate shock loading or redesign drive to handle it | | | | | Possible Cause | Primary Cause | Possible Cause | | Possible Cause | | | |
| Increase wrap on sprocket | | Could Cause But Not Likely | Could Cause But Not Likely | | | Possible Cause | | | | | | |
| Replace sprocket | | | | | | | Could Cause But Not Likely | | | | | Possible Cause |
| Replace product, do not crimp belt or drop sprockets | | | | | | | Primary Cause | | | | Could Cause But Not Likely | |
| Replace bearings or reinforce mountings | | | | | | | | | | | | Possible Cause |
| Alignment is critical | | | | | | | | | | Possible Cause | | |
| Check sprocket balance | | | | | | | | Possible Cause | | | | Primary Cause |
| Check for proper belt | | Possible Cause | | | | Possible Cause | | Possible Cause | | | Possible Cause | Possible Cause |

Legend

Primary Cause | Possible Cause | Could Cause But Not Likely

# Synchronous Belts
# Tensioning Tables

Synchronous Belt Tensioning Tables

**Deflection Forces for Belt Tensioning (lb.)**

| Belt Type | 0-100 RPM New Belt | 0-100 RPM Used Belt | 101-1000 RPM New Belt | 101-1000 RPM Used Belt | 1000-Up RPM New Belt | 1000-Up RPM Used Belt |
|---|---|---|---|---|---|---|
| **SilentSync®** | | | | | | |
| Yellow | 15 | 11 | 12 | 8 | 9 | 7 |
| White | 30 | 21 | 24 | 17 | 19 | 13 |
| Purple | 60 | 43 | 47 | 34 | 38 | 27 |
| Blue | 54 | 38 | 44 | 31 | 38 | 27 |
| Green | 80 | 57 | 66 | 47 | 57 | 41 |
| Orange | 107 | 76 | 88 | 63 | 76 | 55 |
| Red | 161 | 115 | 131 | 94 | 115 | 82 |
| **Falcon Pd®** | | | | | | |
| 8GTR 12 | 24 | 17 | 14 | 10 | 9 | 7 |
| 8GTR 21 | 42 | 30 | 25 | 18 | 16 | 12 |
| 8GTR 36 | 72 | 51 | 42 | 30 | 27 | 21 |
| 8GTR 62 | 124 | 88 | 72 | 52 | 47 | 36 |
| 14GTR 20 | 38 | 29 | 31 | 23 | 28 | 21 |
| 14GTR 37 | 70 | 54 | 57 | 43 | 52 | 39 |
| 14GTR 68 | 129 | 99 | 105 | 78 | 95 | 71 |
| 14GTR 90 | 171 | 131 | 140 | 104 | 126 | 95 |
| 14GTR 125 | 238 | 181 | 194 | 144 | 175 | 131 |
| **Blackhawk Pd®** | | | | | | |
| 8MBH12 | 12 | 9 | 9 | 7 | 7 | 5 |
| 8MBH 22 | 23 | 17 | 16 | 12 | 13 | 10 |
| 8MBH 35 | 36 | 26 | 26 | 19 | 21 | 16 |
| 8MBH 60 | 62 | 45 | 45 | 33 | 36 | 27 |
| 14MBH 20 | 36 | 26 | 27 | 20 | 23 | 17 |
| 14MBH 42 | 76 | 55 | 57 | 42 | 49 | 36 |
| 14MBH 65 | 117 | 85 | 89 | 65 | 76 | 55 |
| 14MBH 90 | 162 | 118 | 123 | 90 | 105 | 77 |
| 14MBH 120 | 217 | 157 | 164 | 119 | 139 | 102 |
| **Hawk Pd®** | | | | | | |
| 8M 20 | 15 | 11 | 13 | 10 | 12 | 9 |
| 8M 30 | 23 | 17 | 20 | 15 | 19 | 14 |
| 8M 50 | 39 | 29 | 35 | 26 | 32 | 24 |
| 8M 85 | 69 | 50 | 61 | 45 | 56 | 41 |
| 14M 40 | 47 | 34 | 38 | 28 | 32 | 24 |
| 14M 55 | 70 | 51 | 56 | 41 | 48 | 35 |
| 14M 85 | 116 | 84 | 93 | 68 | 79 | 58 |
| 14M 115 | 162 | 118 | 130 | 95 | 110 | 80 |
| 14M 170 | 249 | 181 | 201 | 146 | 171 | 125 |

