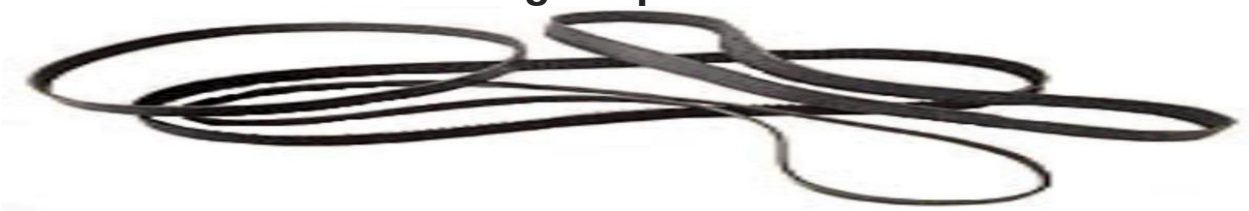
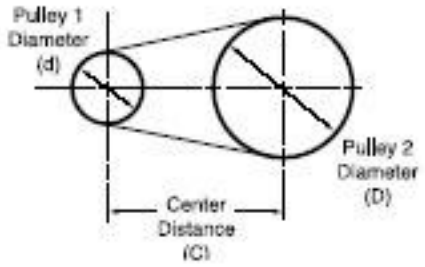
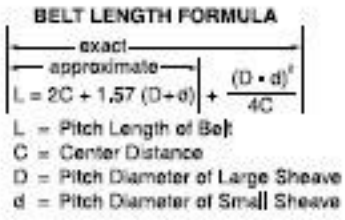
Ensuring Proper Fan-Belt



Fan belt is the traditional term for what today is called a drive belt. Drive belts are made of reinforced, high-tensile strength cords and synthetic rubber. Belts come in two different types: The traditional V-belt (cross-section of belts has a V-shape for V-shaped pulleys) and the serpentine belt (also called Poly-V, Poly-Rib, Multi-Rib, and Micro-V belt), which uses multiple Vs for more positive contact with its matching pulleys.

Belts are NOT measured by diameter nor folding the belt in half. The most accurate way to measure the circumference of a belt is with a measuring tool or using a cloth tape measure (Not a steel tape measure). An additional option is to wrap a small diameter string/rope around the belt, then measure the string length. Keep in mind belts do stretch and unfortunately there is no specific given value that a belt stretches. Follow the belt length formula below





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A properly tensioned belt ensures smooth operation and extends the service life of fans and motors. An improper tension on a belt can causes problems like noise, vibration, poor performance and shortening the fan-motor life span. Common methods of measuring belt tension are by deflection, frequency, and the use of a tension-finding device.

Understanding Proper Belt Tension

The proper tension of a V-belt drive is the lowest tension at which the belt will not slip at peak-load conditions. For applications without a variable-frequency drive (VFD) or starter, a belt must be tensioned to handle increased motor torque during startup. For slow-start VFD applications, a belt must be tensioned to handle the actual brake horsepower of the fan at the fan shaft.

Initial installation tensioning, retension of a V-belt is recommended after one or two days. After that it should be checked periodically for noise or vibration issues. Under-tensioned belts can slip and cause heat that will crack and belt failure eventually. Over-tensioned belts stretch excessively which will reduce belt and bearing life as the bearing loads increase. While checking belt tension on should inspect for cracks or faying because they indicate belt wear.

TABLE 1. Recommended minimum belt-deflection force, pounds.

