Maintenance
& Troubleshooting Guide

Warning & Safety Reminder

Safety must be considered a basic factor in machinery operation at all times. **Most accidents are the results of carelessness or negligence.** All rotating power transmission products are potentially dangerous and must be guarded by the contractor, installer, purchaser, owner, and user as required by applicable laws, regulations, standards, and good safety practice. Additional specific information must be obtained from other sources including the latest editions of American Society of Mechanical Engineers; Standard ANSI B15.1. A copy of this standard may be obtained from the American Society of Mechanical Engineers at 345 East 47th Street New York, NY 10017 (212705-7722).

It is the responsibility of the contractor, installer, purchaser, owner, and user to install, maintain, and operate the parts or components manufactured and supplied by Martin Sprocket & Gear, Inc., in such a manner as to comply with the Williams-Steiger Occupational Safety Act and with all state and local laws, ordinances, regulations, and the American National Standard Institute Safety Code.

Caution

All OSHA Lock Out/Tag Out procedures are to be properly followed prior to removal of any guards, access doors or covers for inspection or general maintenance. Failure to follow these instructions may result in severe personal injury and/or property damage.

Notice

Troubleshooting guidelines are to be used as a general rule of thumb to fix common problems associated with power transmission and material handling equipment using Martin products. These guidelines are in no way intended to replace, supersede or override equipment manufacturer's installation and operating guides. Martin publishes this information to be used by trained professionals. There is no warranty or guarantee either expressed or implied with respect to the troubleshooting guidelines. In no event shall Martin be held liable for any damage to equipment arising from the use of these guidelines, or failure to follow the equipment manufacturer's installation and operating guide. **The safety reminder and cautionary note is not meant to be a comprehensive analysis of all potential safety hazards, and is provided solely to call your attention to general safety concerns when operating power transmission and material handling equipment. Martin accepts no responsibility for any failure to follow the safety recommendations noted above.** For specific troubleshooting recommendations concerning any product Martin sells, please contact Martin.

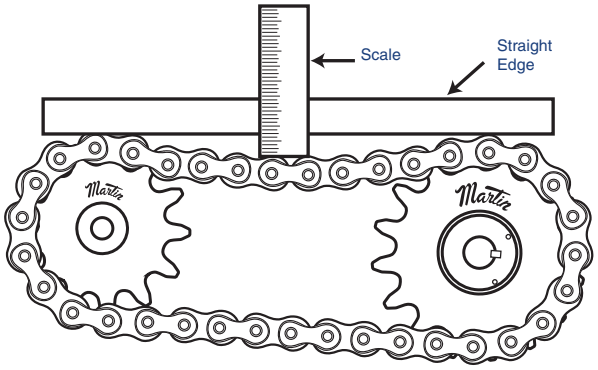
Table of Contents

Chain Drives

PROPER TENSIONING

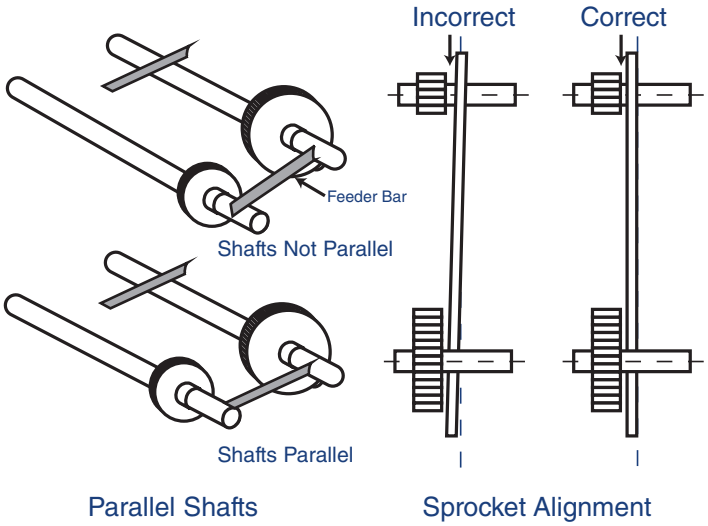
SAG IN INCHES BASED ON 2% OF SPROCKET CENTERS

Sprocket centers in inches	20	30	40	50	60	70	80	90	100	125
Sag in Inches	1/5	5/8	7/8	1	1-1/4	1-1/2	1-5/8	1-7/8	2	2-1/2



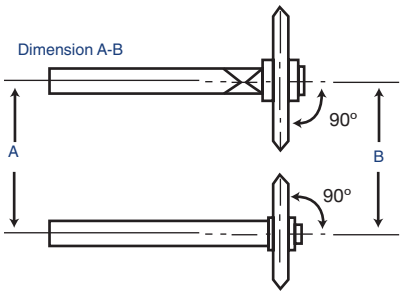
If a straight edge is placed from the top of one sprocket to the top of the other sprocket on a horizontal drive, the maximum sag should be between 2-4% of the center distance.

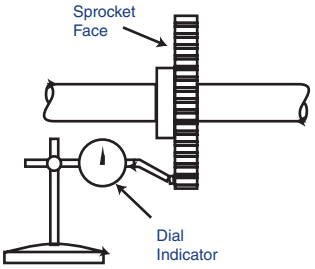
PROPER INSTALLATION & ALIGNMENT



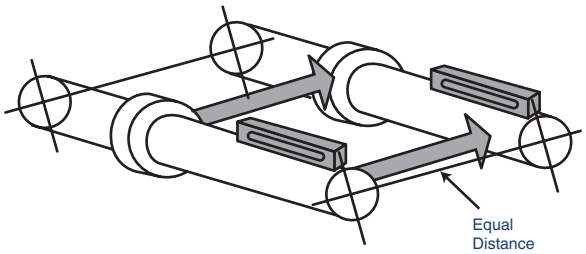
PROPER INSTALLATION & ALIGNMENT

To assure correct alignment, the following steps are recommended:
Check to determine if the sprocket is positioned axially square on the shaft.
Use a dial indicator as shown.



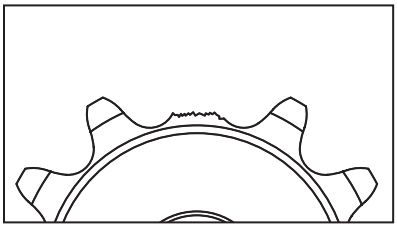


Level the shafts using a machinists level.

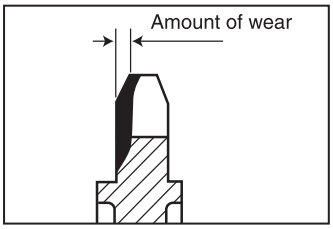


Type of Maintenance	What to Do
Lubrication — Type A	• **Manual Lubrication**, oil applied periodically brush or spout can. • **Drip lubrication**, oil applied between link plates edges from a drip lubricator.
Lubrication — Type B	• **Oil bath** or oil slinger, oil level maintained in casing at predetermined height.
Lubrication — Type C	• **Oil stream**, oil supplied by circulating pump inside chain loop on lower span.
Check for Chain Stretch	• **If chain elongation exceeds 3%**, replace with new chain. Check length after first 1,000 hours.
Check Sprocket	• **If teeth have a hooked appearance**, replace. Initial inspection 24 hours, second 100 hours, third 500 hours. Periodically thereafter, check chain length, may be elongated.
Check Alignment	**If wear is apparent** on inner surface of roller link side-bars and on sides of sprocket teeth, there is misalignment. Realign sprockets.
Check for Drive Interference	• **Check drive for interference from other parts of equipment** with the drive. If there is interference, correct immediately. Chain failure could result.
Check for Failure	• **Inspect the chain** for deformed, cracked and/or broken parts. If signs exist, replace the entire chain.

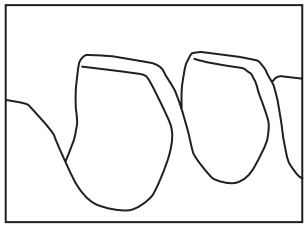
Chain Drives



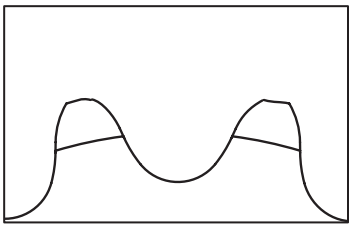
Broken teeth



Wear on side of sprocket teeth



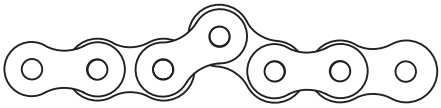
Asymmetrical tooth wear



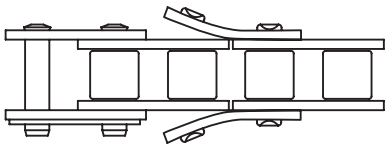
Wear on tips of sprocket tooth

Troubleshooting	Probable Cause / Corrective Action
Broken Sprocket Teeth	• **If cast iron**, replace with Martin stock steel sprockets (available hardened in pinion sizes). • **Reduce shock load** or redesign and replace with a larger drive. • **Check alignment**. If out of alignment, correct any misalignment. • **Replace sprocket**, might be excessively hardened. Should be RC40-50.
Wear on Sprockets or Rollers Non symmetrical	• **Realigning** nonparallel shafts or shafts not in the same plane. • **Check shafts**. Shafts might be bent, or shaft bearings worn.
Wear on Side of Sprocket Teeth or Inside of Roller Plates	• **Check sprocket alignment.** Sprockets that are offset or not parallel should be realigned.
Wear on Tips of Sprocket Teeth	• **Check chain**. Chain elongation is excessive and chain should be replaced.
Chain Climbs Sprocket	• **Excessive chain slack.** Retension chain, replace if necessary. • **Excessive sprocket wear.** Replace chain and sprocket or replace chain if worn. • **Not enough teeth on sprocket.** Redesign drive for more teeth in contact if insufficient chain wrap. Or use Martin chain tighteners. Should have at least 17 teeth in small sprocket. • **Foreign material on drive.** Provide cover for chain drive when material builds up in the tooth pocket of the sprocket. Or “mud reliefs” may be helpful. • **Excessive chain wear.** Replace chain. • **Excessive chain load.** Replace chain. Eliminate cause of overload.
Chain Clings to Sprocket	• **Excessive sprocket wear.** Replace sprockets and chain. • **Sprocket misalignment.** Replace sprockets and chain if needed. Realign sprockets.
Excessive Noise	• **Obstruction.** Eliminate interference. Replace chain. • **Sprocket misalignment.** Replace chain and/or sprocket(s) if worn. Driver should have hardened teeth. Realign sprocket, lubricate chain and sprocket drive. • **Loose casing or shaft mounts.** Tighten fasteners and align supports, casing, and chain. • **Excess chain slack.** Retension chain. • **Excessive chain wear.** Replace and retension chain. • **Excessive sprocket wear.** Inspect chain and sprocket for damage. Replace sprocket and chain. • **Inadequate lubrication.** Reastablish proper lubrication procedures. Replace chain if needed. • **Chain pitch too large.** Redesign drive for smaller pitch chain. • **Too few sprocket teeth.** Check to see if larger sprockets can be used. If not, redesign drive using smaller chain pitch.
Excessive Link Plate Wear and/ or Sides of Sprocket Teeth	• **Sprocket misalignment.** Replace sprockets and chain if needed. Realign drive. Retension chain.
Excessive Vibration	• **Possible broken or missing roller.** Replace or repair chain. Check shaft bearing supports, bearings may be worn or broken.