1. The table deflection forces and strand tensions are typically at maximum values to cover the broad range of loads, rpm and pulley combinations for all possible drives.
2. For drives where hub loads are critical, high speed drives or other drives with special circumstances, the belt deflection force and strand installation tension should be calculated by using formulas found in existing engineering manuals or use the MaximizerPro™ Drive Selection Analysis Program.

Synchronous Belts Tensioning Tables

**Belt Strand Tension (lb.)**

| Belt Type | 0-100 RPM New Belt | 0-100 RPM Used Belt | 101-1000 RPM New Belt | 101-1000 RPM Used Belt | 1000-Up RPM New Belt | 1000-Up RPM Used Belt | Belt Weight (kg/m) |
|---|---|---|---|---|---|---|---|
| **SilentSync®** | | | | | | | |
| Yellow | 224 | 160 | 176 | 112 | 128 | 96 | 0.073 |
| White | 449 | 305 | 353 | 241 | 273 | 177 | 0.147 |
| Purple | 897 | 625 | 689 | 481 | 545 | 369 | 0.293 |
| Blue | 817 | 561 | 657 | 449 | 561 | 385 | 0.261 |
| Green | 1210 | 842 | 986 | 682 | 842 | 586 | 0.392 |
| Orange | 1618 | 1122 | 1314 | 914 | 1122 | 786 | 0.523 |
| Red | 2436 | 1700 | 1956 | 1364 | 1700 | 1172 | 0.784 |
| **Falcon Pd®** | | | | | | | |
| 8GTR 12 | 370 | 258 | 210 | 146 | 130 | 98 | 0.056 |
| 8GTR 21 | 648 | 456 | 376 | 264 | 232 | 168 | 0.093 |
| 8GTR 36 | 1111 | 775 | 631 | 439 | 391 | 295 | 0.167 |
| 8GTR 62 | 1913 | 1337 | 1081 | 761 | 681 | 505 | 0.288 |
| 14GTR 20 | 571 | 427 | 459 | 331 | 411 | 299 | 0.158 |
| 14GTR 37 | 1052 | 796 | 844 | 620 | 764 | 556 | 0.292 |
| 14GTR 68 | 1939 | 1459 | 1555 | 1123 | 1395 | 1011 | 0.537 |
| 14GTR 90 | 2570 | 1930 | 2074 | 1498 | 1850 | 1354 | 0.711 |
| 14GTR 125 | 3578 | 2666 | 2874 | 2074 | 2570 | 1866 | 0.987 |
| **Blackhawk Pd®** | | | | | | | |
| 8MBH12 | 179 | 131 | 131 | 99 | 99 | 67 | 0.057 |
| 8MBH 22 | 345 | 249 | 233 | 169 | 185 | 137 | 0.104 |
| BMBH 35 | 539 | 379 | 379 | 267 | 299 | 219 | 0.165 |
| 8MBH 60 | 928 | 656 | 656 | 464 | 512 | 368 | 0.283 |
| 14MBH 20 | 553 | 393 | 409 | 297 | 345 | 249 | 0.157 |
| 14MBH 42 | 1167 | 831 | 863 | 623 | 735 | 527 | 0.330 |
| 14MBH 65 | 1796 | 1284 | 1348 | 964 | 1140 | 804 | 0.510 |
| 14MBH 90 | 2487 | 1783 | 1863 | 1335 | 1575 | 1127 | 0.706 |
| 14MBH 120 | 3332 | 2372 | 2484 | 1764 | 2084 | 1492 | 0.941 |
| **Hawk Pd®** | | | | | | | |
| 8M 20 | 226 | 162 | 194 | 146 | 178 | 130 | 0.118 |
| 8M 30 | 347 | 251 | 299 | 219 | 283 | 203 | 0.176 |
| BM 50 | 590 | 430 | 526 | 382 | 478 | 350 | 0.289 |
| 8M 85 | 1046 | 742 | 918 | 662 | 838 | 598 | 0.507 |
| 14M 40 | 715 | 507 | 571 | 411 | 475 | 347 | 0.438 |
| 14M 55 | 1069 | 765 | 845 | 605 | 717 | 509 | 0.583 |
| 14M 85 | 1778 | 1266 | 1410 | 1010 | 1186 | 850 | 0.913 |
| 14M 115 | 2486 | 1782 | 1974 | 1414 | 1654 | 1174 | 1.233 |
| 14M 170 | 3827 | 2739 | 3059 | 2179 | 2579 | 1843 | 1.835 |

