Installation, operation and maintenance manual

V-Belt replacement work instructions

A publication by SKF Power Transmission

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SKF

Content

1 Scope

This document covers the replacement of SKF V-belts in drives and the maintenance inspection procedure required to ensure the longest possible lifespan from the product.

This document includes:

- **Situational check** – awareness of the working environment to ensure safety
- **Tools** – best practices and minimum requirements for most applications
- **Best practice** – from a manufacturers' perspective, the requirements to achieve best product performance
- **Standards** – the requirements for drive repair and installation based on international standards

Disclaimer: This is not a drive design check document, but a procedure to follow for maintaining and installing V-belts. If a drive design check is required, please refer to SKF Belt Drive Design Manual (PUB 6895).

Note!
The information contained in this work instruction manual is given as a general guideline for the installation and replacement of Industrial V-belts. It is the responsibility of the installer to ensure all safety procedures and requirements of the site are adhered to. The information herein is given in good faith and based on accepted engineering practices. SKF standard warranty applies and is limited to product defects only.

2 Safe Working Environment

⚠ **CAUTION**

The procedures mentioned are GENERAL Guidelines only. Company and site procedures with regards to occupational health and safety should take precedence.

Electric current

The changing of V-belts in any application requires attention to safety requirements. Adhering to the precautions below will ensure a safe working environment and reduce problems in the drive's performance during its operational life.

1 **Electrical safety** – ensure ALL power is disconnected. Ensure control room lockouts and signages stating "down for maintenance, do not power on" are in place. This is to isolate machinery from accidental start up, until such time as all maintenance is completed. The best procedure is a signed work order allowing only authorised maintenance personnel to release the machine after the safety check is completed.
2 **Trained Staff** – Ensure personnel working on the machines are correctly trained. They should complete safety induction and possess the required skills for mechanical maintenance. Knowledge of V-belt maintenance will enable them to understand the priorities and requirements before the drive start-up.
3 **Check Machine Components** – check the positioning of the machine components, such as heavy flywheels, counterweights, gears and clutches in a neutral position to avoid accidental moving. (If unsure, refer to the machine manufacturers for help for these items before commencement of maintenance).
4 **PPE, Clothing** - the correct clothes to wear for the belt maintenance should include: Non-bulky clothing, with no loose sleeves, or lab coats opened. Wear gloves for inspections of pulleys and components to ensure injury from sharp components is minimised. The PPE rules of the site should be followed for this maintenance. However in all belt drive maintenance instances, when dealing with heavy items, safety shoes and glasses should be worn as a minimum precaution.
5 **Drive access** – the surrounding environment of the belt drives needs to be kept clean from clutter. Floors and surfaces should be clean and dry, for operator safety. Any overhead obstructions that might cause possible injury should be noted – "Am I safe?" should be an important part of each operators thoughts through the entire maintenance procedure.
6 **Drive Guarding** – the rotating equipment should be guarded for operator safety and to ensure an external influence doesn't damage the belts. The use of partial guards or unsafe guards is not recommended, as these tend to give a false sense of security, and may lead to possible unsafe actions.
7 **Test Run** – before being returned to normal operational conditions, check the drive thoroughly and account for all tools used. Ensure guards are securely re-fastened. Run the machine to ensure that any changes made are working correctly. If corrective action is required, it should be undertaken at this time - before a full return to production.

General guidelines for belt drive guard designs.

- Complete enclosure of the drive belt system should be mandatory – the guard should limit any entry or access in ALL directions.
- Ventilation – as all V-belt drives generate heat, the heat needs to be dissipated through the ventilated sides, and possibly bottom, of the drive guard.
- The size of the ventilation holes or mesh screens needs to be small enough to limit ingress of materials, but large enough to allow unrestricted airflow.
- Inspection panels – the guards need to be designed with inspection panels to allow for visual checks, and if possible also to allow tension of drives without full guard removal.
- A safety shutdown system (e.g. limit switches) should be incorporated in the guard access cover, so that if the guard is opened, the system advises and/ or stops the drive.
- Weather protection – if an external drive system is used, it is important to take into account the anticipated weather conditions in the area to ensure the guard design is adequate for hot or wet environments. Belts run best under dry conditions, so protection from moisture is mandatory.
- Keep the design simple – for ease of repair – if damaged. Complicated designs can be hard to repair and typically, the repair is never done.

3 Prerequisites

Typical tools required for installation of belt drives should include:

- Spanners, sockets and shifting tools to loosen or remove bolts and nuts
- Allen keys for grub screws
- Hammers – soft and hard, for adjustments
- Screwdrivers for adjustments and cover removal
- Tension tools for setting accurate belt tension
- Shaft alignment tools – e.g. Laser system, straight edge are recommended
- Pulley/sheave groove wear check profiles – to make sure that the pulley conditions are good. This is a major prerequisite for belt preventative maintenance

4 Procedure

The basic procedure to replace, re-install or maintain a V-belt drive is listed below and in the following appendix. The instructions cover all V-belt types including wrapped (jacketed or envelope construction) type and CRE (Cogged Raw Edge), and also includes the SKF 'XP' variation of the wrapped type.

Adhere to the following procedure when changing or installing a V-belt drive, regardless of the application. This is the Best Practice, as prescribed by SKF PTP.

> ⚠ **CAUTION**
>
> - Ensure ALL power is disconnected, and the drive isolated.
> - Double check before work commences. Exposure to a bare rotating shaft can be harmful.
> - Ensure all personal are familiar with the Drive Safety Checklist for a safe working environment!
> - Conduct a toolbox talk prior to starting the installation – ensuring awareness of the environment, and that all parties understand the task being undertaken, and highlighting any potential hazards!

1 **Inspection (guard)** – as components are removed, inspect for damage or wear. Check guarding for any damage or signs of wear or rubbing. Also check for signs of grease or oil that may have escaped from bearings. This may indicate other problems.

2 **Belt inspection** – Visually inspect existing V-belts before belt replacement. This will show any wear patterns or any unusual wear on the drive system. Belt wear may show signs that other trouble-shooting is required to ensure better belt life. Replace **all** belts that are damaged – important note: Sets of belts must be replaced, not just one belt on a drive system. see appendix 1, V-belt trouble-shooting. Remove belts by shortening the center distance and making the belts loose (do not pry the belts off as damage might occur to the belts and pulleys)

3 **Pulley inspection** – If the drive is new, check the pulleys for any damage in transit. Also ensure the pulleys are designed according to ISO/RMA standards for groove angle and dimensions – i.e. to match each other (essential if running banded belt sets). For existing pulleys, check for groove wear, and any external damage. The use of pulley profile gauges is strongly recommended - these will confirm any groove wear, and also ensure pulley groove angles are correct.

4 **Pulley installation** – there are different types of shaft fixing methods available for pulleys in todays' market, such as taper bush, QD, locking assemblies, etc. We will advise how to install for the main global type – the taper bushing series. This system consists of a tapered bushing (external taper) that fits into a matching pre-machined pulley. To install, see document **"Taper Bushing Installation" in appendix II**
When fitting the taper bushing, ensure the recommended torque settings are used for the securing of each grub screw. This is required to apply the correct holding torque of the bushing, and failure to tighten correctly may result in failure of bushing. See **"Taper Bushing torque settings"** in appendix III

5 **Drive alignment** – the accuracy of the drives' alignment will ensure long and efficient pulley and belt life, maximise power transmission capability, and mimimise vibration. A straight edge or laser alignment system is recommended, see appendix IV Installation and Maintenance, for reference to alignment and methods.

6 **Drive tension procedure** – the tension procedure is attached – see appendix V Tensioning methods for V-belts. For manual calculation of accurate tensions for each drive, please see appendix VI Calculating belt tension. This covers the standard procedure for each type of the various tension tools now available, to suit all V-belt types.

7 **Test run** – before being returned to normal operational conditions, check the drive thoroughly, and account for all tools used. Ensure guards are securely re-fastened. Run the machine to ensure that any changes made are working correctly. If corrective action is required, it should be undertaken at this time - before a full return to production.