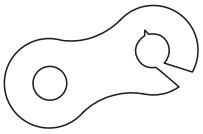
Chain Drives



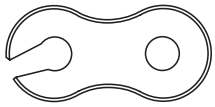
Tight Joints



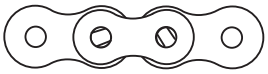
Broken Pins



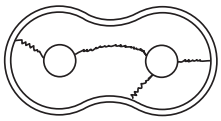
Fatigue Failure



Broken Link Plate

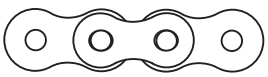


Turned Pins

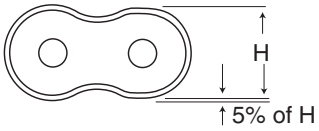


Cracked Link Plates

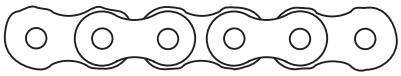
Deformed Rollers



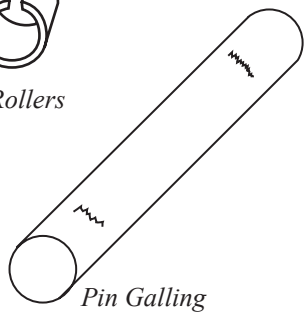
Enlarged Holes



Worn Link Plate Contours



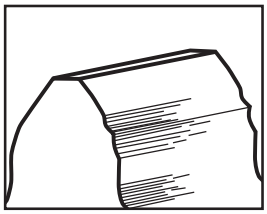
Battered Link Plate Edges

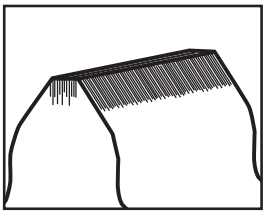


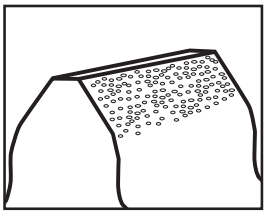
Pin Galling

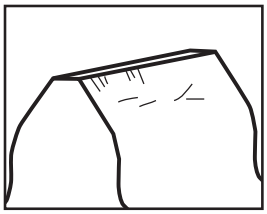
Troubleshooting	Probable Cause / Corrective Action
Tight Joints	• **Foreign material or dirt in chain joints**. Clean and lubricate chain. • **Misalignment.** Replace sprockets and chain if needed. Realign sprockets. • **Inadequate lubrication.** Replace chain. Reastablish proper lubrication. • **Internal corrosion or rust.** Replace chain. Eliminate cause of overload.
Rusty Chain	• **Exposed to moisture. Replace chain.** Protect from moisture. • **Inadequate lubrication.** Provide proper lubrication. Replace chain, if needed. • **Water in lubricant. Change lubricant.** Protect lubrication system from water. Replace chain.
Turned Pins	• **Inadequate lubrication.** Replace chain. Reastablish proper lubrication.
Enlarged Holes	• **Overload.** Replace chain. Eliminate cause of overload.
Pins Broken **Link Plates Broken**	• **Extreme overload.** Replace chain. Replace sprockets if indicated. Eliminate cause of overload or redesign drive for larger pitch chain.
Missing / Broken Parts **Missing / Broken Cotters**	• **Cotters installed improperly.** Install new cotters per manufacturers instructions. • **Vibration.** Replace chain. Reduce vibration. Use larger sprockets. • **Excessively high speed.** Reduce speed. Replace chain. Redesign drive for smaller pitch chain.
Broken, Cracked or Deformed Chain Rollers	• **Speed too high.** Replace chain. Reduce speed. • **Sprockets too small.** Replace chain. Use larger sprockets, or possibly redesign drive for smaller pitch chain. • **Chain riding too high on sprocket teeth.** Replace chain. Increase frequency that chain is retensioned.
Pin Galling	• **Inadequate lubrication.** Reduce speed or load. Possibly redesign drive for smaller pitch chain. Provide or reastablish proper lubrication.
Exposed Chain Surfaces Corroded or Pitted	• **Exposure to corrosive environment.** Replace chain. Protect from hostile environment.
Cracked Link Plates	• **Exposure to corrosive environment combined with stress from press fits.** Replace chain. Protect from hostile environment.
Cracked Link Plates (fatigue)	• **Loading greater than chain's dynamic capacity.** Replace chain. Reduce dynamic loading or redesign drive for larger chain.
Battered Link Plate Edges	• **Chain striking an obstruction.** Replace chain. Eliminate interference.
Worn Link Plate Contours	• **Chain rubbing on casing, guide, or obstruction.** Replace chain if 5% or more of height worn away. Retension chain. Eliminate interference.

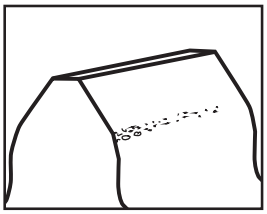
Gear Drives

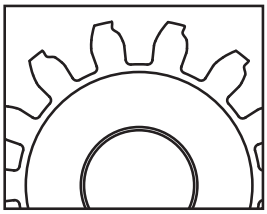

Abrasive Wear

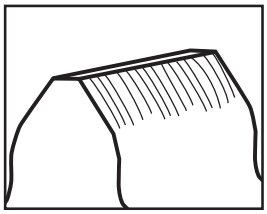

Burning

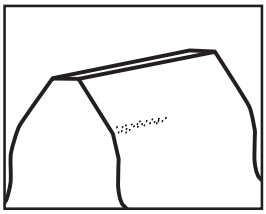

Corrosive Wear

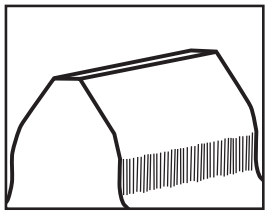

Cracking

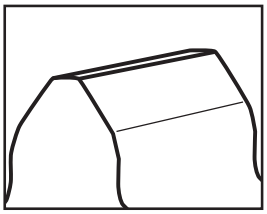

Destructive Pitting

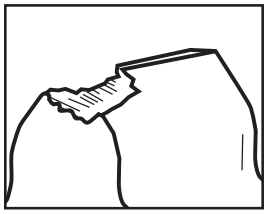

Fatigue Breakage

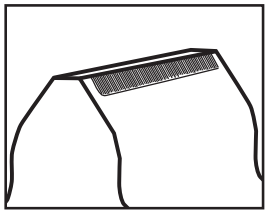

Grinding Checks

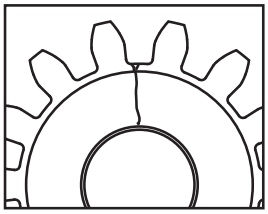

Initial Pitting

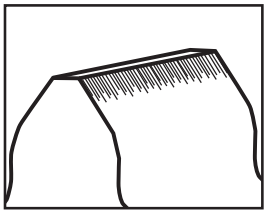

Interference

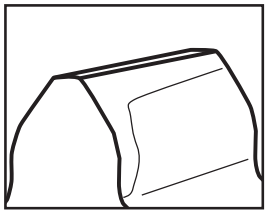

Normal Wear

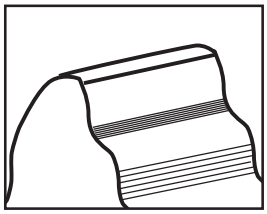

Overload Breakage

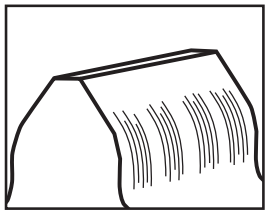

Overload Wear

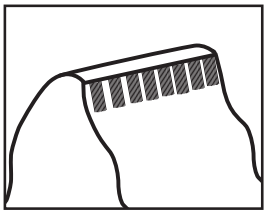

Quenching Cracks

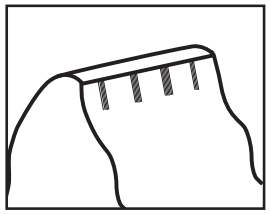

Ridging

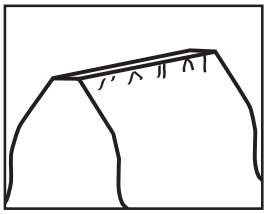

Rippling


Rolling and Peening


Scratching


Severe Scoring


Slight Scoring


Spalling

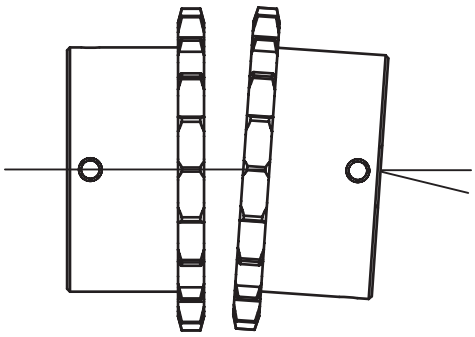
Type of Maintenance	What to Do
Proper Lubrication	• As recommended by your lubrication supplier. Contact for details.
Inspect for Wear and Alignment	• Initial inspection 24 hours, second 100 hours, third 500 hours. Once a year thereafter. Check tooth contact pattern for full-face contact.

Troubleshooting	Probable Cause / Corrective Action
Abrasive Wear Caused by small, hard particle contamination in oil causing scratches on gear teeth as they make contact.	• **Drain** and flush residual oil. • **Thoroughly clean internal surfaces** of gear housing by scraping flushing and wiping. • **Clean and flush** out any oil passages. • **Refill the housing** with a light flushing grade oil and run without load for 10 minutes. • **Clean breathers** and replace seals and filters. • **Check environment** for possible contamination. • **Drain** the flushing oil and refill with recommended oil.
Corrosive Wear Caused by chemical reaction resulting from acid coming in contact with metal. Usually identified by a stained or rusty appearance.	• **System overload.** Reduce the load or upgrade system. • **Use extreme pressure lubricant** if a system overload can not be corrected. • **Incorrect grade lubricant**. Check with manufacturer for recommended lubrication. • **Maintenance recommendations not being followed.** Check with manufacturer for correct maintenance procedures. Increase oil change frequency.
Electrical Pitting An electric arc discharge across the film of oil between mating gear teeth.	• **Ground clamp.** Place a ground clamp on the same side of a bearing box when welding. • **Ground straps.** Run grounding straps from a machine to rigid electrical or pneumatic piping to reduce static electricity created by manufacturing processes. • **Check electric system** for proper installation and grounding.

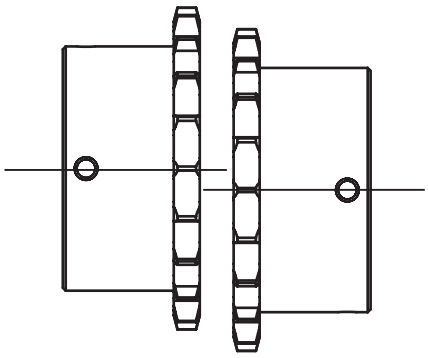
Gear Drives

Troubleshooting	Probable Cause / Corrective Action
Rolling and Scuffing Is created when gear teeth do not mesh properly and continues until total damage has occurred.	• **Rolling** is the deforming of metal on the active portion of gear teeth caused by high contact stresses. The displacement of surface materials forms grooves along the pitch line and burrs on the tips of drive gear teeth. • **Scuffing** is the severe adhesion that causes the transfer of metal from one tooth surface to another due to welding and tearing. Scuffing generally occurs in localized patches due to the surface area of meshed teeth being mismatched or misaligned. • **Improper meshing of the teeth**. Improper adjustments including radial/axial misalignment, improper end play and out-of-tolerance backlash.
Fatigue Wear Is gear wear created by repeated stresses below the tensile strength of the material. Fatigue may be identified as cracks or fractures.	• **Fatigue crack** is a crack in a gear that occurs due to bending, mechanical stress, thermal stress, or material flaws. • **Fatigue fracture** is breaking or tearing of gear teeth. Fatigue cracks usually culminate in a fracture when the fatigue crack grows to a point where the remaining tooth section can no longer support the load. Fatigue wear begins at the first moment a gear is used. • **Fatigue wear** is repeated minute deformations under normal stress (normally unseen and immeasurable) that eventually produce cracks or fractures.
Plastic Flow Failure	• **A type of deformation in surface**. It is a result of high contact stresses with sliding and rolling action of meshing gear teeth. It is a cause for cold working of the tooth surfaces. Normally occurs in softer gear materials, but can occur even in heavily loaded case hardened gears.
Rippling Plastic Flow Failure	• **Rippling is a regular occurrence on hardened gear surfaces**. Rippling in advanced stages can be dangerous.
Ridging Plastic Flow Failure	• **Ridging occurs by the combined action of compressive stress** that has high contact and a low sliding velocity. Heavily loaded worm drives and hypoid and pinion gear drives are more frequently affected.
Surface Fatigue Failure	• **Is the failure of a material** as a result of repeated surface or sub-surface stresses beyond the endurance limit of the material.
Surface Fatigue Failure Pitting	• **Initial Pitting** is caused by local areas of high stress due to uneven surfaces on the gear tooth.
Surface Fatigue Failure Spalling	• **Spalling** is similar to pitting, but the pits may be bigger, shallow and non uniform. Typical symptoms are quick breaking away of the edges of pits, formation of large and irregular interconnected voids. Cause of Spalling is exceedingly high contact stress levels.
Excessive Gear Wear	• **Check HP requirement** for possible replacement with hardened gears of same size. Or replace with gears having greater face width. See Martin Catalog - Gear Section. • **Possible redesign of drive with more capacity.** Check Martin Catalog - Gear Section. • **Check environmental abrasiveness,** provide cover as needed with replacement of hardened gears. Check for proper lubrication.
Excessive Drive Noise	• **Improper backlash.** Check gear set for proper backlash. Adjust as necessary. • **Misaligned drive.** Realign as necessary. • **Worn gears.** Replace as necessary. • **Drive speed too high.** Check pitch line velocity.
Gear Breakage	• **Overload or shock load.** Eliminate overload or shock load conditions. Replace drive with wider gears or 20° P.A. gears. • **Contaminants entering drive.** Provide adequate cover for environmental material surrounding drive.
Disfiguration of Gear Tooth	• **Overload.** Remove overload condition. Replace with hardened gears or wider gears.