3. Consult the TensionRite® Belt Frequency Meter manual for detailed information on using the frequency based tension gauge.
4. Continental ContiTechoffers three different levels of tension gauges to aid you in properly tensioning your power transmission belts. See your Sales Representative or Distributor for more information on tensioning gauges.

# Wedge TLP™ V-Belts
## Tensioning Tables

Deflection Forces for Belt Tensioning (lb.)

| Smallest Sheave Diameter Range | RPM Range | New Belt | Used Belt |
|---|---|---|---|
| **3VT – Belt Type** | | | |
| 2.65-3.65 | 1000-2500 | 5.4 | 4.6 |
| 2.65-3.65 | 2501-4000 | 4.7 | 4.0 |
| 4.12-6.9 | 1000-2500 | 7.6 | 6.3 |
| 4.12-6.9 | 2501-4000 | 6.9 | 5.8 |
| **5VT – Belt Type** | | | |
| 7.1-10.9 | 500-1740 | 22.1 | 18.5 |
| 7.1-10.9 | 1741-3000 | 19.6 | 16.4 |
| 11.8-16 | 500-1740 | 25.8 | 21.6 |
| 11.8-16 | 1741-3000 | 23.2 | 19.4 |
| **8VT – Belt Type** | | | |
| 12.5-17.0 | 200-850 | 51.6 | 43.1 |
| 12.5-17.0 | 851-1500 | 42.2 | 35.3 |
| 18.0-22.4 | 200-850 | 61.4 | 51.3 |
| 18.0-22.4 | 851-1500 | 55.2 | 46.1 |

Belt Strand Tension (lb.)

| New Belt | Used Belt | Belt Weight (kg/meter) |
|---|---|---|
| **3VT – Belt Type** | | |
| 83.8 | 69.8 | 3VT=0.082 |
| 72.4 | 60.3 | |
| 118 | 98.3 | |
| 107 | 89.2 | |
| **5VT – Belt Type** | | |
| 348.2 | 290.2 | 5VT=0.212 |
| 308.9 | 257.4 | |
| 408.2 | 340.2 | |
| 366 | 305.0 | |
| **8VT – Belt Type** | | |
| 813.6 | 678.0 | 8VT=0.565 |
| 662.7 | 552.2 | |
| 969.7 | 808.1 | |
| 871.1 | 725.9 | |

1. The table deflection forces and strand tensions are typically at maximum values to cover the broad range of loads, rpm and pulley combinations for all possible drives.
2. For drives where hub loads are critical, high speed drives or other drives with special circumstances, the belt deflection force and strand installation tension should be calculated by using formulas found in existing engineering manuals or use the MaximizerPro™ Drive Selection Analysis Program.
3. Consult the TensionRite® Belt Frequency Meter manual for detailed information on using the frequency based tension gauge.
4. Continental ContiTech offers three different levels of tension gauges to aid you in properly tensioning your power transmission belts. See your Sales Representative or Distributor for more information on tensioning gauges.