> **! Note!**
> Remember to ensure that all power is disconnected and that the drive is isolated.

5 References

The procedure listed above is the typical overall tension procedure. For the efficient performance of the V-belts, there is also a requirement to understand the time interval between each re-tension, and how the belt is affected during the initial 'running-in' post 'initial installation' period.

Wrapped (envelope) belts

SKF wrapped belts come in two types: Standard wrapped (jacketed) and XP (Xtra Performance) type. These are similar in outward appearance, but differ in internal construction. As such, they have different requirements for installation re-tensioning.

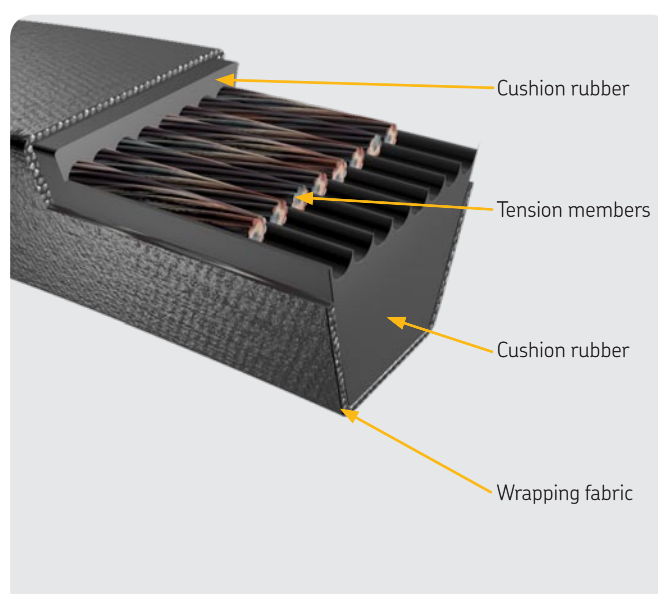
Standard Wrapped belts:

These come with a fabric cover, and after the initial installation procedure, the cover starts to stretch and the belt will loose some tension. The following is the recommended procedure for running these belts.

1 **Initial Tension** – as the above installation procedure has already set the drive to run for the first time on new belts, that is call the NEW tension setting. This setting is typically higher than used belts, to allow for a rapid stretch in the fabric cover, and this causes a loss in overall tension. The tension could drop in an initial 2 – 24 hours significantly. This is normal for **NEW** belt drives, and is referred to as initial "Tension Decay".

2 **Retension 1** - the drive will need to be stopped, and then set up to reset the tension. Once again, ensure ALL safety procedures are followed. Using the tools in the maintenance procedure reset the drive belt tensions to the **USED** figure as stated for each type of tool. The belts now have tension applied to the Tension members, which will heat up as they reach their power transmission potential and will see slight elongation. Over 24-48 hours the tension will drop below the **USED**,

3 **Retension 2** – for the second retension the drive needs to be stopped and tension reset again to the **USED**, the drive should now be "Tension Stable" for the next 1-3 months depending on environment and load factors.



SKF XP Wrapped belts:

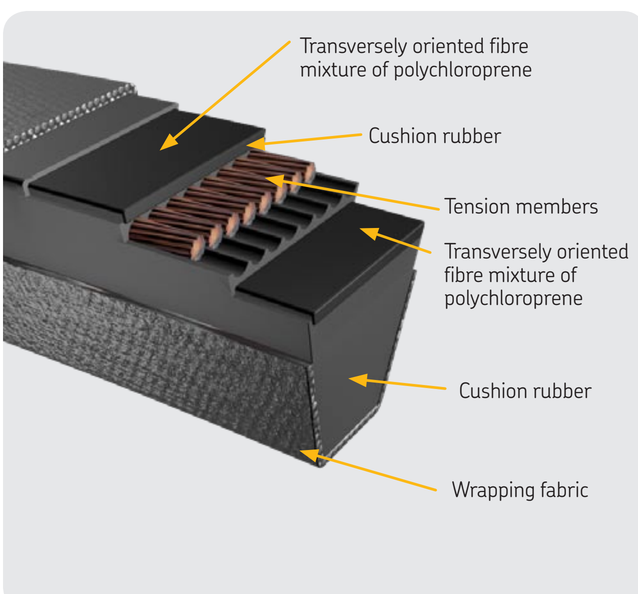
These come with a fabric cover, but there is a major advantage in the manufacture of this product. The belts are manufactured in a process that removes most of the initial stretch in both the fabric cover and the cords. The following is the recommended procedure for the running of these **XP** series belts.

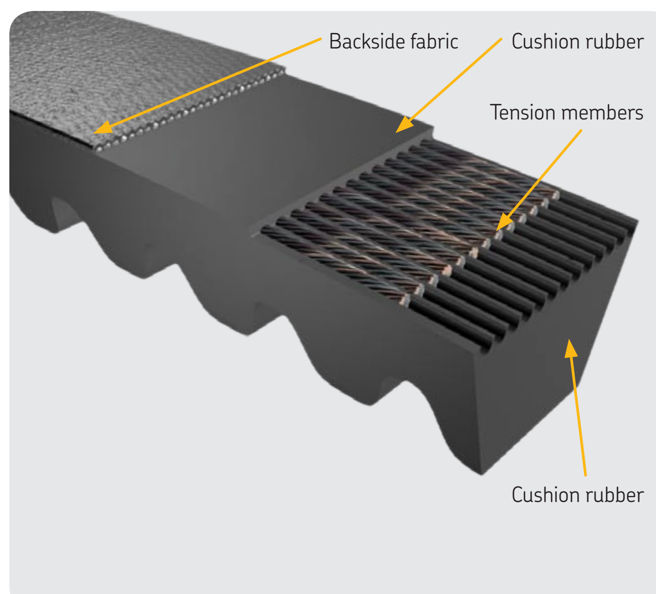
1. **Initial Tension** – as the above installation procedure has already set the drive to run for the first time on new belts that is call the **NEW** tension setting. This setting must be selected for the **XP** belts – this is higher than normal V belts in wrapped section. The tension can be seen to drop slowly in this type of belt, with retension requirements from 2 hours to 14 days. Tension drop value seen is less than the typical cord elongation seen in standard wrapped belts.
2. **Retension 1** – the drive will need to be stopped, and then set up to reset the tension. Ensure safety procedures are followed. Using the tools in the maintenance procedure reset the drive belt tensions to the USED figure stated for each type of tool for the SKF **XP** series belts. The belts now have tension applied to the Tension members, which will heat up as they reach their power transmission potential and will see a slight elongation. Over 1-3 months it is recommended to check the tension and reset to the **USED** - if required.

SKF CRE belts:

These come with no fabric cover, but have exposed flanks, and a cogged bottom profile (for better flexibility), so the process for the tension is very similar to the XP series belts. The following is the recommended procedure for the running of these CRE belts.

1. **Initial Tension** – as the above installation procedure has already set the drive to run for the first time on new belts that is call the **NEW** tension setting. This setting must be selected for the CRE (Cogged Raw Edge) belts – this is higher than normal V belts in wrapped section. The tension can be seen to drop slowly in this type of belt, with retension requirements from 2 hours to 24 hours. Tension drop value seen is less than the typical cord elongation seen in standard wrapped belts.
2. **Retension 1** – the drive will need to be stopped, and then set up to reset the tension. Ensure safety procedures are followed. Using the tools in the maintenance procedure reset the drive belt tensions to the **USED** figure stated for each type of tool for the SKF CRE series belts. The belts now have tension applied to the Tension members, which will heat up as they reach their power transmission potential and will see a slight elongation. Over 1-3 months it is recommended to check the tension and rest to the **USED** if required.





6 Appendix

The following pages are the technical and supplementary data sheets offered for the installation of V Belt drives.