Belt section	Small sheave		Drive ratio			
	Speed range	Diameter	1.0	1.5	2.0	4.0 & over
3V	1200-3600	2.65	2.0	2.4	2.6	3.0
	1200-3600	3.65	2.8	3.6	3.8	4.2
	1200-3600	4.75	3.8	4.2	4.4	4.8
	1200-3600	5.60	4.2	4.6	4.8	5.4
	1200-3600	6.90	4.6	5.0	5.2	5.6
5V	900-1800	7.1	8.5	9.5	10.0	11.0
	900-1800	9.0	10.0	11.0	12.0	13.0
	900-1800	14.0	12.0	13.0	14.0	15.0
	700-1200	21.2	14.0	15.0	16.0	17.0
8V	900-1800	12.5	18.0	21.0	23.0	25.0
	900-1800	14.0	21.0	23.0	24.0	28.0
	700-1500	17.0	24.0	26.0	28.0	30.0
	700-1200	21.2	28.0	30.0	32.0	34.0
	400-1000	24.8	31.0	32.0	34.0	36.0
3VX	1200-3600	2.20	2.2	2.5	2.7	3.0
	1200-3600	2.50	2.6	2.9	3.1	3.6
	1200-3600	3.00	3.1	3.5	3.7	4.2
	1200-3600	4.12	3.9	4.3	4.5	5.1
	1200-3600	5.30	4.6	4.9	5.1	5.7
	1200-3600	6.90	5.0	5.4	5.6	6.2
5VX	1200-3600	4.4	6.5	7.5	8.0	9.0
	1200-3600	5.2	8.0	9.0	9.5	10.0
	1200-3600	6.3	9.5	10.0	11.0	12.0
	1200-3600	7.1	10.0	11.0	12.0	13.0
	900-1800	9.0	12.0	13.0	14.0	15.0
	900-1800	14.0	14.0	15.0	16.0	17.0
8VX	900-1800	12.5	18.0	21.0	23.0	25.0
	900-1800	14.0	21.0	23.0	24.0	28.0
	700-1500	17.0	24.0	26.0	28.0	30.0
	700-1200	21.2	28.0	30.0	32.0	34.0
	400-1000	24.8	31.0	32.0	34.0	36.0
AP A	1800-3600	3.0	2.0	2.3	2.4	2.6
	1800-3600	4.0	2.6	2.8	3.0	3.3
	1800-3600	5.0	3.0	3.3	3.4	3.7
	1800-3600	7.0	3.5	3.7	3.8	4.3
BP B	1200-1800	4.6	3.7	4.3	4.5	5.0
	1200-1800	5.0	4.1	4.6	4.8	5.6
	1200-1800	6.0	4.8	5.3	5.5	6.3
	1200-1800	8.0	5.7	6.2	6.4	7.2
CP C	900-1800	7.0	6.5	7.0	8.0	9.0
	900-1800	9.0	8.0	9.0	10.0	11.0
	900-1800	12.0	10.0	11.0	12.0	13.0
	700-1500	16.0	12.0	13.0	13.0	14.0
DP D	900-1500	12.0	13.0	15.0	16.0	17.0
	900-1500	15.0	16.0	18.0	19.0	21.0
	700-1200	18.0	19.0	21.0	22.0	24.0
	700-1200	22.0	22.0	23.0	24.0	26.0
AX	1800-3600	3.0	2.5	2.8	3.0	3.3
	1800-3600	4.0	3.3	3.6	3.8	4.2
	1800-3600	5.0	3.7	4.1	4.3	4.6
	1800-3600	7.0	4.3	4.6	4.8	5.3
BX	1200-1800	4.6	5.2	5.8	6.0	6.9
	1200-1800	5.0	5.4	6.0	6.3	7.1
	1200-1800	6.0	6.0	6.4	6.7	7.7
	1200-1800	8.0	6.6	7.1	7.5	8.2
CX	900-1800	7.0	10.0	11.0	12.0	13.0
	900-1800	9.0	11.0	12.0	13.0	14.0
	900-1800	12.0	12.0	13.0	13.0	14.0
	700-1500	16.0	13.0	14.0	14.0	15.0
DX	900-1500	12.0	16.0	18.0	19.0	20.0
	900-1500	15.0	19.0	21.0	22.0.	24.0
	700-1200	18.0	22.0	24.0	25.0	27.0
	700-1200	22.0	25.0	27.0	28.0	30.0

Measuring Belt Tension by Deflection

By measuring the force required to deflect a belt at a given distance, one is able to evaluate belt tension. Recommended force for proper belt tension can be referenced in **Table 1**. This information is based on readings achieved using a single-stem tensiometer. A tensiometer measures the force required to deflect a belt at a given distance.