# **V-Belts** Tensioning Tables

Deflection Forces for Belt Tensioning (lb.)

| Smallest Sheave Diameter Range | RPM Range | Noncogged Single, Torque Team®* & Torque Team Plus®* Belts – New Belt | Noncogged Single, Torque Team®* & Torque Team Plus®* Belts – Used Belt | Cogged Single & Torque Team®* – New Belt | Cogged Single & Torque Team®* – Used Belt |
|---|---|---|---|---|---|
| **A, AX Cross Section** | | | | | |
| 3.0-3.6 | 1000-2500 | 5.5 | 3.7 | 6.1 | 4.1 |
| | 2501-4000 | 4.2 | 2.8 | 5.0 | 3.4 |
| 3.8-4.8 | 1000-2500 | 6.8 | 4.5 | 7.4 | 5.0 |
| | 2501-4000 | 5.7 | 3.8 | 6.4 | 4.3 |
| 5.0-7.0 | 1000-2500 | 8.0 | 5.4 | 9.4 | 5.7 |
| | 2501-4000 | 7.0 | 4.7 | 7.6 | 5.1 |
| **B, BX Cross Section** | | | | | |
| 3.4-4.2 | 860-2500 | N/A | N/A | 7.2 | 4.9 |
| | 2501-4000 | N/A | N/A | 6.2 | 4.2 |
| 4.4-5.6 | 860-2500 | 7.9 | 5.3 | 10.5 | 7.1 |
| | 2501-4000 | 6.7 | 4.5 | 9.1 | 6.2 |
| 5.8-8.6 | 860-2500 | 9.4 | 6.3 | 12.6 | 8.5 |
| | 2501-4000 | 8.2 | 5.5 | 10.9 | 7.3 |
| **C, CX Cross Section** | | | | | |
| 7.0-9.0 | 500-1740 | 17.0 | 11.5 | 21.8 | 14.7 |
| | 1741-3000 | 13.8 | 9.4 | 17.5 | 11.9 |
| 9.5-16.0 | 500-1740 | 21.0 | 14.1 | 23.5 | 15.9 |
| | 1741-3000 | 18.5 | 12.5 | 21.6 | 14.6 |
| **D Cross Section** | | | | | |
| 12.0-16.0 | 200-850 | 37.0 | 24.9 | N/A | N/A |
| | 851-1500 | 31.3 | 21.2 | N/A | N/A |
| 18.0-20.0 | 200-850 | 45.2 | 30.4 | N/A | N/A |
| | 851-1500 | 38.0 | 25.6 | N/A | N/A |
| **3V, 3VX, XPZ Cross Section** | | | | | |
| 2.2-2.4 | 1000-2500 | N/A | N/A | 4.9 | 3.3 |
| | 2501-4000 | N/A | N/A | 4.3 | 2.9 |
| 2.65-3.65 | 1000-2500 | 5.1 | 3.6 | 6.2 | 4.2 |
| | 2501-4000 | 4.4 | 3.0 | 5.6 | 3.8 |
| 4.12-6.90 | 1000-2500 | 7.3 | 4.9 | 7.9 | 5.3 |
| | 2501-4000 | 6.6 | 4.4 | 7.3 | 4.9 |
| **SPA, XPA Cross Section** | | | | | |
| 3.0-4.1 | 1000-2500 | N/A | N/A | 9.0 | 6.1 |
| | 2501-4000 | N/A | N/A | 7.9 | 5.2 |
| 4.2-5.7 | 1000-2500 | 10.1 | 6.7 | 12.4 | 8.3 |
| | 2501-4000 | 8.3 | 5.6 | 11.2 | 7.4 |
| 5.7-10.1 | 1000-2500 | 14.6 | 9.7 | 15.3 | 10.1 |
| | 2501-4000 | 12.6 | 8.5 | 13.7 | 9.2 |

Deflection Forces for Belt Tensioning (lb.)