For more information:
SKF BELT DESIGN MANUAL
PUB PT/P1 06875 EN

Troubleshooting guide

Problem	Possible causes	Solution
Belts mismatched	Used and new belts mixed	Replace with new set
	Misaligned drive	Belts are progressively tighter from one side to the other. Realign pulleys.
	Worn or badly machined pulley grooves	Replace or rework the pulleys
	Belts undertensioned	Rotate drive to get all belts slack on bottom side. Retension to required value.
Belts fail shortly after fitting	Improper belt installation	Belt levered over pulley. Follow installation instructions.
	Drive undersized	Check drive design
	Drive blocked	Remove cause
Belt vibrations	Resonant condition	Change drive dimensions (increase/decrease centre distance), use outside “kissing” idler or inside idler on belt slack side.
	High shock load	Increase tension. Use SKF banded belts.
	Pulley not balanced	Provide dynamically balanced pulleys.
Belts break and cracks	Improper outside idler size or position	Follow instructions on how to work with idlers.
	Pulley diameter too small	Belt flexing issue. Change pulley according to minimum diameter recommendations.
	Excessive heat	Remove source of heating. Use raw edge belts which resist higher temperatures. Check tension. Too loose belts will slip and cause heat.
	Chemical attack	Provide adequate protection
Belts turn over	Poor drive alignment	Realign pulleys
	Incorrect belt/pulley groove section	Match belt and pulley
	Excessive wear of pulleys	Replace or rework the pulleys
	Too low tension on belts	Increase belt tension
Belts wear rapidly	Belt hitting guard frame	Remove cause
	Starting torque too high, overloaded drive	Check drive design and redesign
	Excessive pulley groove wear	Replace or rework grooves
	Poor pulley alignment	Realign drive
	Belt tension too low	Increase belt tension
Belts slip	Drive undertensioned	Tension properly
	Drive overload	Redesign the drive
	Pulleys worn (belt bottom in groove)	Replace or rework grooves
	Excessive oil or grease	Provide better shielding on drive

Taper bushing Installation Instructions

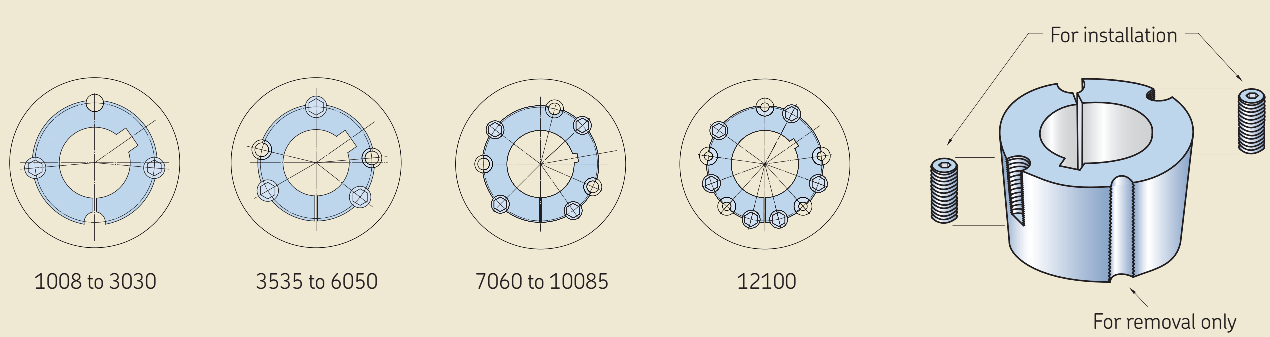
Assembly

1 Clean contact surfaces and ensure they are free from grease for shaft, taper bushing and taper-bored component.
2 Insert bushing into component and match holes (not threads).
3 Lightly oil screws and insert into holes that are threaded on the component side. Do not tighten yet.
4 Slip bushing and component onto shaft and align in desired position. Note that bushing will grip shaft first and component will move onto bushing. If using a key, fit it in the shaft keyway first. There should be atop clearance between the key and the bushing keyway.
5 Tighten the screws alternately and uniformly in accordance with the recommended torques (→ **tables 1A, 1B, page 12).**
6 Fill the empty holes with grease to prevent corrosion.
7 Check the screw tightening torques after the drive has been operating under load for a short period (half to one hour).

Removal

1 Loosen all screws. Remove one or two depending on size, leaving at least one to keep the bushing in the component.
2 Oil thread and insert into jacking off hole(s) on bush.
3 Tighten the screws alternately and uniformly until the bushing disengages.
4 Remove bushing and component from shaft.

Fig. 1



Taper Bush Tightening Torque

Table 1A

Bush Size	1008	1108	1210	1215	1610	1615	2012	2517	2525	3020	3030	3525
Screw tightening torque (Nm)	5,6	5,6	20	20	20	20	30	50	50	90	90	112
Max transmissable torque (lbf-in)*	1,200	1,300	3,600	3,550	4,300	4,300	7,150	11,600	11,300	24,000	24,000	44,800
Max transmissable torque (Nm)*	113	146	406	401	485	485	807	1310	1270	2711	2711	5061
Set screw size (BSW) (inch)	1/4x1/2	1/4x1/2	3/8x5/8	3/8x5/8	3/8x5/8	3/8x5/8	7/16x7/8	1/2x1	1/2x1	1/2x1	5/8x1-1/4	5/8x1-1/4
Set Screw Qty	2	2	2	2	2	2	2	2	2	2	2	2

Table 1B

Bush Size	3535	4030	4040	4535	4545	5040	5050	6050	7060	8065	10085	120100
Screw tightening torque (Nm)	115	170	170	190	190	270	270	883	883	883	1547	1547
Max transmissable torque (lbf-in)*	44,800	77,300	77,300	110,000	110,000	126,000	126,000	282,000	416,000	456,000	869,000	1,520,000
Max transmissable torque (Nm)*	5061	8700	8700	12400	12400	14200	14200	31861	47001	51521	98183	171736
Set screw size (BSW) (inch)	5/8x1-1/4	1/2x1-1/2	1/2x1-1/2	5/8x1-3/4	5/8x1-3/4	3/4x2	7/8x 2-1/4	1-1/4x 3-1/2	1-1/4x 3-1/2	1-1/4x 3-1/2	1-1/4x 3-1/2	1-1/4x 3-1/2
Set Screw Qty	3	3	3	3	3	3	3	3	4	4	4	6

* Torque values shown are for a service factor of 1.00, and must not be exceeded. For heavy shock of service applications, the torque capacity must be reduced accordingly. (Refer to www.skfptp.com for further information.)

Installation and maintenance

All SKF V-belts are produced to be set free, i.e. you can take any belt of the same designation from the shelf and put it on a multiple groove drive. Proper tensioning will compensate small length deviations and make all belts carry equal load on the drive.

Before installing a new belt, make sure that:

1 Pulleys are properly aligned. Maximum allowable misalignment β is 0,3° or 5 mm / 1 m of centre distance. Values greater than those listed will reduce the belt service life and cause edge wear. Misalignment is represented by the ways shown in **fig. 2**. A straight edge should be used to check proper alignment as in **fig. 3**.

A more precise way to check alignment, particularly over long distances, is the SKF Belt Alignment Tool (→ **fig. 4**).

2 Make sure that all pulley grooves are of the same size. Uneven wear of grooves causes belts to run on different diameter levels in the pulley. This generates excessive slip of the belts on one side and has an effect similar to mismatched belts on the other side (→ **fig. 5**).