Chain Couplings



Angular Misalignment



Offset Misalignment

Adjust angular misalignment so that the width of the tooth surface is the same around the circumference of the sprockets. The allowable angular misalignment is approximately 1°. Adjust the offset misalignment to less than 2% of chain pitch.

Type of Maintenance	What to Do
Lubrication	• **Check after initial 100 hours for leakage.** Change lubricant once per year thereafter.
Check Alignment	• **Disassemble after initial 100 hours**. Check for excessive wear. If misaligned, wear patterns will appear very uneven. If necessary, realign shafts and replace worn coupling parts.

Troubleshooting	Probable Cause / Corrective Action
Premature Chain Wear	• **Provide adequate lubrication**. Provide with sealed cover for longer life. Check for excessive radial misalignment and/or excessive end float. Realign shafts to eliminate most of misalignment. Check for sudden shock loads. If they are present then it may be necessary to change from chain couplings to more flexible type couplings such as Martin-Flex® or Quadra-Flex®.
Chain Breakage	• **Provide adequate lubrication**. Provide with sealed cover for longer life. Check for excessive radial misalignment and/or excessive end float. Realign shafts to eliminate most of misalignment. If not provided with cover, check for foreign objects near or in coupling, provide with cover. Check for sudden shock loads, if present go to larger coupling or go to more flexible type couplings such as Martin-Flex® or Quadra-Flex®.
Excessive Noise	• **Check chain and sprockets** to make sure they are not worn, or have broken pin links. Replace if necessary. Chain may be striking inside of cover.
Excessive Vibration	• **Loose or damaged chain or sprocket, unbalanced, misalignment.** Visually inspect coupling, replace chain, sprocket or both. Balance and realign if necessary.
Leaking Lubricant	• **Damaged chain cover, excessive speeds, incorrect lubricant consistency or excessive lubricant.** Visually or stroboscopic inspection, replace cover, correct speed, or replace lubricant as necessary.
Excessive Temperature	• **Unbalance, misalignment, excessive loads or speeds, insufficient, improper or excessive lubricant.** Temperature can be checked using infrared temperature device or thermographic scan.
Noise and Vibration	• **Visual inspection.** Stop coupling, remove the chain cover and inspect the chain for damaged links or rollers, worn or broken sprocket teeth and misalignment that is evident by wear on one side of the chain or sprocket teeth. Inspect keys and keyways for wear or fatigue. If the chain, sprockets, key and keyways are damaged in any way, replace the coupling.
Excessive Temperature	• **Infrared temperature device or thermographic scan**. Unbalance, misalignment, excessive loads or speeds, insufficient, improper or excessive lubricant.

Troubleshooting guidelines are to be used as a general rule of thumb.
*For specific troubleshooting recommendations concerning unique problems contact **Martin**.*

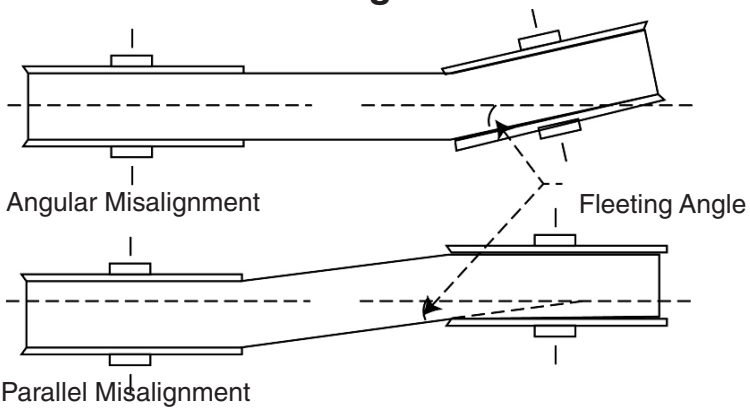
Jaw Couplings

Troubleshooting	Probable Cause / Corrective Action
Jaw Breakage	• **Buna-N Insert failed causing metal to metal contact.** Replace with Hytrel® or urethane spiders. Hytrel® withstands oil products better than urethane or Buna-N. Hytrel® will not withstand hot water. Urethane withstands water better. Eliminate overload or shock load conditions. Replace drive with new MS jaw coupling. Carries approximately 20% higher capacity.
Rubber Element Failure	• **Buna-N insert failed due to horsepower applied to coupling greater than insert can withstand.** Replace with Hytrel® spider, which can withstand 3 times Buna-N horsepower capacity. • **Check misalignment.** Coupling can only handle up to 1° angular misalignment.
Excessive Drive Noise	• **Check jaw set for proper fit.** May have wrong insert in coupling. • **Misaligned drive.** Realign drive. • **Worn couplings.** Replace as necessary. • **Drive speed too high**, check shaft RPM. • **Loose or missing bolts, broken, cracked or loose bolts or disc(s), loose key or damaged shaft keyway, misalignment, unbalanced.**
Excessive Vibration	• **Loose or missing bolts, broken, cracked or loose disc(s), loose key or damaged shaft keyway, or key of incorrect length or weight.** Stroboscopic (for visual inspection) while the coupling is rotating. Any erratic behavior of the component being “strobed” suggests that component is vibrating. Further analysis should be made to determine the direct cause of the vibration.
Excessive Temperature	• **Unbalanced, misalignment, excessive loads or speeds.**

Quadra-Flex® Couplings

Troubleshooting	Probable Cause / Corrective Action
Element Failure	• **Check for alignment**. Can handle up to 1° angular and up to .062 parallel offset misalignment. • **Check for proper installation.** May be installed in an application not suited for the coupling; i.e., an internal combustion engine, reciprocating pump, compressor, or fan and propeller blades.
Teeth Worn on One or Both Sides of Sleeve	• **Caused by excessive misalignment.** Realign coupling. • **Improper service factor.** Check design, go to larger coupling.
Sleeve Ruptured	• **Caused by shock loads.** Use a larger coupling. • **Critical speed.** Check for excessive vibrations.
Wire Ring Comes Loose	• **Caused by overload.** Use a larger coupling.
Excessive Compression Set or Permanent Wind-up	• **Caused by overload.** Use a larger coupling.
Crack in Sleeve at 45°	• **Caused by flex fatigue.** Normal mode of failure, if premature, use a larger coupling.
Noise	• **Loose bolts, ripped or torn rubber, loose key or damaged shaft keyway, misalignment, unbalanced.** Visual inspection: repair replace or re-align.
Excessive Temperature	• **Unbalanced, misalignment, excessive loads or speeds, inappropriate guard.**
Sleeve Thrown Out of Coupling	• **Caused by shock load.** Free machine of material causing jam, check for misalignment. • **Caused by overspeed.** Reduce speed of coupling.
Element Deterioration	• **If elements are deteriorating due to heat or solvents** check sleeve chemical resistance from table in Martin catalog. • **TPR (Thermo-Plastic Rubber)** can operate in conditions of extreme temperatures 50°F to +250°F and in oily or wet conditions. • **Neoprene** can operate in temperatures of 0°F to +250°F. • **Hytrel®** can operate in temperatures of -65°F to +250°F and oily conditions. Hytrel® will not withstand hot water.

Drive Alignment



These ranges of deflection forces are applicable for drive installation. Actual operation tension depends on the number of teeth mesh, system rigidity, peak loads, etc.

Belt Pitch	Belt Width	Force*	Belt Pitch	Belt Width	Force*
5mm	9mm	9 to 18 oz	14mm	40mm	10 to 13 lb
	15mm	1 to 2 lb		55mm	15 to 18 lb
	25mm	1½ to 3 lb		85mm	23 to 28 lb
8mm	20mm	3 to 4 lb		115mm	32 to 39 lb
	30mm	5 to 6½ lb		170mm	48 to 57 lb
	50mm	9 to 12 lb		115mm	45 to 55 lb
	85mm	16 to 20 lb		170mm	70 to 85 lb
			20mm	230mm	95 to 120 lb
				290mm	120 to 150 lb
				340mm	145 to 180 lb

***Force applies to speeds exceeding 600 RPM.**

Type of Failure	Probable Cause / Corrective Action
Excessive Edge Wear (Exposed Tensile Member)	• **Misalignment or nonrigid centers.** Check alignment and/or reinforce mounting. • **Bent flange.** Straighten flange.
Jacket Wear on Pressure-Face Side of Belt Tooth	• **Excessive overload and/or excessive belt tightness.** Reduce installation tension and/or increase drive load-carrying capacity.
Excessive Jacket Wear Between Belt Teeth (Exposed Tension Members)	• **Excessive installation tension.** Reduce installation tension.
Cracks in Neoprene Backing	• **Exposure to excessive low temperature (below 30°F).** Eliminate low temperature condition or consult factory for proper belt construction.
Softening of Neoprene Backing	• **Exposure to excessive heat (+200°F) and/or oil.** Eliminate high temperature and oil condition or consult factory for proper belt construction.
Tensile or Tooth Shear Failure Indicating Corrosion of Tension Member (rust)	• **Small or sub-minimum diameter pulley.** Increase pulley diameter or use next smaller pitch with same P.D. • **Extreme humidity.** Eliminate humidity or refer to factory for belt construction. • **Acid or caustic atmosphere**. Refer to factory for belt construction.

Note: When HP rating is adequate, using multiple belts in matched sets, rather than a single wide belt, will reduce sound emission. Effective noise reduction for power transmission drives can be accomplished by incorporating a flexible noise-absorbing material such as acoustical-grade glass fiber with the protective guard. The guard design must allow a cooling air passage on the top and bottom to prevent overheating the drive.