| Smallest Sheave Diameter Range | RPM Range | Noncogged Single, Torque Team®* & Torque Team Plus®* Belts – New Belt | Noncogged Single, Torque Team®* & Torque Team Plus®* Belts – Used Belt | Cogged Single & Torque Team®* – New Belt | Cogged Single & Torque Team®* – Used Belt |
|---|---|---|---|---|---|
| **5V, 5VX, SPB, XPB Cross Section** | | | | | |
| 4.4-6.7 | 500-1749 | N/A | N/A | 15.2 | 10.2 |
| | 1750-3000 | N/A | N/A | 13.2 | 8.8 |
| | 3001-4000 | N/A | N/A | 8.5 | 5.6 |
| 7.1-10.9 | 500-1740 | 18.9 | 12.7 | 22.1 | 14.8 |
| | 1741-3000 | 16.7 | 11.2 | 20.1 | 13.7 |
| 11.8-16.0 | 500-1740 | 23.4 | 15.5 | 25.5 | 17.1 |
| | 1741-3000 | 21.8 | 14.6 | 25.0 | 16.8 |
| **SPC, XPC Cross Section** | | | | | |
| 8.3-14.3 | 500-1000 | 31.0 | 20.7 | 33.3 | 22.3 |
| | 1000-1750 | 28.6 | 19.1 | 32.4 | 21.6 |
| 14.4-20.1 | 500-1000 | 39.3 | 26.3 | 41.8 | 27.9 |
| | 1000-1750 | 37.5 | 25.2 | 45.6 | 30.3 |
| **8V, 8VX Cross Section** | | | | | |
| 12.5-17.0 | 200-850 | 49.3 | 33.0 | N/A | N/A |
| | 851-1500 | 39.9 | 26.8 | N/A | N/A |
| 18.0-22.4 | 200-850 | 59.2 | 39.6 | N/A | N/A |
| | 851-1500 | 52.7 | 35.3 | N/A | N/A |
| **5VF Cross Section** | | | | | |
| 7.1-10.9 | 200-700 | 30.9 | 21.1 | N/A | N/A |
| | 701-1250 | 26.3 | 18.0 | N/A | N/A |
| | 1251-1900 | 23.4 | 16.7 | N/A | N/A |
| | 1901-3000 | 23.0 | 15.8 | N/A | N/A |
| 11.8-16.0 | 200-700 | 39.5 | 26.8 | N/A | N/A |
| | 701-1250 | 34.7 | 23.5 | N/A | N/A |
| | 1251-2100 | 33.3 | 22.7 | N/A | N/A |
| **8VF Cross Section** | | | | | |
| 12.0-20.0 | 200-500 | 65.8 | 44.7 | N/A | N/A |
| | 501-850 | 56.6 | 38.5 | N/A | N/A |
| | 851-1150 | 51.6 | 35.2 | N/A | N/A |
| | 1151-1650 | 49.0 | 33.5 | N/A | N/A |
| 21.2-25.0 | 200-500 | 97.6 | 65.9 | N/A | N/A |
| | 501-850 | 90.6 | 61.2 | N/A | N/A |
| | 851-1200 | 84.3 | 57.0 | N/A | N/A |

*Multiply table values by the number of Torque Team® ribs to achieve recommended tensioning value.

1. The table deflection forces and strand tensions are typically at maximum values to cover the broad range of loads, rpm and pulley combinations for all possible drives.
2. For drives where hub loads are critical, high speed drives or other drives with special circumstances, the belt deflection force and strand installation tension should be calculated by using formulas found in existing engineering manuals or use the MaximizerPro™ Drive Selection Analysis Program.
3. Consult the TensionRite® Belt Frequency Meter manual for detailed information on using the frequency based tension gauge.
4. Continental ContiTech offers three different levels of tension gauges to aid you in properly tensioning your power transmission belts. See your Sales Representative or Distributor for more information on tensioning gauges.