Fig. 2

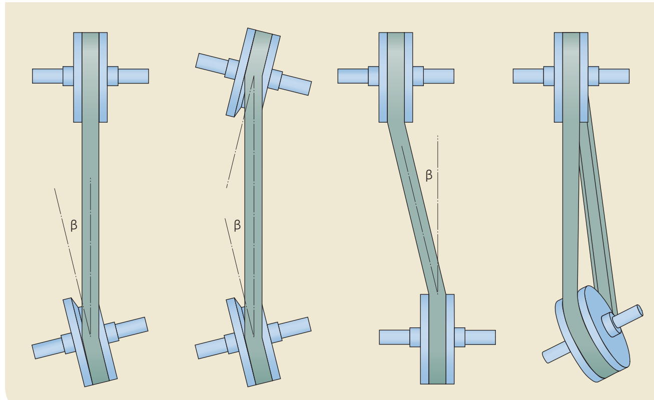


Fig. 3

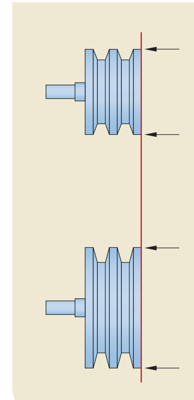


Fig. 4

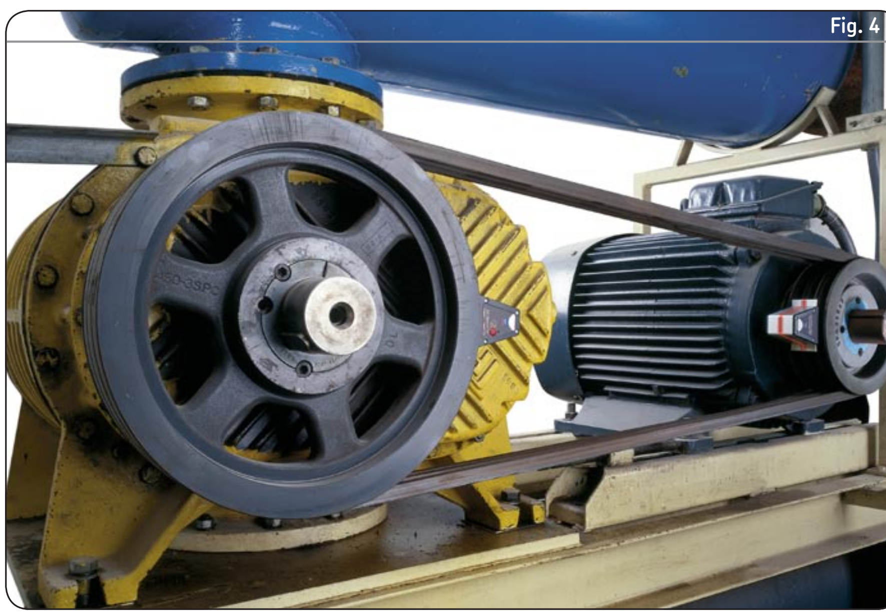
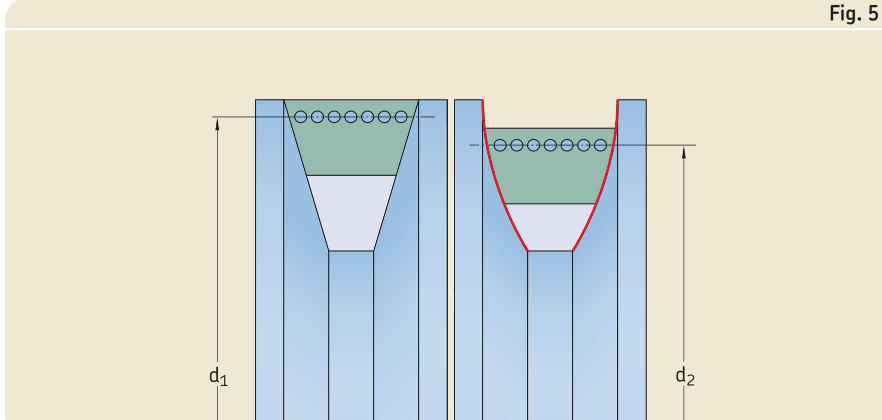


Fig. 5



General advice is to briefly inspect pulleys at every belt change but closely inspect and possibly replace at every third belt change. Use an SKF pulley gauge (→ **fig. 6**) to check pulley wear.

Pulleys should be replaced when more than 0,8 mm is detected between template and groove.

3 Never mix different brands or belt types on the same drive.

Belt lengths can differ from one manufacturer to another and different materials can have significantly different values for the coefficient of thermal contraction.

SKF also does not recommend mixing new and used belts as it may result in uneven load distribution and premature belt failure.

4 Never force belts over the pulley edge, since this may damage the surface and initiate a crack, which will weaken the belt and cause premature belt failure. Properly slack off and take up the drive until belts are easily placed in the grooves.

5 Do not rely on belt dressings to eliminate belt slippage. Belt dressings can temporarily increase friction between the belt and pulley. However, this is always a temporary fix until the cause of slippage can be identified and corrected.

6 Tension belts according to SKF tensioning recommendations. Refer to Tensioning section on **pages 15** to **17** to review tensioning equipment available. Please note, that incorrect belt tension will cause premature belt failure. A good practice is to apply slightly higher, rather than lower, tension to the belt. General experience shows that an under-tensioned V-belt is the major cause of power loss and premature belt failure. However, excessive tension may cause premature bearing failure.

SKF recommends checking belt tension after the first 48 hours of continuous use and rechecking belt tension 3 to 4 times per year.

Fig. 6

Tensioning methods

Tensioning with the SKF belt tension tester

These testers provide a simple way to determine belt tension.

It is very useful in cases where no technical drive data is known which makes it impossible to calculate the appropriate tension. **Table 1** gives general tensioning values for a particular belt cross section in relation to the pulley diameter.

There are three testers (gauges) that cover most of the V-belt range:
Gauge 1 – range: 15–70 kg
Gauge 2 – range: 50–150 kg
Gauge 3 – range: 150–300 kg

Instructions

1. Select the appropriate tester from **table 1**.
2. With the indicator arm down, place the tester parallel to the side of one belt along the mid section of the span length.
3. Holding the rubber finger loop, press down on the belt.
4. Stop when you feel and hear the "click".
5. Remove tester and read the belt tension by observing the point where the top surface of the indicator arm crosses the numbered scale on the tester body (→ **fig. 7**).

Table 1

Metric dimension

Section	Wrapped belt tension		Smallest pulley diameter	Section	Cogged belt tension	
	Initial new belt	Run in used belt			Initial new belt	Run in used belt
–	kg		mm	–	kg	
A	15 20 31	11 15 25	≤80 80–100 101–132	**AX**	20 25 41	15 20 31
B	31 41 51	25 31 41	≤125 126–160 161–200	**BX**	46 51 61	36 41 46
C	71 82 92	51 61 71	≤200 201–250 251–355	**CX**	82 92 102	61 71 82
SPZ, 3V	20 25 36	15 20 25	≤71 72–90 91–125	**XPZ, 3VX**	25 31 41	20 25 31
SPA	36 41 51	25 31 41	≤100 101–140 141–200	**XPA**	41 51 61	31 41 46
SPB, 5V	66 71 92	51 56 71	≤160 161–224 225–355	**XPB, 5VX**	71 87 102	56 66 82
SPC	102 143 183	82 112 143	≤250 251–355 356–560	**XPC**	143 163 194	112 122 153
SPZ-XP, 3V-XP	22 28 40	17 22 28	≤ 71 72 – 90 91 – 125			
SPA-XP	40 45 56	28 34 45	≤ 100 101 - 140 141 - 200			
SPB-XP, 5V-XP	73 78 101	56 62 78	≤ 160 161 – 224 225 – 355			
SPC-XP	112 157 201	90 123 157	≤ 250 251 - 355 356 - 560			