Synchronous Drives - Timing Belt Drives

Allowable Working Tensions (T.) in Pounds

Belt Width			¼	5/16	⅜	7/16	½	⅝	¾	⅞	1	1¼	1½	1¾	2	2½	3	3½	4	5	6	7	8	9	10	11	12	13	14
Belt Pitch	XL	⅛"	6	8	11	14	17	23	29	35	41	53	64																
	L	⅜"			15	19	23	31	39	47	55	71	86	101	118	150	185												
	H	½"					59	80	99	120	140	181	218	258	300	381	470	568	666	861	1050	1245	1445						
	XH	⅞"									191	246	298	351	409	520	642	775	909	1175	1433	1698	1971	2235	2502	2752	3025	3278	3555
	XXH	1¼"									234	302	365	431	501	636	786	950	1114	1439	1755	2080	2415	2738	3065	3372	3707	4015	4357
Width Factor			.15	.21	.28	.35	.42	.57	.71	.86	1.0	1.29	1.56	1.84	2.14	2.72	3.36	4.06	4.76	6.15	7.50	8.89	10.32	11.70	13.10	14.41	15.84	17.16	18.62

Shaded Areas are Stock Width Belts

Type of Failure	Probable Cause / Corrective Action
Excessive Pulley Tooth Wear (On Pressure-Face and/or O.D.)	• **Excessive overload and/or excessive belt tightness.** Reduce installation tension and/or increase drive load-carrying capacity. • **Insufficient hardness of pulley material.** Surface-hardened pulley or use harder material.
Unmounting of Flange	• **Incorrect flange installation.** Reinstall flange correctly. • **Misalignment.** Correct alignment.
Excessive Drive Noise	• **Misalignment.** Correct alignment. • **Excessive installation tension.** Reduce tension. • **Excessive load.** Increase drive load-carrying capacity. • **Sub-minimum pulley diameter.** Increase pulley diameter.
Tooth Shear	• **Less than 6 teeth in mesh (TIM).** Increase TIM or use next smaller pitch with same P.D. • **Excessive load.** Increase drive load-carrying capacity.
Apparent Belt Stretch	• **Reduction of center distance or nonrigid mounting.** Retension drive and/or reinforce mounting.
Cracks or Premature Wear at Belt Tooth Root	• **Improper pulley groove top radius.** Regroove or install new pulleys.
Tensile Break	• **Excessive load.** Increase load-carrying capacity of drive. • **Sub-minimum diameter.** Increase pulley diameters.
Apparent Belt Stretch	• **Reduction of center distance or nonrigid mounting.** Retension drive and/or reinforce mounting.
Cracks or Premature Wear at Belt Tooth Root	• **Improper pulley groove top radius.** Regroove or install new pulleys.
Tensile Break	• **Excessive load.** Increase load-carrying capacity of drive. • **Sub-minimum diameter.** Increase pulley diameters.
Teeth Wearing Unevenly	• **Shafts might not be parallel causing belt to pull one side. Abrasion material may be on teeth or enmeshed into belt.** Check alignment of shafts.
Belt Breakage	• **Improper size for torque loading.** Check proper sizing procedures. • **Too much load.** May be severe shock load, may need to go to chain drive instead of belt drives. • **Under designed drive.** Redesign drive. • **Sharp bend damaged tensile cord.** Follow proper storage and handling procedures. • **Belt was pried or forced on the drive.** Follow proper installation procedures. • **Foreign object in drive.** Shield drive. • **Belt runs onto pulley flange.** Align pulleys.

Synchronous Drives - Timing Belt Drives

Troubleshooting	Probable Cause / Corrective Action
Apparent Belt Stretch	• **Reduction of center distance or nonrigid mounting.** Retension drive and/or reinforce mounting. • **Pulley teeth poorly machined or worn.** Replace pulleys. Install cover if drive is dusty. • **Sudden equipment stops.** Increase deceleration time or redesign drive. • **Belt does not engage pulley teeth.** Retension drive.
Tooth Shear	• **Less than 6 teeth in mesh.** Redesign drive, install back side idler, or use next smaller pitch. • **Excessive load.** Redesign drive.
Tensile or Tooth Shear Failure	• **Pulley diameter too small.** Increase pulley diameter or use next smaller pitch. • **Exposure to acid or caustic atmosphere.** Protect drive or ask Martin about special construction belt.
Excessive Pulley Tooth Wear (On Pressure Face and/or O.D.)	• **Drive overload and/or excess belt tension.** Reduce installation tension and/or increase drive load carrying capacity. • **Insufficient hardness of pulley material.** Use harder material or surface-hardened pulley.
Excessive Jacket Wear Between Teeth, Exposed Tensile Cord	• **Excessive installation tension.** Reduce installation tension.
Excessive Noise	• **Misalignment.** Realign drive. • **Excessive installation tension.** Reduce tension. • **Excessive load.** Increase drive load carrying capacity. • **Pulley diameter too small.** Increase pulley diameter.
Cracks in Belt Backing	• **High temperatures.** Improve ventilation, remove heat source, or check with Martin for special construction belt.
Softening of Backing	• **Excess heat (over 200°F) and/or oil.** Lower ambient temperature, protect from oil, or ask Martin about special belt construction.
Excessive Edge Wear	• **Misalignment or nonrigid centers.** Realign drive and/or reinforce mounting. • **Bent flange.** Straighten flange.
Unmounting of Flange or Flange Wear	• **Incorrect flange installation.** Install flange correctly. • **Misalignment.** Realign drive.
Ratcheting	• **(Synchronous equivalent to slipping) Caused by improper tensioning, excessive loads, or inadequate bracketry that allows the center distance to give when a load is applied.** Replace belt and re-evaluate the load.

V-Belt Drives

Sheaves should be checked for wear every time you change a belt!

Normal Sheave (Uniform Angle) Worn Sheave (Dished Out)

WARNING
When performing any type of inspection / maintenance, always observe proper safety procedures.
ALWAYS LOCK OUT / TAG OUT POWER!

Indications of sheave wear include:

- Belts are turning over.
- Belts wear out faster than normal.
- Belts are "bottoming" out.
- Belt dressing is used to quiet drive (not enough tension or worn grooves).
- Belts appear to be "mismatched".

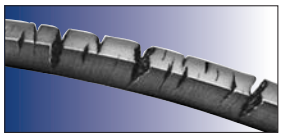
If wear is present, replace them with Martin Sheaves.

Martinz offers:

- Instant availability QD and Taper Bushed.
- The best MTO capability - cast iron, ductile and steel.
- Expertise in personnel to assist your efforts.
- Complimentary Groove Gauges available for customer inspection.

V-BELT DRIVE TROUBLESHOOTING

Cracked V-Belt



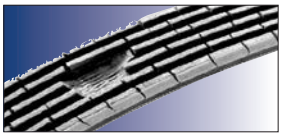
Cause:

- Sheave diameter too small
- Back side idler diameter too small
- Slippage
- High temperature

Prevention:

- Redesign drive
- Replace with an inside idler on slack side or
- Redesign retension drive
- Remove heat source

Cracking or Chunking



Cause:

- Severe back-bend idlers
- Improper or prolonged storage
- Excessive ambient operating temperature

Prevention:

Check storage conditions and age of belt. If back-bend idler cannot be avoided, install idler of larger diameter. Avoid ambient temperature over 1400 ºF.

Missing Cog

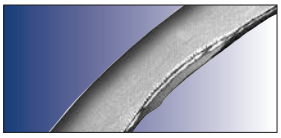
Cause:

- Excessive Heat
- Sheaves Too Small
- Backside Idler
- Sheaves Misaligned
- Improper or Prolonged Storage

Prevention:

- Check storage conditions
- If backend idler cannot be avoided, install one of larger diameter
- Avoid ambient temperature over 1400
- Redesign drive using sheaves of proper size

Rapid Sidewall Wear



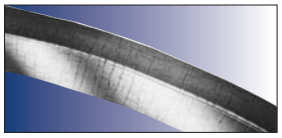
Cause:

- Worn or damaged sheaves
- Sheaves misaligned

Prevention:

- Replace sheaves
- Align sheaves

Glazed Belt



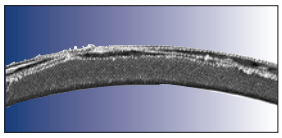
Cause:

- V-Belt Slippage

Prevention:

- Check tension, increase if necessary
- Overloaded drive, Reduce loads
- Sheave worn, belt bottoming in groove - shiny sheave groove bottom - Replace Sheave
- Oily drive conditions

Worn Belt Sides



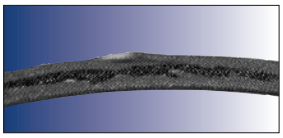
Cause:

- Misalignment
- Grit or Dirt
- Normal Wear

Prevention:

- Align sheaves
- Replace belts as required

Belt Swelling



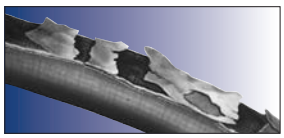
Cause:

- Oil softened rubber

Prevention:

Splash guards will protect drives against oil. Even with oil resistant belts, excessive oil can cause damage.

Cover Fabric Rupture



Cause:

Cover fabric ruptured when belt was pried over sheave during installation.

Prevention:

Proper installation of belts by moving motor so belts do not have to be pried into the grooves.

Slip or Spin Burn

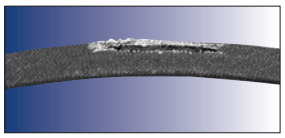
Cause:

- Belt too loose
- Belt slips under starting or stalling load.
- Load miscalculated - Drive under designed

Prevention:

- Maintain proper tension on drive
- Redesign drive

Belt Cover Splits



Cause:

- Belt pried or misplaced slack
- Foreign object in groove

Prevention:

- Maintain proper tension on drive
- Proper installation of belts by moving motor so belts do not have to be pried into the grooves
- Dust guards help protect against foreign particles

V-Belt Drives

Type of Failure	Probable Cause / Corrective Action
Rapid Failure With No Visible Reason	• **Worn sheave grooves** (Use groove gauge to check)**.** Replace sheaves. • **Tensile cord damage through improper installation.** Replace all belts with a new set, check for proper installation. • **Drive is under designed.** Redesign drive. • **Wrong type or cross section belt.** Replace all belts with correct type, check for proper installation. • **Sheave diameter too small.** Redesign drive. • **Foreign substance caught between belts and sheave.** Shield the drive with drive guard.
Soft, Sticky, Swollen Sidewalls Low Adhesion Between Plies	• **Oil or grease on belt or sheave.** Clean belts and sheave with degreasing agent or detergent and water. Remove source of oil or grease. Install splash guards to protect drives from oil.
Dry, Hard Sidewalls. Use Low Adhesion Between Plies. Cracked Belt Bottom	• **Excessive high temperature.** Remove heat source. Improve ventilation.
Deterioration of Rubber	• **Belt dressing being used.** Don't use belt dressing. Clean belts and sheaves with degreasing agent or detergent and water. Tension belts properly.
Rapid Sidewall Wear	• **Worn or damaged sheaves.** Replace sheaves.
Broken Belts	• **Foreign object in drive.** Shield drive with drive guard.
Spin Burns	• **Belts slip under starting or stalling load.** Check belt tension — retension drive if necessary. • **Sheave diameter too small.** Redesign drive. • **Load miscalculated — drive underdesigned.** Redesign drive.
Cut Bottom	• **Improper installation.** Replace all belts with a new set, check for proper installation. • **Foreign object in drive.** Shield drive with drive guard. • **Belt was run off sheave.** Check for proper tension and alignment.
Cracked Bottom	• **Excessive high temperature.** Remove heat source. Improve ventilation. • **Back side idler too small.** Replace with an inside idler on slack side, or redesign. • **Sheave diameter too small.** Redesign drive. Use cogged belts. • **Slippage.** Retension drive.
Extreme Cover Wear, Worn Corners	• **Sheaves rusted, sharp corners or burrs on sheaves.** Repair or replace sheaves. • **Dirt on belt.** Clean belt, shield drive. • **Sheaves misaligned.** Realign sheaves. • **Belts rub against guard or other obstruction.** Remove obstruction or check drive alignment • **Improper tension.** Retension drive.
Improper DriveN Speed Incorrect DriveR to DriveN Ratio	• **Design error.** Redesign drive.
Belts Stretch Equally	• **Overloaded or underdesigned drive.** Redesign drive. • **Insufficient take-up allowance.** Check take-up and follow guidelines.
Belts Stretch Unequally	• **Tensile cord broken from improper installation.** Replace all belts with a new set, check for proper installation. • **Misaligned drive.** Realign drive. • **Mismatched belts.** Use matched or combo (banded) belts.

