Belt Tensioning

Challenge 'V' and Wedge belts are manufactured to ensure precise length and to stay matched during storage and on the drive for many years. This also ensures that each belt, when correctly tensioned, will take the correct share of the load to be transmitted, thus helping to achieve maximum life for the drive.

We recommend using the CHALLENGE Belt Tensioning Gauge to obtain the correct tension for the drive thus ensuring optimum life from the belts. This method has been verified by successful drives globally

Method of belt tensioning using the CHALLENGE Belt Tension Gauge

1] Install the belts to be a snug fit around the pulleys

2] Rotate the pulleys a few revolutions to allow the belts to sit correctly in the pulley grooves. Be careful not to trap fingers !

3] Calculate the deflection in mm on a basis of 16 mm per metre of centre distance

4] Set the lower black rubber ring on the large tube to the deflection required in mm

5] Set the upper ring (on the metal rod) against the top of the large tube

6] Place the belt tension indicator on top of the belt at the middle of the centre distance and apply a force at right angles to the belt, deflecting it to the point where the lower rubber ring is level with the top of an adjacent belt.

7] Read off the tensioning force value indicated by the bottom edge of the upper rubber ring

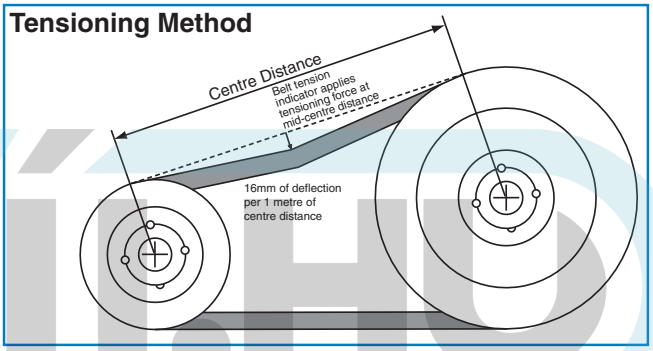
8] Compare this force to the value in the table and adjust the tension until the correct value is attained

9] A new drive should be tensioned to the 1.3 x tensioning force to allow for belt tension decay during the initial bedding in period. After approximately 30 minutes of running and thereafter, the tension should be set to the basic tensioning value

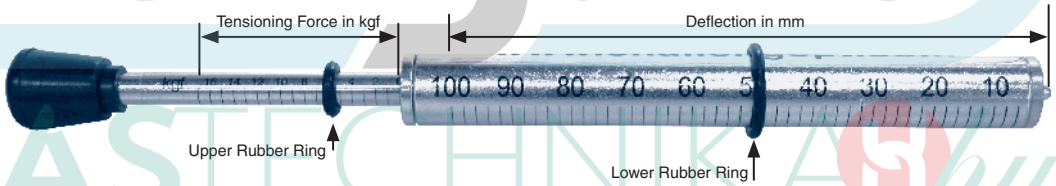
10] For a single belt drive, use a straight edge across the two pulleys to act as a reference point and apply the CHALLENGE Belt Tension Gauge as per point 6.

11] If a CHALLENGE Belt Tension Gauge is not available, using a spring balance and rule is acceptable.

Tensioning Method



Belt Tension Indicator



Tensioning forces

Belt section	Tensioning force to deflect belt 16 mm per metre of centre distance		
	Small pulley diameter (mm)	Basic tensioning forces (kgf)	1.3 x tensioning forces (kgf)
SPZ	56 – 71 75 – 90 90 – 125 125 +	1.6 1.8 2.0 2.1	2.1 2.3 2.6 2.7
SPA	63 – 100 106 – 140 150 – 200 200 +	2.2 3.0 3.7 4.0	2.8 3.9 4.8 5.2
SPB	100 – 160 170 – 224 236 – 355 355 +	4.0 5.1 6.3 6.6	5.2 6.6 8.2 8.6
SPC	200 – 250 265 – 355 375 +	7.1 9.4 12.0	9.2 12.2 15.6
Z	56 – 100	0.5 – 0.8	0.6 – 1.0
A	80 – 140	1.0 – 1.5	1.3 – 1.9
B	125 – 200	2.0 – 3.1	2.6 – 4.0
C	200 – 400	4.1 – 6.1	5.5 – 7.9
D	355 – 600	7.1 – 10.7	9.2 – 13.9

The tensioning forces in the table above are representative for a correctly designed drive.
A precise tensioning force for a particular drive can be calculated from basic principles if desired.
Contact Challenge for details

Technical Information

Design Data Required For Belt Drives

1) Type of prime driver
2) Starting arrangement: 'Soft' Start
   'Heavy' Start
3) Speed of prime driver in rev/min
4) Power rating of prime driver in kW
5) Type of driven machine
6) Speed of driven machine in rev/min
7) Absorbed power of the driven machine in kW
8) Operating hours / day
9) Shaft diameters of both driver and driven machines
10) Drive centre distance. Is this fixed or does it have adjustment?
11) Are there any space constraints
12) Are the any environmental issues such as temperature, water, oil etc.