Fig. 7

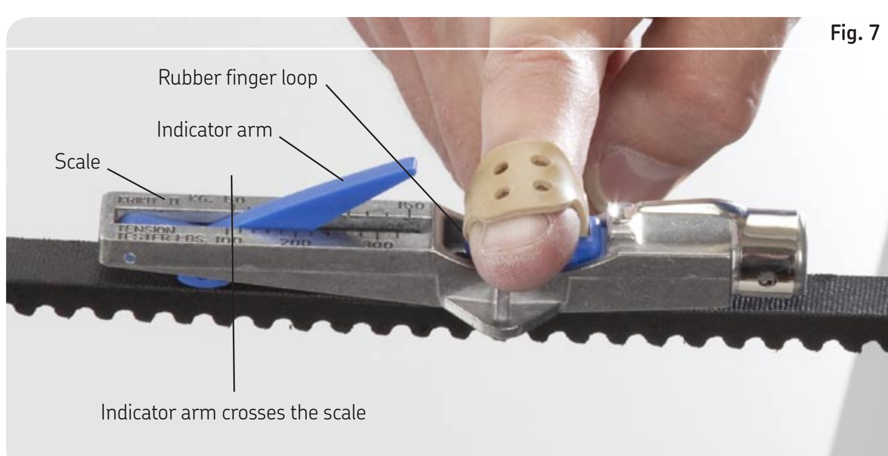


Fig. 8

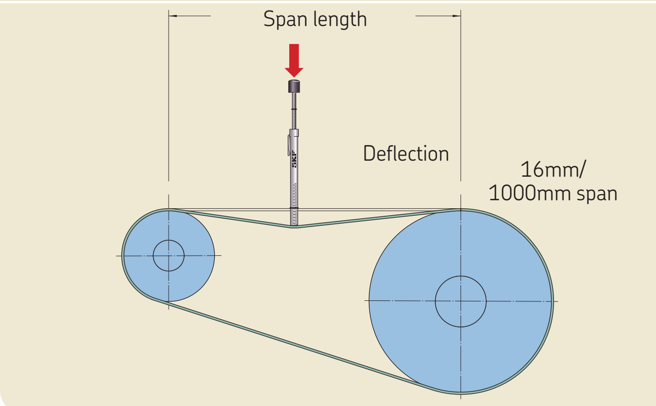


Fig. 9

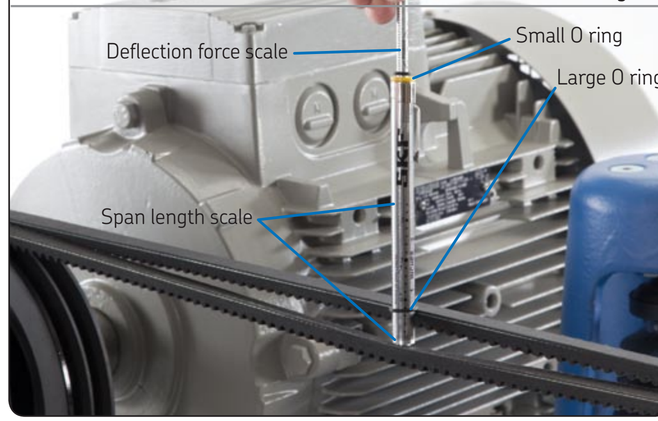


Table 2

Tension values

Section	Smallest pulley diameter	Speed range	Belt deflection force Un–cogged belts New belt	Used run-in belt	Cogged belts New belt	Used run-in belt
–	mm	r/min	kg			
Z, ZX	40–60	1 000–2 500	0,7	0,5	0,8	0,5
		2 501–4 000	0,8	0,5	0,9	0,6
	61–over	1 000–2 500	1,1	0,8	1,3	0,9
		2 501–4 000	1,1	0,8	1,3	0,9
A, AX	75–90	1 000–2 500	2,1	1,4	2,4	1,6
		2 501–4 000	1,6	1,1	2,0	1,3
	91–120	1 000–2 500	2,6	1,7	2,9	2,0
		2 501–4 000	2,2	1,4	2,5	1,7
	121–over	1 000–2 500	3,1	2,0	3,2	2,2
		2 501–4 000	2,7	1,8	2,9	2,0
B, BX	85–105	860–2 500	–	–	2,8	1,9
		2 501–4 000	–	–	2,4	1,6
	106–140	860–2 500	3,1	2,0	4,1	2,7
		2 501–4 000	2,6	1,7	3,5	2,4
	141–over	860–2 500	3,7	2,5	4,8	3,3
		2 501–4 000	3,4	2,3	4,2	2,8
C,CX	175–230	500–1 740	6,5	4,4	8,4	5,7
		1 741–3 000	5,4	3,7	6,7	4,6
	231–over	500–1 740	8,1	5,4	9,1	6,1
		1 741–3 000	7,1	4,8	8,3	5,6
D	305–400	200–850	14,3	9,6	–	–
		851–1 500	12,1	8,2	–	–
	401–over	200–850	17,4	11,7	–	–
		851–1 500	14,6	9,9	–	–
SPZ, XPZ	56–79	1 000–2 500	2,3	1,5	2,3	1,6
		2 501–4 000	1,9	1,1	1,9	1,3
	80–95	1 000–2 500	3,1	1,7	2,9	1,9
		2 501–4 000	2,8	1,8	2,8	1,8
	96–over	1 000–2 500	3,1	2,1	3,3	2,2
		2 501–4 000	2,9	1,9	3,1	2,0
SPA, XPA	71–105	1 000–2 500	3,8	2,5	4,3	2,9
		2 501–4 000	3,4	2,3	3,9	2,6
	106–140	1 000–2 500	4,5	3,0	5,2	3,5
		2 501–4 000	4,1	2,7	4,7	3,1
	141–over	1 000–2 500	5,7	3,8	6,6	4,3
		2 501–4 000	5,7	3,8	5,9	3,9
SPB, XPB	107–159	860–2 500	6,3	4,3	7,3	4,9
		2 501–4 000	6,1	4,1	7,0	4,7
	160–250	860–2 500	8,2	5,5	9,4	6,2
		2 501–4 000	7,3	4,9	8,7	5,8
	251–over	860–2 500	9,7	6,5	10,4	6,9
		2 501–4 000	8,3	5,5	9,5	6,3
SPC, XPC	200–355	500–1 740	13,1	8,8	15,1	10,1
		1 741–3 000	13,3	8,9	15,3	10,1
	356–over	500–1 740	15,0	10,0	17,2	11,4
		1 741–3 000	17,4	11,6	19,9	13,3
3V, 3VX	55–60	1 000–2 500	–	–	1,9	1,3
		2 501–4 000	–	–	1,7	1,1
	61–90	1 000–2 500	2,0	1,4	2,4	1,6
		2 501–4 000	1,7	1,2	2,1	1,4
	91–over	1 000–2 500	2,8	1,9	3,1	2,0
		2 501–4 000	2,6	1,7	2,8	1,9
5V, 5VX	110–170	1 000–2 500	–	–	5,9	3,9
		2 501–4 000	–	–	3,3	2,1
	171–275	500–1 740	7,3	4,9	8,5	5,7
		1 741–3 001	6,5	4,3	7,7	5,3
	276–over	500–1 740	9,0	6,0	9,9	6,6
		1 741–3 001	8,4	5,6	9,6	6,5
8V	315–430	200–850	19,0	12,8	–	–
		851–1 500	15,4	10,4	–	–
	431–over	200–850	22,8	15,3	–	–
		851–1 500	20,3	13,6	–	–
SPZ–XP	56–79	1 000–2 500	2,7	1,8	–	–
		2 501–4 000	2,3	1,4	–	–
	80–95	1 000–2 500	3,8	2,0	–	–
		2 501–4 000	3,4	2,2	–	–
	96–over	1 000–2 500	3,8	2,5	–	–
		2 501–4 000	3,5	2,3	–	–
SPA–XP	71–105	1 000–2 500	4,6	3,0	–	–
		2 501–4 000	4,1	2,8	–	–
	106–140	1 000–2 500	5,5	3,7	–	–
		2 501–4 000	4,9	3,3	–	–
	141–over	1 000–2 500	6,9	4,6	–	–
		2 501–4 000	6,9	4,6	–	–
SPB–XP	107–159	860–2 500	7,7	5,1	–	–
		2 501–4 000	7,4	4,9	–	–
	160–250	860–2 500	9,9	6,6	–	–
		2 501–4 000	8,8	5,9	–	–
	251–over	860–2 500	11,7	7,9	–	–
		2 501–4 000	10,1	6,7	–	–
SPC–XP	200–355	500–1 740	15,9	10,7	–	–
		1 741–3 000	16,1	10,7	–	–
	356–over	500–1 740	18,1	12,1	–	–
		1 741–3 000	21,0	14,0	–	–
3V–XP	55–60	1 000–2 500			–	–
		2 501–4 000			–	–
	61–90	1 000–2 500	2,4	1,6	–	–
		2 501–4 000	2,1	1,4	–	–
	91–over	1 000–2 500	3,4	2,3	–	–
		2 501–4 000	3,1	2,1	–	–
5V–XP	110–170	1 000–2 500			–	–
		2 501–4 000			–	–
	171–275	500–1 740	8,8	6,0	–	–
		1 741–3 001	7,8	5,2	–	–
	276–over	500–1 740	10,9	7,2	–	–
		1 741–3 001	10,2	6,8	–	–
8V–XP	315–430	200–850	23,0	15,4	–	–
		851–1 500	18,6	12,5	–	–
	431–over	200–850	27,6	18,5	–	–
		851–1 500	22,3	15,0	–	–

Tensioning with the SKF pen tester

This gauge is available to determine the deflection force [kg] required to set and maintain V-belt tension.