Belt Strand Tension (lb.)

| | | Noncogged Single, Torque Team®* & Torque Team Plus®* Belts | | Cogged Single & Torque Team®* | | Belt Weight (kg/meter) |
|---|---|---|---|---|---|---|
| **Smallest Sheave Diameter Range** | **RPM Range** | **New Belt** | **Used Belt** | **New Belt** | **Used Belt** | |
| **A, AX Cross Section** | | | | | | |
| 3.0-3.6 | 1000-2500 | 84 | 56 | 94 | 62 | |
| | 2501-4000 | 64 | 41 | 76 | 51 | A=0.100 |
| 3.8-4.8 | 1000-2500 | 105 | 68 | 115 | 76 | |
| | 2501-4000 | 88 | 57 | 99 | 65 | |
| 5.0-7.0 | 1000-2500 | 124 | 83 | 147 | 88 | AX=0.930 |
| | 2501-4000 | 108 | 72 | 118 | 78 | |
| **B, BX Cross Section** | | | | | | |
| 3.4-4.2 | 860-2500 | N/A | N/A | 110.3 | 73.5 | B=0.168 |
| | 2501-4000 | N/A | N/A | 94.3 | 62.3 | Torque Team® |
| 4.4-5.6 | 860-2500 | 121.5 | 79.9 | 163.1 | 108.7 | B= 0.216x # ribs |
| | 2501-4000 | 102.3 | 67.1 | 140.7 | 94.3 | BX=0.161 |
| 5.8-8.6 | 860-2500 | 145.5 | 95.9 | 196.7 | 131.1 | Torque Team® |
| | 2501-4000 | 126.3 | 83.1 | 169.5 | 111.9 | BX=0.211 x # ribs |
| **C, CX Cross Section** | | | | | | |
| 7.0-9.0 | 500-1740 | 264.8 | 176.6 | 341.4 | 227.8 | C=0.296 |
| | 1741-3000 | 213.4 | 143.0 | 272.6 | 183.0 | Torque Team® C=0.367 x # ribs |
| 9.5-16.0 | 500-1740 | 328.6 | 218.2 | 368.6 | 247.0 | CX=0.282 |
| | 1741-3000 | 288.6 | 192.6 | 338.2 | 226.2 | Torque Team® CX=0.344 x # ribs |
| **D Cross Section** | | | | | | |
| 12.0-16.0 | 200-850 | 581.9 | 388.3 | N/A | N/A | D=0.671 |
| | 851-1500 | 490.7 | 329.1 | N/A | N/A | |
| 18.0-20.0 | 200-850 | 713.1 | 476.3 | N/A | N/A | Torque Team® |
| | 851-1500 | 597.9 | 399.5 | N/A | N/A | D=0.755 x # ribs |
| **3V, 3VX, XPZ Cross Section** | | | | | | |
| 2.2-2.4 | 1000-2500 | N/A | N/A | 75.9 | 50.3 | 3V=0.076 |
| | 2501-4000 | N/A | N/A | 66.3 | 43.9 | Torque Team® |
| 2.65-3.65 | 1000-2500 | 79.1 | 55.1 | 96.7 | 64.7 | 3V=0.094 x # ribs |
| | 2501-4000 | 67.9 | 45.5 | 87.1 | 58.3 | 3VX, XPZ = 0.068 |
| 4.12-6.90 | 1000-2500 | 114.3 | 75.9 | 123.9 | 82.3 | Torque Team® |
| | 2501-4000 | 103.1 | 67.9 | 114.3 | 75.9 | 3VX=0.096 x # ribs |
| **SPA, XPA Cross Section** | | | | | | |
| 3.0-4.1 | 1000-2500 | N/A | N/A | 140.3 | 93.9 | |
| | 2501-4000 | N/A | N/A | 122.7 | 79.5 | SPA=0.128 |
| 4.2-5.7 | 1000-2500 | 157.9 | 103.5 | 194.7 | 129.1 | |
| | 2501-4000 | 129.1 | 85.9 | 175.5 | 114.7 | |
| 5.7-10.1 | 1000-2500 | 229.9 | 151.5 | 241.1 | 157.9 | XPA= 0.114 |
| | 2501-4000 | 197.9 | 132.3 | 215.5 | 143.5 | |

# **V-Belts** Tensioning Tables

Belt Strand Tension (lb.)