V-Belt Drives

Type of Failure	Probable Cause / Corrective Action
Belt Turnover	• **Misaligned sheaves.** Realign sheaves. • **Belt under tensioned.** Retension drive. • **Severe vibration and shock loads.** Use Combo belts. • **Incorrectly placed flat pulley.** Position idler on slack side of drive, as close as possible to DriveR sheave. • **Worn sheave grooves (Use groove gauge to check).** Replace sheaves. • **Foreign material in grooves.** Shield drive with drive guard. • **Tensile cord broken from improper installation.** Replace all belts with a new set, check for proper installation.
Belt Noise	• **Belt slip.** Retension. • **Misaligned sheaves.** Realign sheaves. • **Wrong belt type.** Replace cut edge with wrapped belt.
Belt Vibration	• **Shock loads.** Use Banded or Combo belts. • **Incorrectly placed flat idler pulley.** Position idler on slack side of drive, as close as possible to DriveR sheave. • **Distance between shafts too long.** Install idler. • **Belt lengths uneven.** Replace all belts with a new matched set. • **Belt too loose.** Retension drive.
Severe Slippage	• **Spin burns.** Retension drive. • **Too few belts.** Redesign drive. • **Arc of contact too small.** Install back side idler on slack side, or use timing belt. • **Oil or water on belt.** Clean belts and sheave, shield drive with drive guard.
Installation Problems Belts Too Long or Short at Installation	• **Design and/or belt selection error.** Check catalog for proper design and selection.
Installation Problems Belts Mismatched at Installation	• **Worn sheave grooves.** Replace sheaves. • **Mixed used and new belts.** Replace all belts with new belts. • **Mixed belts from different manufacturers.** Replace belts from the same manufacturer.
Hot Bearings Drive Over Tensioned	• **Worn sheave grooves, belts bottom out.** Replace sheaves.
Hot Bearings Sheave Diameter Too Small	• **Design error.** Redesign drive.
Hot Bearings Sheaves Too Far Out on Shaft	• **Design error or obstruction.** Place sheaves as close to bearing as possible.
Hot Bearings Poor Bearing Condition	• **Bearing underdesigned.** Check bearing design. • **Bearing not properly maintained.** Align and lubricate bearing.
Hot Bearings Belt Slippage	• **Drive under tensioned.** Retension.
Damaged or Broken Sheave	• **Incorrect belt installation.** Never pry belts onto sheaves. • **Excessive rim speeds.** Maintain operational speeds within recommended range. • **Sheave installed incorrectly.** Follow recommended torque values when tightening bushings. • **Foreign object interfering with drive operation.** Use drive guards.
Severe Sheave Groove Wear	• **Wrong belt.** Check to be sure sheave and belt combination is correct. • **Belt tension is excessive.** Check drive design and retension. • **Sand, debris or contamination.** Clean and shield drive.

Screw Conveyor

Type of Failure	Probable Cause / Corrective Action
Premature Trough Failure	• **Trough Gauge (thickness) too light.** Increase thickness. Consult Martin catalog materials table / component series for recommendation. • **Screw deflection.** Eliminate excessive deflection. Consult Martin catalog for calculation procedure to determine proper pipe size and screw length. • **Bent screw.** Straighten or replace. Check before operation.
Accelerated Flight Tip Wear	• **Gauge (thickness) too light.** Increase thickness. Consider hardfacing or use abrasion resistant materials. • **RPM too high.** Slow conveyor down. Consult Martin catalog engineering section to determine proper trough loading.
Coupling Shaft Breakage	• **Torque capacity insufficient.** Increase torque capacity or use larger shaft. Check motor amp demand for torque requirements. • **Incorrect alignment.** Realign trough assembly and hangers in accordance with installation instructions. • **Excessive shaft wear.** Replace coupling shaft.
Shaft Hole Elongation	• **Insufficient numbers of bolts.** Increase number of bolts. • **Conveyor subject to "jogging" or too frequent stop/start, or frequent overloads.** Cease jogging or frequent stop/start or overload. If this is not possible increase bearing capacity of shaft and/or increase number of bolts.
Drive Shaft Breakage	• **Insufficient torque capacity.** Increase torque capacity. • **Obstruction in conveyor.** Check screw alignment.
Motor / Heaters Overload	• **Amp demand excessive for motor.** Recheck horsepower calculations. Check material characteristics. Check capacity. Regulate feed. • **Upset loading conditions.** Empty trough. Operate under design specifications.
Inlet Trough End Bearing Failure	• **Material getting into bearing.** Add or upgrade seal to keep material out of bearing. Change to outboard bearing. • **Insufficient lubrication.** Lubricate properly. • **Shaft slope.** Align screw. Check for excessive screw deflection and for bent screw.
Discharge Trough End Bearing Failure	• **Material getting into bearing.** Add or upgrade seal. Change to outboard bearing. Cut off flight at center of discharge.
Hanger Bearing Failure	• **Incorrect alignment.** Realign trough assembly and hanger. • **Heat due to hot material being conveyed.** Use appropriate bearing material. • **Heat due to insufficient lubrication.** Properly lubricate. • **Thrust due to pipe pressing on bearing insert.** Check coupling bolts and holes for elongation and wear. Replace as necessary to get proper clearances. • **Improper bearing material.** For material being conveyed consult Martin catalog for proper bearing. • **Improper speed.** For material being conveyed consult Martin catalog for proper speed. • **Improper trough loading.** For material being conveyed consult Martin catalog for proper trough loading.

Drag Conveyor

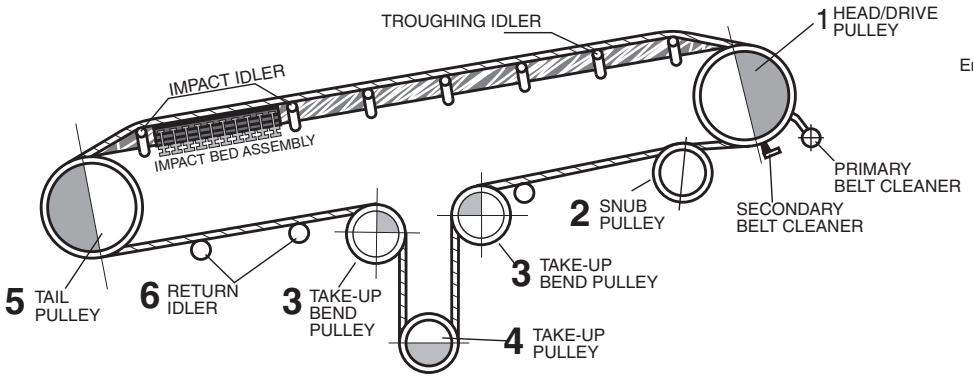
Type of Failure	Probable Cause / Corrective Action
Premature Trough Failure	• **Gauge too light.** Increase thickness. Consult catalog materials table / component series for recommendation. • **Worn Flights.** Replace flights. • **Excessive chain speed.** Check speed.
Accelerated Flight Wear	• **Excessive heat.** Change flight material. UHMW limited to 175ºF. • **Speed too high.** Slow drag down. Consult catalog engineering section to determine proper speed.
Chain Breakage	• **Worn chain.** Change chain if worn. • **Take-up loose.** Adjust take-up.
Drive Shaft Breakage	• **Insufficient torque capacity.** Increase torque capacity. • **Obstruction in conveyor.** Check sprocket alignment.
Motor/Heaters Overload	• **Amp demand excessive for motor.** Recheck horsepower calculations. Check material characteristics. Check capacity. Assure regulated feed.
Inlet Trough End Bearing Failure	• **Material getting into bearing.** Add or upgrade seal to keep material out of bearing. Change to outboard bearing. • **Insufficient lubrication.** Lubricate properly.
Discharge Trough End Bearing Failure	• **Material getting into bearing.** Add or upgrade seal to keep material out of bearing. Change to outboard bearing.

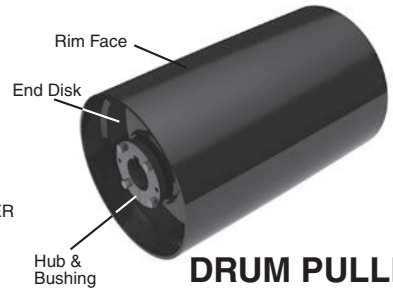
Bucket Elevator

Type of Failure	Probable Cause / Corrective Action
Elevator Vibrates	• **Foreign matter in boot.** • **Excessively tight chain/belt.** • **Excessively loose chain/belt.** • **Loose or broken buckets.** • **Buckets hitting bib plate.** • **Misaligned elevator head and boot shaft.** Check alignment. • **Elevator is not adequately braced. Refer to installation instructions.** • **Chain/belt hitting inside of casing when casing is not plumb.**
Elevator Will Not Start	• **Obstruction in boot.** • **Electrical problem.** • **Backstop incorrectly installed.** • **Broken V-Belts or drive chains.** • **Reducer failure.** • **Boot plugged with material.** • **Excessively tight chain/belt.**
Pillow Blocks Get Hot	• **Over lubrication.** Lubricate properly. • **Under lubrication.** Lubricate properly. • **Excessive chain/belt tension.** • **Misalignment of head shaft pillow blocks.** Check alignment. • **Misalignment between head and boot shaft.** Check alignment.
Elevator Not Discharging Properly	• **Speed incorrect.** Consult factory. • **Air cushion.** Vent compartment being discharged into. • **Light fluffy materials.** Reduce speed up to 15%. • **Certain materials may require perforated buckets*.** • **Some materials may be affected by static electricity.***

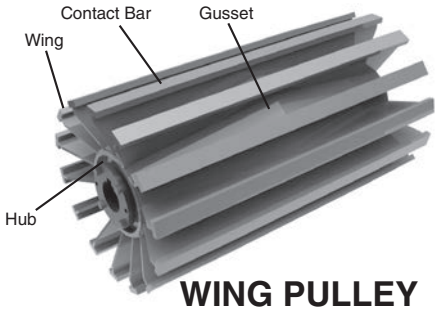
** Consult with **Martin**.*

Heavy-Duty Conveyor Pulleys / Belt Conveyors





DRUM PULLEY



WING PULLEY

1. **Head Pulley.** The pulley at the discharge end of a conveyor belt; may be either an idler or a drive pulley. This is usually a drum pulley and it has a larger diameter than other pulleys in the system and is often lagged to increase traction and pulley life.
2. **Snub Pulley.** This is usually a drum pulley and is mounted close to the drive pulley on the return side of the belt, the snub pulleys primary job is to increase the angle of wrap around the drive pulley, thereby increasing traction. Its secondary purpose is reducing belt tension, which is important in maximizing conveyor component life. May be lagged for longer wear life.
3. **Take-Up Bend Pulley.** The bend pulley is usually a drum pulley and is used for changing the direction of the belt running to the gravity take-up. May be lagged for longer wear life.
4. **Take-Up Pulley.** An adjustable idler pulley (usually a wing pulley) to accommodate changes in the length of a conveyor belt to maintain proper tension.
5. **Tail Pulley.** A pulley at the tail of the belt conveyor opposite the normal discharge end; it is usually a wing pulley and adjustable if manual take up is used.
6. **Return Idler.** The idler or roller on which the conveyor belt rides after the load which it was carrying has been dumped.

Belt Wear / Breakage

Type of Failure	Probable Cause / Corrective Action
Excessive Bottom Cover Wear	• **Material build-up (on pulleys and idlers).** Remove the accumulation and install cleaning devices, scrapers, and inverted “V” decking. • **Idlers frozen.** Free the idlers. • **Breaker strip missing or inadequate.** When service is lost, install belt with proper breaker strip. • **Insufficient traction between belt and pulley.** Increase wrap with snub pulleys. Lag drive pulley. In wet conditions use grooved lagging. Install the correct cleaning devices on belt and centrifugal switch for safety. • **Material falling between belt and pulley.** Use skirtboards properly. Remove accumulation. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions. Repair loose bolts protruding. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew.** Use belt designed for specific condition. For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun.
Belt Folding Over on Itself	• **Severe pulley crowning** • **Material buildup** • • **Component alignment**
Short Breaks in Carcass Parallel to Belt Edge, Start Breaks in Carcass	• **Impact of material on belt.** Redesign chute so as to reduce impact; install impact idlers, or impact bed. • **Material trapped between belt and pulley.** Install plows or scrapers on return run ahead of tail pulley.
Belt Sag	• **Insufficient belt tension or improper idler placement.** Adjust placement of idlers and adjust belt tension as necessary.