Table 2 lists the required force needed to deflect a belt in mid-span relative to pulley diameter and speed.

1 Measure the span length (→ **fig.** 8)
2 Position the bottom of the large O ring on the pen scale at the measured span length (→ **fig.** 9)
3 Set the small O ring on the deflection force scale to zero
4 Place the tension tester squarely on one belt at the centre of the span length (→ **fig.** 9) and apply downward force to the plunger until the bottom of the large O-ring is even with the next belt or with the bottom of a straight edge laid across the pulleys.
5 Remove the tension tester and read the force applied with the values given in the tables. The force should be between the minimum and the maximum shown. The maximum value shown is for new belts, which will allow for anticipated tension loss. Used belts should be maintained at the minimum values indicated in the tables.

Fig. 10

Tensioning with the SKF Belt Frequency Meter

The SKF Belt Frequency Meter is used for checking the tension by means of belt natural frequency measurements (→ **fig.** 10).

Tension measurements are presented in hertz [Hz] or in newton [N], if the drive parameters are entered.

Advantages

- Precise and repeatable measurements
- Non-contact optical head with LED beam for easy pointing to belt surface
- Easy-to-use
- Wide tension range (10–400 Hz)
- Extremely fast response allows quick tension checks on multiple belt drives

Can be used in two different ways:

a Technical data of the drive is not known and therefore the appropriate tension cannot be calculated. In such cases, refer to general tension values recommended for the particular belt in **tables** 3A, 3B and 3C.
a Drive data is known. The tensioning value can be calculated by the drive design program or by a belt tension formula. Simply measure the strand tension in the belt and compare it with the calculated value.

Instructions

1 Press ON/OFF to switch meter ON.
2 Press button UP or DOWN to select display mode indicated on left side of the display.
3 In case newton [N] mode is selected, then:
   i. Enter belt specific mass [g/m] provided with operating instruction.
   ii. Enter span length [m]
4 Hold the optical head up to the belt span and strum the belt slightly to make it vibrate.
5 Measurement is automatically performed. Read-out is given in herz or in newton depending on selected display mode.

Table 3A

Wrapped V, wedge XP and banded belts

Section	Smallest pulley diameter	Speed range	Belt tension per single belt* New belt	Used run-in belt	Mass Single belt	Belt in a band**
–	mm	r/min	N		kg/m	
Z	40–60	1 000–2 500	104	69	0,051	n/a
		2 501–4 000	121	81		
	61–over	1 000–2 500	174	116		
		2 501–4 000	174	116		
A	75–90	1 000–2 500	332	222	0,115	0,150
		2 501–4 000	254	169		
	91–120	1 000–2 500	391	261		
		2 501–4 000	332	222		
	121–175	1 000–2 500	469	313		
		2 501–4 000	411	274		
B	105–140	860–2 500	469	313	0,193	0,260
		2 501–4 000	391	261		
	141–220	860–2 500	567	378		
		2 501–4 000	528	352		
C	175–230	500–1 740	1 017	678	0,320	0,417
		1 741–3 000	841	561		
	231–400	500–1 740	1 251	834		
		1 741–3 000	1 115	743		
D	305–400	200–850	2 210	1 473	0,69	0,870
		851–1 500	1 877	1 251		
	401–510	200–850	2 698	1 799		
		851–1 500	2 268	1 512		
SPZ	56–79	1 000–2 500	338	226	0,076	n/a
		2 501–4 000	262	175		
	80–95	1 000–2 500	383	255		
		2 501–4 000	415	276		
	96–over	1 000–2 500	477	318		
		2 501–4 000	438	292		
SPA	71–105	1 000–2 500	575	383	0,134	0,155
		2 501–4 000	524	349		
	106–140	1 000–2 500	696	464		
		2 501–4 000	628	418		
	141–over	1 000–2 500	872	581		
		2 501–4 000	876	584		
SPB	107–159	860–2 500	978	652	0,223	0,268
		2 501–4 000	941	627		
	160–250	860–2 500	1 255	837		
		2 501–4 000	1 116	744		
	251–over	860–2 500	1 496	997		
		2 501–4 000	1 275	850		
SPC	200–355	500–1 740	2 026	1 350	0,354	0,394
		1 741–3 000	2 043	1 362		
	356–over	500–1 740	2 305	1 537		
		1 741–3 000	2 671	1 781		
3V	61–90	1 000–2 500	313	209	0,076	0,099
		2 501–4 000	274	182		
	91–175	1 000–2 500	430	287		
		2 501–4 000	391	261		
5V	171–275	500–1 740	1 134	756	0,223	0,272
		1 741–3 000	997	665		
	276–500	500–1 740	1 369	912		
		1 741–3 000	1 291	860		
8V	315–430	200–850	2 933	1 955	0,504	0,654
		851–1 500	2 386	1 590		
	431–570	200–850	3 520	2 346		
		851–1 500	3 129	2 086		

Section	Smallest pulley diameter	Speed range	Belt tension per single belt* New belt	Used run-in belt	Mass Single belt	Belt in a band**
–	mm	r/min	N		kg/m	
SPZ-XP	56–79	1 000–2 500	372	249	0,079	n/a
		2 501–4 000	288	193		
	80–95	1 000–2 500	421	281		
		2 501–4 000	457	304		
	95–over	1 000–2 500	525	350		
		2 501–4 000	482	321		
SPA-XP	71–105	1 000–2 500	633	421	0,122	n/a
		2 501–4 000	576	384		
	106–140	1 000–2 500	766	510		
		2 501–4 000	691	460		
	141–over	1 000–2 500	959	639		
		2 501–4 000	964	642		
SPB-XP	107–159	860–2 500	1076	717	0,202	n/a
		2 501–4 000	1035	690		
	160–250	860–2 500	1381	921		
		2 501–4 000	1228	818		
	251–over	860–2 500	1646	1097		
		2 501–4 000	1403	935		
SPC-XP	200–355	500–1 740	2229	1485	0,350	n/a
		1 741–3 000	2247	1498		
	356–over	500–1 740	2536	1691		
		1 741–3 000	2938	1959		
3V-XP	61–90	1 000–2 500	344	230	0,079	n/a
		2 501–4 000	301	200		
	91–175	1 000–2 500	473	315,7		
		2 501–4 000	430,1	287,1		
5V-XP	171–275	500–1 740	1247,4	831,6	0,202	n/a
		1 741–3 001	1096,7	731,5		
	276–500	500–1 740	1505,9	1003,2		
		1 741–3 001	1420,1	946		
8V-XP	315–430	200–850	3226,3	2150,5	0,520	n/a
		851–1 500	2624,6	1749		
	431–570	200–850	3872	2580,6		
		851–1 500	3441,9	2294,6		

The values listed in the tables on the following pages provide a guideline for belt tensioning. More accurate values for your specific belt drive can be obtained from belt drive calculations on skfptp.com.

* Multiply the belt tension required for a single belt by the number of belts in the banded belt unit to get the total tension to apply.
**Multiply the mass of one belt in a band by the number of belts in the banded belt unit to get the total mass to apply.