| | | Noncogged Single, Torque Team®* & Torque Team Plus®* Belts | | Cogged Single & Torque Team®* | | Belt Weight (kg/meter) |
|---|---|---|---|---|---|---|
| **Smallest Sheave Diameter Range** | **RPM Range** | **New Belt** | **Used Belt** | **New Belt** | **Used Belt** | |
| **5V, 5VX, SPB, XPB Cross Section** | | | | | | |
| 4.4-6.7 | 500-1749 | N/A | N/A | 238.8 | 158.8 | 5V, SPB= 0.186 |
| | 1750-3000 | N/A | N/A | 206.8 | 136.4 | Torque Team® 5V=0.243 x # ribs |
| | 3001-4000 | N/A | N/A | 131.6 | 85.2 | |
| 7.1-10.9 | 500-1740 | 298.0 | 198.8 | 349.2 | 232.4 | 5VX, XPB=0.149 |
| | 1741-3000 | 262.8 | 174.8 | 317.2 | 214.8 | |
| 11.8-16.0 | 500-1740 | 370.0 | 243.6 | 403.6 | 269.2 | Torque Team® 5VX=0.217 x # ribs |
| | 1741-3000 | 344.4 | 229.2 | 395.6 | 264.4 | |
| **SPC. XPC Cross Section** | | | | | | |
| 8.3-14.3 | 500-1000 | 488.6 | 323.8 | 525.4 | 349.4 | SPC=0.372 |
| | 1000-1750 | 450.2 | 298.2 | 511.0 | 338.2 | |
| 14.4-20.1 | 500-1000 | 621.4 | 413.4 | 661.4 | 439.0 | XPC=0.289 |
| | 1000-1750 | 592.6 | 395.8 | 722.2 | 477.4 | |
| **8V, 8VX Cross Section** | | | | | | |
| 12.5-17.0 | 200-850 | 779.3 | 518.5 | N/A | N/A | 8V=0.495 |
| | 851-1500 | 628.9 | 419.3 | N/A | N/A | Torque Team® |
| 18.0-22.4 | 200-850 | 937.7 | 624.1 | N/A | N/A | BV=0.546 x # ribs |
| | 851-1500 | 833.7 | 555.3 | N/A | N/A | 8VX= 0.486 |
| **5VF Cross Section** | | | | | | |
| 7.1-10.9 | 200-700 | 467.1 | 310.3 | N/A | N/A | Torque Team® 5VF=0.242 x # ribs |
| | 701-1250 | 393.5 | 260.7 | N/A | N/A | |
| | 1251-1900 | 347.1 | 239.9 | N/A | N/A | |
| | 1901-3000 | 340.7 | 225.5 | N/A | N/A | |
| 11.8-16.0 | 200-700 | 604.7 | 401.5 | N/A | N/A | |
| | 701-1250 | 527.9 | 348.7 | N/A | N/A | |
| | 1251-2100 | 505.5 | 335.9 | N/A | N/A | |
| **8VF Cross Section** | | | | | | |
| 12.5-20.0 | 200-500 | 1008.4 | 670.8 | N/A | N/A | Torque Team® 8VF=0.603 x # ribs |
| | 501-850 | 861.2 | 571.6 | N/A | N/A | |
| | 851-1150 | 781.2 | 518.8 | N/A | N/A | |
| | 1151-1650 | 739.6 | 491.6 | N/A | N/A | |
| 21.2-25.0 | 200-500 | 1517.2 | 1010.0 | N/A | N/A | |
| | 501-850 | 1405.2 | 934.8 | N/A | N/A | |
| | 851-1200 | 1304.4 | 867.6 | N/A | N/A | |

*Multiply table values by the number of Torque Team® ribs to achieve recommended tensioning value.

1. The table deflection forces and strand tensions are typically at maximum values to cover the broad range of loads, rpm and pulley combinations for all possible drives.
2. For drives where hub loads are critical, high speed drives or other drives with special circumstances, the belt deflection force and strand installation tension should be calculated by using formulas found in existing engineering manuals or use the MaximizerPro™ Drive Selection Analysis Program.
3. Consult the TensionRite® Belt Frequency Meter manual for detailed information on using the frequency-based tension gauge.
4. Continental ContiTech offers three different levels of tension gauges to aid in properly tensioning power transmission belts. See your Sales Representative or Distributor for more information on tensioning gauges.