Belt Length Calculation

$$\text{Length (L)} = 2C + \frac{(D-d)^2}{4C} + 1.57\,(D+d)$$

where

L	=	Pitch length of belt in millimetres.
C	=	Centre distance in millimetres.
D	=	Pitch diam. of large pulley in millimetres.
d	=	Pitch diam. of small pulley in millimetres.

Centre distance, given pulley diameters and belt length:

$$\text{Centre Distance (C)} = A + \sqrt{A^2 - B}$$

where

$$A = \frac{L}{4} - 0.3925\,(D + d) \quad \text{and} \quad B = \frac{(D - d)^2}{8}$$

Belt Speed Calculation

$$S = \frac{d \times n}{19100} \quad \text{m/s}$$

where S = belt speed in metres per second (m/s)
d = pulley pitch diameter in mm
n = rotational speed of the same pulley in rev/min

Installation and Maintenance of 'V' and Wedge Belt Drives

Modern 'V' and Wedge belt drives are highly efficient, but efficiency and reliability are only maintained if belts are correctly installed, tensioned and maintained.

Particular care must be made in maintaining the correct tension. Incorrectly tensioned drives are the overwhelming cause of premature drive failure.

The correct use of a tension indicator will ensure optimum life is achieved from your drive.

Installation

Pulleys

Inspect pulley grooves for wear and ensure there are no ridges, score marks, rust or pitting and that the groove has been machined to the correct International standard.

Alignment

To avoid premature belt wear, correct pulley alignment is essential. Beware of using straight edges that may not be straight! A piece of string stretched tight is more reliable. Pulley misalignment must not be visible.

If a laser alignment device is available, it should be used.

Belt installation

The drive centre distance should be reduced (normally by adjusting the prime mover position) so that the belts can be fitted easily into the pulley grooves. The belts must never be forced into the grooves as this poor practice could rupture the load carrying cords causing early drive failure.

Tensioning

See page 170 for the correct method of tensioning Challenge 'V' and Wedge belts.

Guards

When guards are fitted to drives, it is essential they allow the free movement of air in order to avoid unnecessary heat build up.

Preferably, guards should be of wire mesh design.

Tensioning pulleys (sometimes called jockey pulleys)

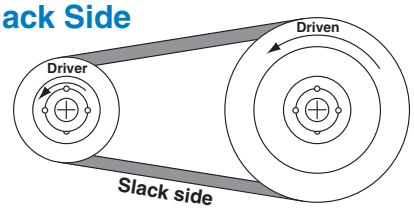
If tensioning pulleys are to be used, follow the basic rules below :-

'V'-Belts – a flat pulley bearing on the outside of the drive is acceptable. The pulley should be fitted to bear on the slack side of the drive near to the small pulley. If a grooved pulley is used on the inside of the drive, it should be positioned near to the large pulley.

Wedge Belts – the tensioning pulley must be grooved and fitted onto the inside of the slack side of the drive near to the large pulley.

The tensioning pulley diameter must be at least the diameter of the small pulley on the drive.

Belt Drive Slack Side



CHALLENGE

Trouble Shooting

Trouble Shooting

Problem	Probable Cause: Excessive Oil	Exposure to Elements	Lever Over Pulley	Contact with Obstruction	Insufficient Tension	Stalled Driven Pulley	Constant Slippage	Rough Pulley	Sub Standard Pulley	Excessive Tension	Shock Load	Foreign Material	Excessive Dust	Drive Misalignment	Worn Pulleys	Excessive Vibration	High Ambient Temperature	Incorrect design	Damaged Tensile Member	Incorrect Belts	Incorrect Drive Set up	Insufficient Take-up	Improper Matching	Mixed Old & New Belts	Non Parallel Shafts	Different Manufacturers	Belt/Pulley Incompatible	Solutions: Clean Pulleys & Belts	Replace Belts	Provide Protection	Install Properly	Check Belt Length	Remove Obstruction	Tension Properly	Replace Pulleys	File Smooth	Redesign Drive	Align Drive	Provide Ventilation	Check for Proper Belt	Check Machinery	Use only New Belts	Use single Source	Check Fit
Loose Cover & Swell	*																											*														
Weathering or Cracks		*																										*														
Gouges			*																									*			*											
Spin Burn				*						*			*											*								*										
Envelope Wear					*						*													*					*				*									
Uneven Envelope Wear						*		*																									*									
Ply Separation							*		*																								*									
Side Split								*																									*									
Broken Belts			*						*		*				*																											
Belt Turn Over					*									*	*																											
Hardening & Premature Cracking																*																											
Belt Squeal					*					*			*											*																		
Excessive Stretch														*																												
Excessive Vibration							*																																		
Belts too Long at Installation													*											*																		
Belts too Short at Installation																																										
Mismatched Belts at Installation													*	*																													

Question to Ask on "Belt Failures"

1) Ask for the above information. Check the design, using this information?
2) Were the belts tensioned correctly?
3) Has the alignment of the drive been checked?
4) Have the pulleys been checked for wear?
5) Ensure that the belts were not "levered" onto the pulley.
6) Compare the belts visual condition against the under mentioned "Trouble Shooting" table in "problems" and decide on the best probable cause/s.