Table 3B

Cogged raw edge V, wedge and banded belts

Section	Smallest pulley diameter	Speed range	Belt tension per single belt* New belt	Used run-in belt	Mass Single belt	Belt in a band**
–	mm	r/min	N		kg/m	
ZX	40–60	1 000–2 500	119	80	0,051	n/a
		2 501–4 000	139	93		
	61–over	1 000–2 500	199	133		
		2 501–4 000	199	133		
AX	75–90	1 000–2 500	372	248	0,115	0,153
		2 501–4 000	293	196		
	91–120	1 000–2 500	450	300		
		2 501–4 000	391	261		
	121–175	1 000–2 500	508	339		
		2 501–4 000	450	300		
BX	85–105	860–2 500	430	287	0,193	0,225
		2 501–4 000	372	248		
	106–140	860–2 500	626	417		
		2 501–4 000	547	365		
	141–220	860–2 500	763	508		
		2 501–4 000	645	430		
CX	175–230	500–1 740	1 310	873	0,320	0,398
		1 741–3 000	1 056	704		
	231–400	500–1 740	1 408	939		
		1 741–3 000	1 291	860		
XPZ	56–79	1 000–2 500	362	241	0,076	n/a
		2 501–4 000	299	199		
	80–95	1 000–2 500	438	292		
		2 501–4 000	418	279		
	96–over	1 000–2 500	499	332		
		2 501–4 000	469	313		
XPA	71–105	1 000–2 500	657	438	0,134	0,156
		2 501–4 000	598	399		
	106–140	1 000–2 500	796	531		
		2 501–4 000	718	478		
	140–over	1 000–2 500	997	665		
		2 501–4 000	897	598		
XPB	107–159	860–2 500	1 116	744	0,223	0,279
		2 501–4 000	1 075	717		
	160–250	860–2 500	1 435	957		
		2 501–4 000	1 330	886		
	251–over	860–2 500	1 596	1 064		
		2 501–4 000	1 455	970		
XPC	200–355	500–1 740	2 313	1 542	0,354	0,548
		1 741–3 000	2 333	1 555		
	356–over	500–1 740	2 632	1 755		
		1 741–3 000	3 050	2 034		
3VX	55–60	1 000–2 500	293	196	0,076	0,102
		2 501–4 000	254	169		
	61–90	1 000–2 500	372	248		
		2 501–4 000	332	222		
	91–175	1 000–2 500	469	313		
		2 501–4 000	430	287		
5VX	110–170	1 000–2 500	899	600	0,223	0,252
		2 501–4 000	489	326		
	171–275	500–1 740	1 310	873		
		1 741–3 001	1 212	808		
	276–400	500–1 740	1 525	1 017		
		1 741–3 001	1 486	991		

The values listed in the tables on following pages provide a guideline for belt tensioning. More accurate values for your specific belt drive can be obtained from belt drive calculations on skfptp.com.

* Multiply the belt tension required for a single belt by the number of belts in the banded belt unit to get total tension to apply.
** Multiply the mass of one belt in a band by the number of belts in the banded belt unit to get total mass to apply.

Table 3C

Timing belts

–	Section –	Belt tension New belt N	Used run-in belt	Mass kg/m
HiTD	5M 9	99	71	0,037
	5M 15	174	124	0,061
	5M 25	311	222	0,102
	8M 20	372	266	0,128
	8M 30	593	424	0,192
	8M 50	1 037	741	0,32
	8M 85	2 044	1 460	0,545
	14M 40	1 297	926	0,429
	14M 55	1 912	1 366	0,59
	14M 85	3 142	2 244	0,911
	14M 115	4 480	3 200	1,233
	14M 170	7 139	5 099	1,823
STD	S8M20	390	279	0,111
	S8M30	620	443	0,167
	S8M50	1 110	793	0,278
	S8M85	2 030	1 450	0,473
	S14M40	1 340	957	0,462
	S14M55	1 925	1 375	0,634
	S14M85	3 165	2 261	0,981
	S14M115	4 465	3 189	1,327
	S14M170	6 975	4 982	1,962

Timing belts

–	Section –	Belt tension New belt N	Used run-in belt	Mass kg/m
Timing	XL 025	13	11	0,014
	XL 037	24	20	0,02
	L050	51	41	0,043
	L075	87	70	0,065
	L 100	122	98	0,087
	H075	220	176	0,084
	H100	311	249	0,112
	H150	485	388	0,168
	H200	667	534	0,223
	H300	1 045	836	0,335
	XH 200	907	726	0,572
	XH 300	1 428	1 142	0,858
	XH 400	2 019	1 615	1,144
	XXH 200	1 130	904	0,809
	XXH 300	1 748	1 398	1,213
	XXH 400	2 478	1 982	1,617

Table 4

Arc of contact power correction factor C_3

D–d / CC * mm	Arc of contact on small pulley deg.	Arc of contact correction factor C_3 –
0,00	180	1,00
0,05	177	0,99
0,10	174	0,99
0,15	171	0,98
0,20	169	0,97
0,25	166	0,97
0,30	163	0,96
0,35	160	0,95
0,40	157	0,94
0,45	154	0,93
0,50	151	0,93
0,55	148	0,92
0,60	145	0,91
0,65	142	0,90
0,70	139	0,89
0,75	136	0,88
0,80	133	0,87
0,85	130	0,86
0,90	127	0,85
0,95	123	0,83
1,00	120	0,82
1,05	117	0,81
1,10	113	0,80
1,15	100	0,78
1,20	107	0,77
1,25	104	0,75
1,30	101	0,73
1,35	97	0,72
1,40	93	0,70

*D Large pulley diameter
d Small pulley diameter
CC Centre to centre distance

Calculating belt tension

Insufficient belt tension will cause the belt to slip, which consequently generates heat, high belt temperatures and premature ageing of the belt.

Degradation of the rubber compound, caused by excessive heat, will have a significant impact on the service life of a belt.

When the tension is too high, the belt will not slip, but this will have a negative impact on the service life of the bearings and the belt.

There are two values that must be considered when tensioning a belt:

a T_{used} (run-in) is minimum tension on the belt that ensures minimum slip on the drive. Belt tension should ideally not drop below this value during the entire belt service life.

b T_{new} (initial) is maximum tension in the belt, used to initially tension a new belt. T_{new} normally decreases during the first hours of operation releasing initial high bearing loads.

General tensioning values

Tensioning values for general tensioning purposes are provided by the operating manual for selected tensioning tools. The values represent the "worst case" drives and as such, tend to be higher than the values calculated for a specific drive.

Calculating tension values

In cases where all drive data is available, it is possible to calculate the required tension instead of using the general tensioning values.

To calculate tension values, the following procedure should be used:

a Find the minimum required strand tension for used run-in belts using the formula:

$$v = \frac{d\,n}{19\,100}$$

where
v = belt speed [m/s]
d = pulley datum diameter [mm]
n = speed of driver pulley [r/min]

$$T_{used} = 510\,\frac{(2{,}2 - C_3)\,P_d}{C_3\,N\,v} + \frac{M\,v^2}{1{,}11}$$

where
T_{used} = minimum required static tension in one strand of the belt [N]
C_3 = arc of contact correction factor (→ **table 4**)
P_d = design power [kW]
N = number of belts on the drive
v = belt speed [m/s]
M = belt weight per unit [kg/m] (→ **tables 3A, 3B, 3C**)

b Increase T_{used} value by 50% to get initial required tension on a new belt T_{new}

$$T_{new} = 1{,}5\,T_{used}$$

c If the SKF pen tester is used to tension the drive, calculate belt deflection force.