Heavy-Duty Conveyor Pulleys / Belt Conveyors

Type of Failure	Probable Cause / Corrective Action
Belt Splices are Separating	• **Particles from buildup migrate and grind into top cover and in between small imperfections in a belt splice.** Use good quality skirting at loading points and other spots where spillage is likely. Install lagging on the head and snub pulleys. Install a belt plow to prevent trapping material between the belt and tail pulley.
Vulcanized Splice Separation	• **Pulleys too small.** Use larger diameter pulley. • **Drive underbelted.** Recalculate maximum belt tensions and select correct belt. If line is over-extended, consider using two flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost. • **Material build-up (on pulleys and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Excessive tension.** Recalculate tension and use appropriate belt • **Insufficient traction between belt and pulley.** Increase wrap with snub pulleys. Lag drive pulley. In wet conditions use grooved lagging. Install correct cleaning devices on belt and centrifugal switch for safety. • **Belt improperly spliced.** Retighten after running for a short while. If improperly spliced, remove old splice and resplice. Set up regular inspection schedule.
Belt Hardens Or Cracks	• **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew: use belt designed for specific condition.** For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. • **Pulleys too small.** Use a larger diameter pulley. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions. Repair loose bolts protruding.
Cover Swells Or Softens In Spots	• **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew: use belt designed for specific condition.** For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. Do not over lubricate idlers.
Covers Harden or Crack	• **Heat or chemical damage.** Use belt designed for specific condition. • **Improper storage or handling.** Follow recommendations for proper storage or handling instructions.
Cover Blisters or Sand Blisters	• **Cover cuts or very small cover punctures allow fines to work under cover and cut cover away from carcass.** Make spot repair with vulcanizer or self-curing repair material. • **Spilled oil or grease.** Over-lubrication of idlers; improve housekeeping; reduce quantity of grease used; check grease seals.
Ply Separation	• **Insufficient traverse stiffness.** Replace with the proper belt. • **Excessive tension.** Recalculate and adjust tension. Use vulcanized splice with recommended limits. • **Pulleys too small.** Use larger diameter pulleys. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew: use belt designed for specific condition.** For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. • **Excessive impact on belt and splice**. • **Edge worn or broken: (permitting moisture penetration and belt shrinkage on one side).** Repair belt edge. Remove badly worn or out-of-square section and splice in new piece of belt. • **Belt edge contacting structure**. Check for obstructions. • **Belt speed too fast.** Reduce speed.

Heavy-Duty Conveyor Pulleys / Belt Conveyors

Type of Failure	Probable Cause / Corrective Action
Belt Breaks At Or Behind Fasteners, Or Fasteners Tear Loose	• **Belt improperly spliced or wrong fasteners.** Use fasteners recommended by the manufacturer. Retighten after running for a short while. If improperly spliced remove old splice and resplice. Set up regular inspection schedule. • **Pulleys too small.** Use a larger diameter pulley. • **Excessive tension.** Recalculate and adjust tension. Use vulcanized splice with recommended limits. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions. Repair loose bolts protruding. • **Material falling between belt and pulley.** Use skirtboards properly. Remove accumulation. • **Drive underbelted.** Recalculate maximum belt tensions and select correct belt. If line is over-extended, consider using two flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost. • **Counterweight too heavy.** Recalculate weight and adjust counterweight accordingly. Reduce take-up tension to point of slippage; retighten slightly. • **Differential speed wrong on dual pulleys.** Make necessary adjustment and observe operation closely.
Excessive Belt Stretch	• **Tension too high.** Increase speed, same tonnage, same speed; improve maintenance to remove friction and replacement of damaged idlers; decrease tension by increasing arc of contact or go to lagged pulley; reduce CWT to minimum amount. Use vulcanized splice with recommended limits. • **System underbelted.** Recalculate belt tensions and select proper belt. Recalculate maximum belt tensions and select correct belt. If line is over-extended, consider using two flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost. • **Build-up of material on idlers.** Remove accumulation; improve maintenance. Install scrapers or other cleaning devices. • **Counterweight too heavy.** Lighten counterweight to value required by calculations. • **Differential speed wrong on dual pulleys.** Make necessary adjustment and observe operation closely. • **Insufficient counterweight travel.** Check for recommended minimum distances. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew.** Use belt designed for specific condition. For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun.
Belt Breaks at or Behind Fasteners: Fasteners Pull Out	• **Fastener plates too long for pulley size.** Replace with smaller fasteners; increase pulley size. • **Wrong type of fastener, fasteners too tight or too loose.** Use proper fastener and splice technique; set up schedule for regular fastener inspection. • **Tension too high for fasteners.** Use vulcanized splice. • **Pulleys too small.** Use larger diameter pulleys. • **Interference from belt scrapers.** Adjust belt scrapers. • **Belt carcass too light.** Select stronger carcass.
Excessive Top Cover Wear, Uniform Around Belt	• **Dirty, stuck, or misaligned return rolls.** Remove accumulations; install cleaning devices; use self-cleaning return rolls; improve maintenance and lubrication. • **Cover quality too low.** Replace with belt of heavier cover gauge or higher quality rubber or other elastomer. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Off-center loading or poor loading.** Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. • **Excessive sag between idlers causing load to work and shuffle on belt as it passes over idlers.** Increase tension if unnecessarily low; reduce idler spacing.

Heavy-Duty Conveyor Pulleys / Belt Conveyors

Type of Failure	Probable Cause / Corrective Action
Belt's Top Cover and Belt Edges are Wearing Excessively	• **Build-up on the snub pulley and return idlers often wears the top cover.** Reduce the wear by installing rubber or plastic sleeves on the return idlers and smooth lagging on the snub pulley. • **Improper load can also damage the top cover and belt edges.** • **Off-center loading or poor loading.** Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. • **Create a stable, positive seal between the chute's bottom edge** (or skirtboard) and the belt by using impact rollers or slider beds below the belt, which shape the belt into a trough. Use good-quality skirting along the belt conveyor to prevent spillage. Avoid using old belt scraps to make the skirting because they can wear your conveyor belt.
Excessive Top Cover Wear, Grooving, Gouges, Rips, Ruptures, And Tears Or Stripping Of Top Cover	• **Skirt boards improperly adjusted or of wrong material.** Adjust skirt board supports to minimum 1" between metal and belt with gap increasing in direction of belt travel; use skirt board rubber (not old belt). • **Relative loading velocity too high or too low.** Adjust chutes or belt speed. Consider use of impact idlers. Observe operation closely. • **Load jams in chute.** Redesign chute for proper angle and width. Feed should be in direction of belt travel and at belt speed, centered on the belt. Control flow with feeders, chutes and skirtboards. • **Material hanging up in or under chute.** Improve loading to reduce spillage; install baffles; widen chute. • **Impact of material on belt.** Reduce impact by improving chute design; install impact idlers, or impact bed. • **Sharp edges of material or tramp iron coming in contact with cover.** Use jingle bars; impact idlers; magnetic removal equipment. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew: use belt designed for specific condition.** For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. • **Breaker strip missing or inadequate.** When service is lost, install belt with proper breaker strip. • **Sticking or frozen idlers.** Free idlers and improve maintenance and lubrication.
Carcass Fatigue at Idler	• **Improper transition between troughed belt and terminal pulleys.** Adjust transition. • **Severe convex (hump) vertical curve.** Decrease idler spacing in curve, increase curve radius. • **Excessive forward tilt of trough rolls.** Reduce forward tilt of idlers to no more than 2° from vertical. • **Excess gap between idlers rolls.** Replace with heavier belt. • **Insufficient transverse stiffness.** Replace with the proper belt. • **Excessive sag between idlers causing load to work and shuffle on belt as it passes over idlers.** Increase tension if unnecessarily low; reduce idler spacing.
Fabric Decay, Carcass Cracks, Gouges, Ruptures, Soft Spots	• **Excessive impact of material on belt or fasteners.** Use correctly designed chutes and baffles. Make vulcanized splices. Install impact idlers. Where possible, load fines first. Where material is trapped under skirts, adjust skirtboards to minimum clearance or install cushioning idlers to hold belt against skirts. • **Material falling between belt and pulley.** Use skirtboards properly. Remove accumulation. • **Breaker strip missing or inadequate.** When service is lost, install belt with proper breaker strip. • **Drive underbelted.** Recalculate maximum belt tensions and select correct belt. If the line is over-extended, consider using two flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost. • **Damage by acids, oils, chemicals, or deterioration by heat, abrasives or mildew.** Use belt designed for specific condition. For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. Do not over lubricate idlers.

Heavy-Duty Conveyor Pulleys / Belt Conveyors

Type of Failure	Probable Cause /Corrective Action
Belt Cupping - Old Belt (Was OK When New)	• **Spilled oil or grease.** Over-lubrication of idlers; improve housekeeping; reduce quantity of grease used; check grease seals. • **Heat or chemical damage.** Use belt designed for specific condition. • **Severe pulley crowning**. Replace pulley. • **Poor belt construction**. Replace belt. • **Belt too Elastic (excessive tension)**. Replace belt.
Transverse Breaks at Belt Edge	• **Belt edges folding up on structure.** Idlers or pulleys out-of square with center line of belt: readjust idlers in affected area. Conveyor frame or structure crooked: straighten in affected area. Idler stands not centered on belt: readjust idlers in affected area. Install limit switches; provide more clearance. • **Improper transition between troughed belt and terminal pulleys.** Adjust transition in accordance with belt manufacturers recommendations. • **Severe convex (hump) vertical curve.** Decrease idler spacing in curve; increase curve radius.
Excessive Edge Wear, Broken Edges	• **Off-center loading or poor loading.** Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. Control flow with feeders, chutes and skirtboards. • **Belt strained (or elongated on one side).** Allow enough time for new belt to "break in." If belt does not break in properly or is not new, remove strained section and splice in new piece. • **Bowed belt.** For new belt this condition should disappear during break-in; in rare instances belt must be straightened or replaced; check storage and handling of belt rolls. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew.** Use belt designed for specific condition. For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. Do not over lubricate idlers. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Belt improperly spliced.** Resplice using proper method as recommended by belt manufacturer. • **Belt hitting structure.** Install training idlers on carrying and return run.
Pulley / Drive Problems	
Severe Pulley Cover Wear	• **Sticking idlers.** Free idlers and improve maintenance and lubrication. • **Slippage on drive pulley.** Increase tension through screw take-up or add counterweight; lag drive pulley; increase arc of contact. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Material trapped between belt and pulley.** Install plows or scrapers on return run ahead of tail pulley. • **Bolt heads protruding above lagging.** Tighten bolts; replace lagging; use vulcanized-on lagging. • **Excessive forward tilt of trough rolls.** Reduce forward tilt of idlers to no more than 2° from vertical.
Tracking Problem	
Belt Runs To One Side Throughout The Entire Length At Specific Idler	• **Idlers or pulley shaft out of square with center line of conveyor.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. • **Improperly placed idlers.** Relocate idlers or insert additional idlers spaced to support belt. • **Material build-up (on pulley and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking.
Erratic Tracking - Belt Runs Off-Line At Intermittent Points	• **Off-center loading.** Adjust chute and loading conditions so as to place load in the center of belt. • **Idlers/pulleys misaligned.** • **Insufficient pulley crowning.** • **Material buildup.** • **Belt is too stiff to train.** Use self-aligning idlers. Increase tension/conforms to crowns. Use more flexible belt on replacement. • **Tilt troughing idlers forward, but not over 2 degrees.** Use more troughable belt.