The equipment needed to measure belt tension by deflection are a tensiometer, tape measure, and straight edge (for single-belt drives). Follow this procedure:

1. Turn off power to the motor and follow lockout and tagout procedures.

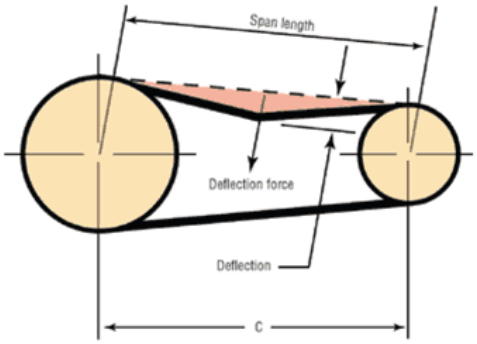

FIGURE 1 . Belt-span length and deflection force.

2. Measure the span length of the belt (**Figure 1**). Span length is the distance between the sheaves. The desired belt deflection is 1/64 in. for every 1 in. of belt span. For example, if the span length is 32 in., the desired belt deflection is ½ in.

3. Set the large O-ring on the tensiometer to the desired deflection determined in Step 2 (**Figure 2**).

4. Set the small O-ring on the tensiometer to the zero mark (Figure 2).

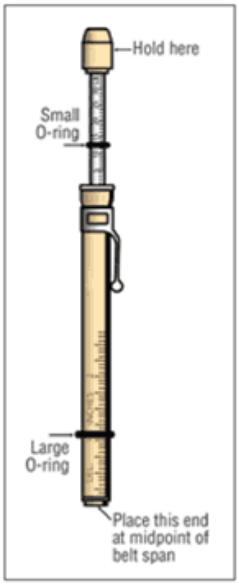

FIGURE 2. Detail of a tensiometer.

5. Hold the tensiometer as indicated in Figure 2, and press the opposing end of the tensiometer to the midpoint of the belt span, as indicated in Figure 1. Press down on the tensiometer (deflecting the belt) until the large O-ring is even with the original location of the belt. For a single-belt drive, the tensiometer should be depressed until the large O-ring is lined up with the bottom of the straight edge placed on the outside rims of the two sheaves. For a multiple-belt drive, depress the tensiometer until the large O-ring is even with the top of the next belt.

6. Read the small O-ring, which now indicates the force (in pounds) required to attain the desired belt deflection. Check this reading against the recommended minimum belt-deflection force in Table 1. For a multiple-belt drive, take a reading from each belt for an average.

7. Tighten or loosen the belt to achieve the recommended minimum belt-deflection force. Tightening the belt will increase belt-deflection force; loosening the belt will decrease it.

Measuring Belt Tension by Frequency

The natural frequency of a tensioned belt can be used to calculate the tension of the belt. This method is applicable for V- and banded belts.

One way to measure the natural frequency of a belt is by using a frequency-finding device. The frequency-finding device uses a laser sensor to measure the frequency of a vibrating belt. This frequency then can be compared to the recommended frequency calculated with the software that accompanies the instrument. To measure belt tension by frequency:

Using Tension Finder

Tension Finder is a gauge used to measure the amount of stretch in a tensioned belt. Tension Finder should not be used with aramid or glass-cord belts, as it could result in damage to the equipment.

Note: Information was obtain from multiple sources and has been checked for suitability. However, a successful solution depends on individual accuracy, skill, and caution. For this reason, Electric Trading Company does not guarantee the result of procedure compliance or assume responsibility for personal injury or property damage to persons following these procedures.