For single V-belts and single units of banded and ribbed belts:

$$F_{d\,used} = 0.102 \times \left[\frac{T_{used}\,N}{16} + \frac{N\,K\,S_p}{L}\right]$$

$$F_{d\,new} = 0.102 \times \left[\frac{T_{new}\,N}{16} + \frac{N\,K\,S_p}{L}\right]$$

For multiple V-belts or matched sets of banded and ribbed belts:

$$F_{d\,used} = 0.102 \times \left[\frac{T_{used}\,N}{16} + N\,K\right]$$

$$F_{d\,new} = 0.102 \times \left[\frac{T_{new}\,N}{16} + N\,K\right]$$

where
$F_{d\,used}$, $F_{d\,new}$ = deflection force for a used run-in respectively a new belt [kg]
T_{used}, T_{new} = required strand tension for a used run-in respectively a new belt
N = number of belts (for single V-belt N = 1) or number of belts in a band.
K = belt modulus factor (→ **table 5**)
S_p = span length of the belt [m]
L = reference length of the belt [m]

d If the SKF Belt Frequency Meter is used to tension the drive, take value T_{new} (T_{used}) and directly compare it with the readings from the tester.

Table 5

Belt modulus factor

Section	K
Z, ZX	2,67
A, AX	2,94
B, BX	3,87
C, CX	5,87
D	8,01
SPZ, XPZ, 3V, 3VX	2,89
SPA, XPA	3,12
SPB, XPB, 5V, 5VX	4,01
SPC, XPC	6,23
8V	7,57

Tensioning by means of belt elongation

This method is used when installing new or used run-in banded V-belt sets or where individual belts require so much force that other tensioning methods are not practical.

Instructions

1 Determine strand tension (New, Used). To do this, use general strand tension values provided in the SKF Belt Frequency Meter manual or calculate the required static strand tension.
2 Fit the belt on both pulleys with no tension.
3 Draw two lines on the back of the belt 1 000 mm apart.
4 Increase the distance between the two lines according to data provided in **table 6**.

If more appropriate, the following approach could be used.

1 Use a tape measure to measure the outside circumference of the belt.
2 Using the length multiplier from **table 7** and calculate the length of the belt under adequate tension.
3 Increase the drive centre distance until the tape measure reaches the calculated length.

Note: If you are re-tensioning a used belt, decrease the centre distance until there is no tension on the belt, then you can tape the outside.

Table 6

Length addition for 1 000 mm of belt strand

Required static strand tension (N) — Single belt, banded belt	A	B	C	D	SPA SPA-XP	SPB SPB-XP 5V 5V-XP	SPC SPC-XP	8V 8V-XP
–	Elongation per 1 000 mm of belt strand (mm)							
200	3,4	1,5	–	–	3,0	–	–	–
250	4,3	1,8	–	–	3,8	–	–	–
300	5,1	2,2	–	–	4,5	–	–	–
350	6,0	2,6	–	–	5,3	–	–	–
400	6,8	2,9	2,4	–	6,0	2,1	–	–
450	7,7	3,3	2,7	–	6,8	2,6	–	–
500	8,5	3,7	3,0	–	7,5	3,1	–	–
550	9,4	4,0	3,3	–	8,3	3,6	1,9	–
600	10,2	4,4	3,6	3,2	9,0	4,1	2,2	–
650	11,1	4,8	3,8	3,4	9,8	4,6	2,5	–
700	11,9	5,2	4,1	3,7	10,5	5,1	2,9	–
750	12,8	5,5	4,4	4,0	11,3	5,6	3,2	–
800	–	5,9	4,7	4,2	–	6,1	3,6	–
900	–	6,6	5,3	4,7	–	7,0	4,1	–
1 000	–	7,4	5,9	5,3	–	7,9	4,7	–
1 200	–	8,8	7,1	6,3	–	9,5	5,8	3,6
1 400	–	10,3	8,3	7,4	–	11,2	6,8	4,6
1 600	–	11,8	9,5	8,4	–	12,9	7,9	5,6
1 800	–	–	–	9,5	–	14,6	9,0	6,6
2 000	–	–	–	10,6	–	16,2	10,0	7,6
2 250	–	–	–	11,9	–	18,3	11,3	8,7
2 500	–	–	–	13,2	–	20,4	12,7	9,9
2 750	–	–	–	14,5	–	22,4	14,0	11,0
3 000	–	–	–	–	–	–	15,3	12,2
3 250	–	–	–	–	–	–	16,6	13,3
3 500	–	–	–	–	–	–	–	14,5
3 750	–	–	–	–	–	–	–	15,6
4 000	–	–	–	–	–	–	–	16,8
4 250	–	–	–	–	–	–	–	17,9

Table 7

Belt length multiplier

Required static strand tension (N) — Single belt, banded belt	A	B	C	D	SPA SPA-XP	SPB SPB-XP 5V 5V-XP	SPC SPC-XP	8V 8V-XP
–	Belt length multipliers							
200	1,0034	1,0015	–	–	1,0030	–	–	–
250	1,0043	1,0018	–	–	1,0038	–	–	–
300	1,0051	1,0022	–	–	1,0045	–	–	–
350	1,0060	1,0026	–	–	1,0053	–	–	–
400	1,0068	1,0029	1,0024	–	1,0060	1,0021	–	–
450	1,0077	1,0033	1,0027	–	1,0068	1,0026	–	–
500	1,0085	1,0037	1,0030	–	1,0075	1,0031	–	–
550	1,0094	1,0040	1,0033	–	1,0083	1,0036	1,0019	–
600	1,0102	1,0044	1,0036	1,0032	1,0090	1,0041	1,0022	–
650	1,0111	1,0048	1,0038	1,0034	1,0098	1,0046	1,0025	–
700	1,0119	1,0052	1,0041	1,0037	1,0105	1,0051	1,0029	–
750	1,0128	1,0055	1,0044	1,0040	1,0113	1,0056	1,0032	–
800	–	1,0059	1,0047	1,0042	–	1,0061	1,0036	–
900	–	1,0066	1,0053	1,0047	–	1,0070	1,0041	–
1 000	–	1,0074	1,0059	1,0053	–	1,0079	1,0047	–
1 200	–	1,0088	1,0071	1,0063	–	1,0095	1,0058	1,0036
1 400	–	1,0103	1,0083	1,0074	–	1,0112	1,0068	1,0046
1 600	–	1,0118	1,0095	1,0084	–	1,0129	1,0079	1,0056
1 800	–	–	–	1,0095	–	1,0146	1,0090	1,0066
2 000	–	–	–	1,0106	–	1,0162	1,0100	1,0076
2 250	–	–	–	1,0119	–	1,0183	1,0113	1,0087
2 500	–	–	–	1,0132	–	1,0204	1,0127	1,0099
2 750	–	–	–	1,0145	–	1,0224	1,0140	1,0110
3 000	–	–	–	–	–	–	1,0153	1,0122
3 250	–	–	–	–	–	–	1,0166	1,0133
3 500	–	–	–	–	–	–	–	1,0145
3 750	–	–	–	–	–	–	–	1,0156
4 000	–	–	–	–	–	–	–	1,0168
4 250	–	–	–	–	–	–	–	1,0179

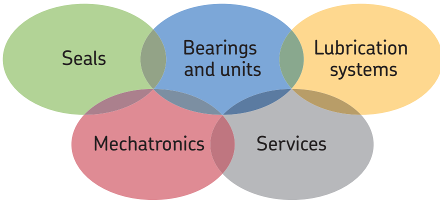
V Belt Pulley Torque Check
V Belt tension setting Check

To enable completion of the Belt Drive assembly to the required best practice, the details of the applied torque settings and belt tension settings need to be properly documented for review. This will ensure the job is completed to the correct standards, and also allow as a check list to makes sure all items are completed - as no margin for error can be allowed (personal health and safety will be compromised otherwise).

Pulley	Taper Bush Size	Required Bolt Torque	Confirmed set bolt torque
Dr			
Dn			

Belt position	Required Tension (from chart)	
1	Actual	
2	Actual	
3	Actual	
4	Actual	
5	Actual	
6	Actual	
7	Actual	
8	Actual	
9	Actual	
10	Actual	
11	Actual	
12	Actual	

* Belt position relates - on Motor pulley, No1 is closest to the motor.



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