Heavy-Duty Conveyor Pulleys / Belt Conveyors

Type of Failure	Probable Cause / Corrective Action
Belt Runs Off at Tail Pulley	• **Counterweight too light.** Recalculate weight required and adjust or add to counterweight or screw takeup accordingly. • **Belt running off-center around the tail pulley and through the loading area.** Install training idlers on the return run prior to tail pulley. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Idlers or pulleys out-of square with center line of belt.** Readjust idlers in affected area. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions.
Belt Slips on Starting	• **Insufficient traction between belt and pulley.** Lag drive pulley; increase belt wrap; install belt cleaning devices. • **Counterweight too light.** Add counterweight or increase screw take-up tension to value determined from calculations. • **Pulley lagging worn.** Replace pulley lagging. • **Pulleys too small.** Use larger diameter pulleys. • **Improper initial positioning of counterweight in its carriage causing apparent excessive belt stretch.** Check for recommended initial position. • **Insufficient counterweight travel.** Check for recommended minimum distances.
Belt Mistracks at Head Pulley	• **Idlers/pulleys misaligned.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions. Repair loose bolts protruding. • **Material buildup (on pulleys and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Improperly placed idlers.** Relocate idlers or insert additional idlers spaced to support belt. • **Off-center loading.**
Belt Runs Off at All Points of the Line	• **Skirts incorrectly placed.** Install skirtboards so that they do not rub against belt. • **Improper Loading.** Feed should be in direction of belt travel and at belt speed, centered on the belt. Control flow with feeders, chutes and skirtboards. • **Idlers or pulley shaft out of square with center line of conveyor.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. • **Material build-up (on pulleys and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Belt strained (or elongated on one side).** Allow enough time for new belt to "break in." If belt does not break in properly or is not new, remove strained section and splice in new piece. • **Improperly placed idlers.** Relocate idlers or insert additional idlers spaced to support belt.
Belt Mistracks at Tail Pulley	• **Insufficient belt tension.** • **Idlers/pulley misaligned.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. **Idlers seized.** Free the idlers. • **Material build-up (on pulley and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Insufficient pulley crowning.** • **Counterweight too light:** recalculate weight and adjust counter weight or screw take-up accordingly. • **Improper Loading.** Feed should be in direction of belt travel and at belt speed, centered on the belt. Control flow with feeders, chutes and skirtboards.

Heavy-Duty Conveyor Pulleys / Belt Conveyors

Type of Failure	Probable Cause / Corrective Action
One Section Runs Off Line at All Conveyor Points	• **Pulleys not parallel, level, square.** • **Insufficient pulley crowning.** • **Damage by chemicals, heat, mechanical components.** • **Belt camber.** Avoid telescoping belt rolls or storing them in damp locations. A new belt should straighten out when "broken in" or complete system must be reinspected. • **Improper splice procedure/technique.** Square ends/resplice. Use fasteners recommended by the manufacturer. Retighten after running for a short while. If improperly spliced, remove old splice and resplice. Set up regular inspection schedule. • **Side Loading.** Load in direction of belt travel. • **Edge worn or Broken (permitting moisture penetration and belt shrinkage on one side).** Repair belt edge. Remove badly worn or out-of-square section and splice in new piece of belt.
Belt Runs True When Empty, Crooked When Loaded	• **Off-center loading or poor loading.** Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. • **Variations in nature and formation of load.** Use notched chute to keep load peak in exact center of belt. • **Belt not making good contact with all idlers.** Adjust height so all idlers contact belt.
Belt Runs to One Side at Given Point on Structure	• **Build-up of material on idlers.** Remove accumulation; improve maintenance. Install scrapers or other cleaning devices. • **Sticking idlers.** Free idlers and improve maintenance and lubrication. • **Idlers or pulleys out-of square with center line of belt.** Readjust idlers in affected area. • **Conveyor frame or structure crooked.** Straighten in affected area. • **Idler stands not centered on belt.** Readjust idlers in affected area. • **Structure not level.** Level structure in affected area.
Belt Mistracks and Runs Off at the Head Pulley	• **Spillage and worn lagging can cause material to build-up between the head pulley and belt.** Prevent the spillage and buildup by installing a slider-bedskirt board system at the loading point and a belt scraper at the head pulley. If your conveying conditions are wet and sticky, use grooved lagging on the head pulley; the grooves repel water and help prevent buildup on the belt. Improve maintenance. • **Idlers or pulleys out-of square with center line of belt.** Readjust idlers in affected area. • **Idler stands not centered on belt.** Readjust idlers in affected area.
Belts Runs to One Side Throughout the Entire Length at Specific Idler	• **Idlers or pulley shaft out of square with center line of conveyor.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. • **Improperly placed idlers.** Relocate idlers or insert additional idlers spaced to support belt. • **Material build-up (on pulley and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking.
Belt Slips	• **Insufficient traction between belt and pulley.** Lag drive pulley - in wet conditions use grooved lagging. Increase belt wrap with snub pulleys; install belt cleaning devices and centrifugal switch for safety. • **Pulley lagging worn.** Replace pulley lagging. Ceramic lagging provides an excellent solution when conventional rubber lagging fails to correct belt slippage and premature wear. • **Counterweight too light.** Add counterweight or increase screw take-up tension to value determined from calculations. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Sticking or frozen idlers.** Free idlers and improve maintenance and lubrication. • **Pulleys too small.** Use larger diameter pulleys.

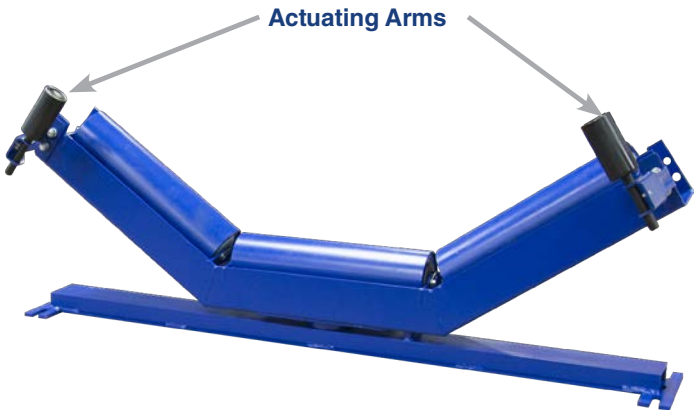
Heavy-Duty Conveyor Pulleys / Belt Conveyors

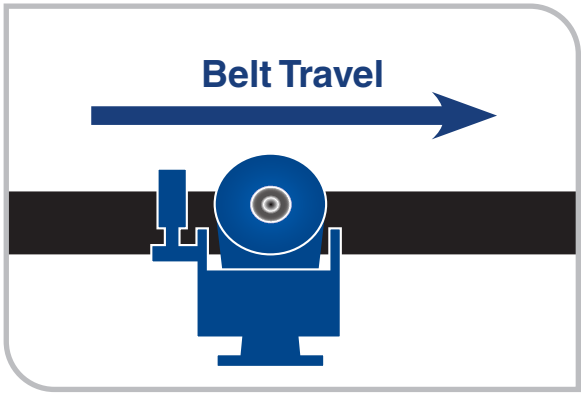
Type of Failure	Probable Cause / Corrective Action
All Portions of Conveyor Belt Running to One Side at a Given Point on Structure	• **One or more idlers immediately preceding trouble point not at right angles to the direction of belt travel.** Advance, in the direction of belt travel, the end of the idler to which the belt has shifted. Square idlers. • **Conveyor frame or structure crooked.** Stretch string along edge to determine extent and make correction. • **One or more idler stands not centered under belt.** Center them. Same as above. • **Sticking idlers.** Clean and lubricate. • **Belt runs off terminal pulley.** Check terminal pulley assignment. Check alignments of idlers approaching terminal pulley. • **Build-up of material on idlers.** Clean them. Install cleaning device. • **Structure not level and belt tends to shift to low side.** Level structure.
Particular Section of Belt Runs to One Side at All Points of Conveyor	• **Belt not joined squarely.** Remove affected splice and resplice. • **Bowed belt.** For new belt this condition should disappear during break-in; in rare instances belt must be straightened or replaced; check storage and handling of belt rolls. • **Worn edge.** "Press edge."
Belt Runs to One Side for Long Distance or Entire Length of Conveyor	• **Belt running off-center around the tail pulley and through the loading area.** Install training idlers on the return run prior to tail pulley. • **Off-center loading or poor loading, the result of buildup in your chutes**. Install non-stick, wear-resistant (rubber for example) chute liners to center and evenly distribute the load on the belt. Choose the liner material carefully to ensure it can resist wear from contacting your conveyed material. Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. • **Build-up of material on idlers.** Remove accumulation; improve maintenance. Install scrapers or other cleaning devices. • **Idlers or pulleys out-of square with center line of belt.** Readjust idlers in affected area. • **Conveyor frame or structure crooked.** Straighten in affected area. • **Idler stands not centered on belt.** Readjust idlers in affected area.

Idler Installation

CAUTION: ALWAYS LIFT IDLERS BY THE FRAME, NEVER BY THE ROLLS.

1. Establish the conveyor centerline by use of a wire or string.
2. Remove mud, stones, burrs, or any other debris from the stringers so that the Pulleys and Idlers will sit squarely in position. This precaution will help prevent belt training problems.
3. Mount Pulleys level with the plane of the conveyor and perpendicular to the line of belt travel. Do not adjust the Pulleys after they have been accurately positioned.
4. Position Idlers perpendicular to the line of belt travel. **THE MIDDLE OF EACH CENTER ROLL MUST BE ON THE CENTERLINE OF THE CONVEYOR**. Tighten all four mounting bolts securely.
5. Rotate each roll to be sure it turns freely. If a roll is tight, look for some external interference or evidence of damage to roll or frame.
6. Install training Idlers with the same care and accuracy used in mounting the basic carrying and return Idlers.
7. To prevent damage during shipment, the actuating arms of positive action training Idlers are **NOT** mounted in operation position at the factory. Bolt the arms to the swivel frame so they extend **TOWARD THE APPROACH SIDE OF BELT**.





8. Inspect roll surfaces and remove any foreign material, especially abrasive dust, to prevent damage to the underside of the belt.
9. Install belt.

NOTE: All Martin Idlers are permanently lubricated at the factory before shipment.

Belt Training

CAUTION: Before performing any maintenance, the circuit should be opened at the switch box, and the switch should be padlocked in the **OFF** position.

After the Idlers and belt have been installed, the system should be started while empty and checked for alignment. A properly aligned conveyor has the belt running evenly in the center of the Idlers and as a result, prevents injury to the belt edges from contact with supporting structures or other objects. If a misalignment problem exists, it is not advisable to attempt correction by readjusting the head or tail Pulley because undue strains on the Pulleys, bearings, belt, belt splice or joint or the conveyor may result. Pulleys should be carefully aligned when installed and should not be adjusted for purposes of belt training.

1. Check the alignment of the entire system by operating the conveyor with the belt completely empty. If all components are properly aligned, the belt will run evenly in the center of the Idlers.

2. If misalignment exists and the empty belt does not run true, DO NOT attempt to correct the problem by adjusting the head or tail Pulley. This causes undue stress on bearings, belt splices, and conveyor frames without correcting the problem.

   ⚠ **CAUTION**: Failure to follow these precautions may result in serious **PERSONAL** injury or damage to equipment.

   If one section of belt consistently runs out of line, either the belt is not straight or the splice is not square.

   Proper alignment is achieved by loosening the mounting bolts on several Idlers on the upstream side and skewing them slightly. When one side of an Idler is shifted ahead of the other, the belt shifts to the side that is behind. To make adjustments use the following steps:

   Loosen the mounting bolts and shift the run-out side forward until the belt runs true.

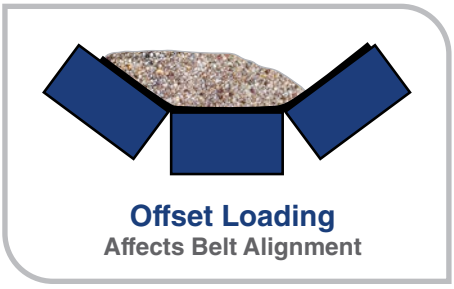
   Retighten mounting bolts, restart conveyor, and check entire system.

   Belt straightness, squareness of splices, and Idler alignment are of vital importance when a belt conveyor operates in both directions.

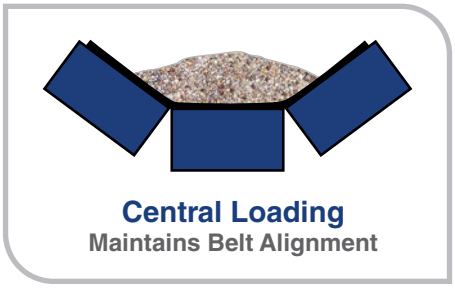
3. Training Idlers are permanently adjusted so that their upper base can swivel 10° in either direction.

   Check belt alignment under full load conditions. A properly aligned and loaded belt will run in the center of the Idlers and will NOT require corrective action from the trainers. This capability is reserved to compensate for occasional off-center belt loading, the effects of wind, concentration of lumps, and other variations which cause temporary belt misalignment.

   Recurrent of continuous misalignment is usually caused by off-center belt loading. Adjust chute so load is distributed as evenly as possible in the center of the belt.



Offset Loading
Affects Belt Alignment



Central Loading
Maintains Belt Alignment

Conveyor Inspection

Costly interruptions in production can often be avoided by a program of regularly scheduled inspections of the system and all components.

Many operators and maintenance supervisors find it economical to inspect the belt daily for breaks in the rubber covering or signs of edge rubbing. It is better to make this inspection before the system is operated and while the belt is empty.

1. After start-up, check belt loading. Chutes should deliver an even flow of material and load it centrally on the belt.
2. Check for unusual vibrations – they can loosen mounting bolts, allow Idlers to shift and cause misalignment. If this condition occurs, eliminate the cause; then realign all loose Idlers and retighten the mounting bolts.
3. Be sure spilled materials do not interfere with swiveling of training Idlers, or the free rotation of Idler rolls. Good housekeeping is essential to high operating efficiency.
4. If an Idler is sluggish, but its movement is not retarded by material buildup, a choked interior or an impending bearing failure is indicated. The latter condition is almost always signaled by an unusual noise, generally a high-pitched squeal. Sluggish, noisy, or completely stalled rolls require immediate attention because they waste power and cause excessive belt wear. If stalled rolls remain in the system, the outer shell will eventually wear through and the resulting sharp edges will severely damage the belt. When a faulty roll is discovered, tag the Idler immediately and remove it from the conveyor as soon as the system is shut down.

Idler Maintenance

Lubrication

Martin Idlers are factory greased and sealed for life and therefore will not require any additional grease during their life cycle.

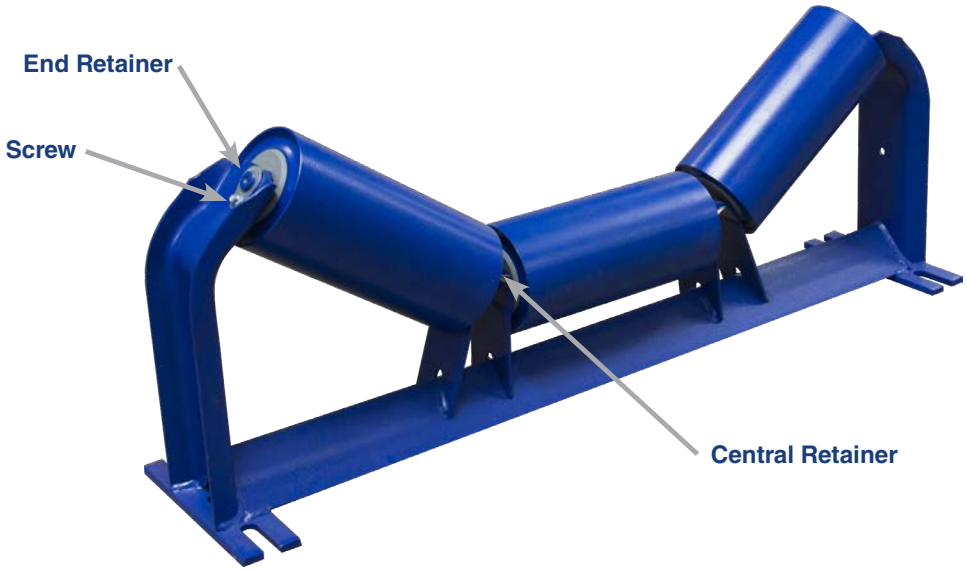
For high ambient temperature ranges, consult Martin Sprocket and Gear, Inc. or your lubricant supplier for recommendations.

Idler Removal

CAUTION: Before performing any maintenance, the circuit should be opened at the switch box, and the switch should be padlocked in the **OFF** position.

1. Remove mounting bolts.
2. Tip Idler forward or backward, whichever is more convenient, until it rests on decking. If the installation does not include decking, additional precautions must be taken to prevent the Idler from falling through to the return run and causing damage or injury. A suitable plank might be used to support the Idler when it comes to rest.
3. Slide the Idler out from under the belt.

NOTE: When Idler is reinstalled, be sure it is accurately aligned and securely bolted in place.



Roll Removal

1. Remove end and center retainer clips.
2. Remove both end rolls. It may be necessary to tap the rolls to free them from the brackets. Use a rubber head mallet.
3. Lift Idler rolls out of the frame.

Roll Installation

1. Place center roll in Idler frame.
2. Install end rolls and secure with end and center retainers. NOTE: End and center retainers are an integral part of the Idler assembly and must be installed.

Properties of Steel

The information shown below is offered as a general guide to physical properties of steel in common use. Lower tensile properties are to be expected in large sections; the values of strength decrease as the size of the section increases. These values are not guaranteed and must **NOT** be used in specifying the raw materials or as a basis for acceptance or rejection of material. It must not be assumed that these properties will be obtained in all cases as they vary widely with permissible variations in analysis, size of section, rolling conditions, grain size, and methods of heat treatment. Dependable physical properties can only be obtained through carefully controlled analysis and heat treatment.

Average Properties of Standard Steel

AISI Number	SAE Number	Condition of Steel	Strength in 1000 PSI		% Elong. in 2"	% Red. of Area	Hardness		Machinability % of B1112 CD
			Tensile	Yield			Brinell	Rockwell	
B1112	1112	COLD DRAWN BESSEMER	75-90	60-70	12-16	40-50	170-185	80-95B	100
C1018	1018	NATURAL HOT ROLLED	55-70	40-50	25-35	50-65	120-140	.....	55
		COLD DRAWN	70-85	50-70	18-25	45-55	160-180	80-90B	65
		1" RD. CARBURIZED AT 1700°F, COOLED IN BOX,							
		REHEATED, QUENCHED – CORE PROPERTIES	90-100	60-80	10-22	35-50	200-230	93-98B	.....
C1020	1020	NATURAL HOT ROLLED	60-80	40-50	25-35	50-65	120-145	60-98B	50
		COLD DRAWN	70-80	45-70	15-25	45-60	120-160	70-85B	60
C1117	1117	NATURAL HOT ROLLED	60-70	37-47	20-30	45-60	135-150	.....	80
		COLD DRAWN	80-90	60-75	15-20	40-50	160-190	80-90B	90
		1" RD. CARBURIZED AT 1700°F, COOLED IN BOX,							
		REHEATED, QUENCHED – CORE PROPERTIES	95-110	60-85	10-25	35-50	210-240	15-22C	.....
C1035	1035	NATURAL HOT ROLLED	75-85	40-55	18-25	40-55	155-175	.....	60
		COLD DRAWN	85-95	65-80	15-25	40-50	170-200	85-95B	65
		1" RD. QUENCHED, TEMPERED 1000°F	95-105	70-80	20-25	55-60	195-220	93-98B	55
C1040	1040	NATURAL HOT ROLLED	80-90	45-55	18-25	35-50	165-185	.....	60
		COLD DRAWN	90-100	70-85	14-20	35-50	190-215	91-98B	62
		1" RD. QUENCHED, TEMPERED 1000°F	100-110	75-85	15-25	45-60	210-240	17-23C	52
C1042	1042	NATURAL HOT ROLLED	85-95	50-60	15-25	35-50	175-205	.....	58
		COLD DRAWN	90-105	75-90	12-20	30-45	185-215	.....	60
		1" RD. QUENCHED, TEMPERED 1000°F	105-120	80-90	15-25	40-60	215-250	.....	.....
C1045	1045	NATURAL HOT ROLLED	85-105	50-65	15-25	35-45	175-215	.....	55
		COLD DRAWN	90-110	75-90	12-20	30-45	195-230	95-99B	58
		1" RD. QUENCHED, TEMPERED 1000°F	110-130	80-95	12-25	40-55	235-260	22-26C	47
C1141	1141	NATURAL HOT ROLLED	90-110	60-80	15-25	25-45	180-220	.....	65
		COLD DRAWN	100-120	85-105	8-18	20-50	195-230	.....	70
		1" RD. QUENCHED, TEMPERED 1000°F	120-145	100-130	10-20	35-50	270-310	.....	.....
C1144	1144	NATURAL HOT ROLLED	95-110	60-85	15-25	30-45	200-240	.....	75
		COLD DRAWN	100-120	90-115	7-17	20-45	210-245	17-23C	85
		1" RD. QUENCHED, TEMPERED 1000°F	130-150	110-130	15	45	286-302	29-31C	.....
C1050	1050	NATURAL HOT ROLLED	95-110	55-70	15-20	25-40	210-325	.....	50
		1" RD. QUENCHED, TEMPERED 1000°F	115-135	85-100	10-22	35-50	240-265	23-27C	.....
4140	4140	HOT ROLLED, ANNEALED	90-100	60-70	20-30	50-60	185-210	91-95B	55
		COLD DRAWN, ANNEALED	110-120	85-95	15-25	45-55	230-250	20-25C	65
		HEAT TREATED, COLD DRAWN.	140-155	125-140	12-20	45-55	270-300	26-30C	45
		1" RD. QUENCHED, TEMPERED 1000°F	150-160	130-140	15-20	50-60	320-350	34-37C	.....
		2" RD. QUENCHED, TEMPERED 1000°F	145-155	125-135	15-20	50-60	320-345	33-36C	.....
		3" RD. QUENCHED, TEMPERED 1000°F	130-145	115-125	15-20	55-65	280-310	28-32C	.....
E52100	52100	HOT ROLLED, ANNEALED .	100-110	75-85	20-25	50-60	210-235	.....	45
		1"" RD. QUENCHED, TEMPERED 1000°F	180-195	65-80	10-15	35-45	375-415	40-43C	.....
8620	8620	NATURAL HOT ROLLED	90-95	55-65	18-25	45-60	160-200	85-95B	55
		COLD DRAWN	90-105	65-80	15-25	40-50	185-215	90-96B	60-70
		1" RD. CARBURIZED 1700°F., COOLED IN BOX,							
		REHEATED, QUENCHED – CORE PROPERTIES	120-135	90-110	15-20	40-50	285-350	28-40C	.....
8645	8645	NATURAL HOT ROLLED	105-125	55-75	15-25	35-50	220-270	20-28C	48-55
		HOT ROLLED, ANNEALED	100-110	50-60	20-25	40-55	210-230	17-21C	54
		2" RD. QUENCHED, TEMPERED 1000°F	140-150	110-125	15-20	45-55	300-320	30-34C	.....
		3" RD. QUENCHED, TEMPERED 1000°F	130-140	105-115	15-20	50-60	285-310	29-32C	.....
8742	8742	NATURAL HOT ROLLED	110-125	50-70	15-25	35-50	230-270	22-28C	45-50
		COLD DRAWN, ANNEALED	105-120	95-105	10-18	35-45	210-235	95-99B	60
		1" RD. QUENCHED, TEMPERED 1000°F	155-165	135-145	15-20	45-52	330-335	35-38C	.....
		2" RD. QUENCHED, TEMPERED 1000°F	135-145	110-120	15-20	50-60	290-320	30-33C	.....

martinsprocket.com