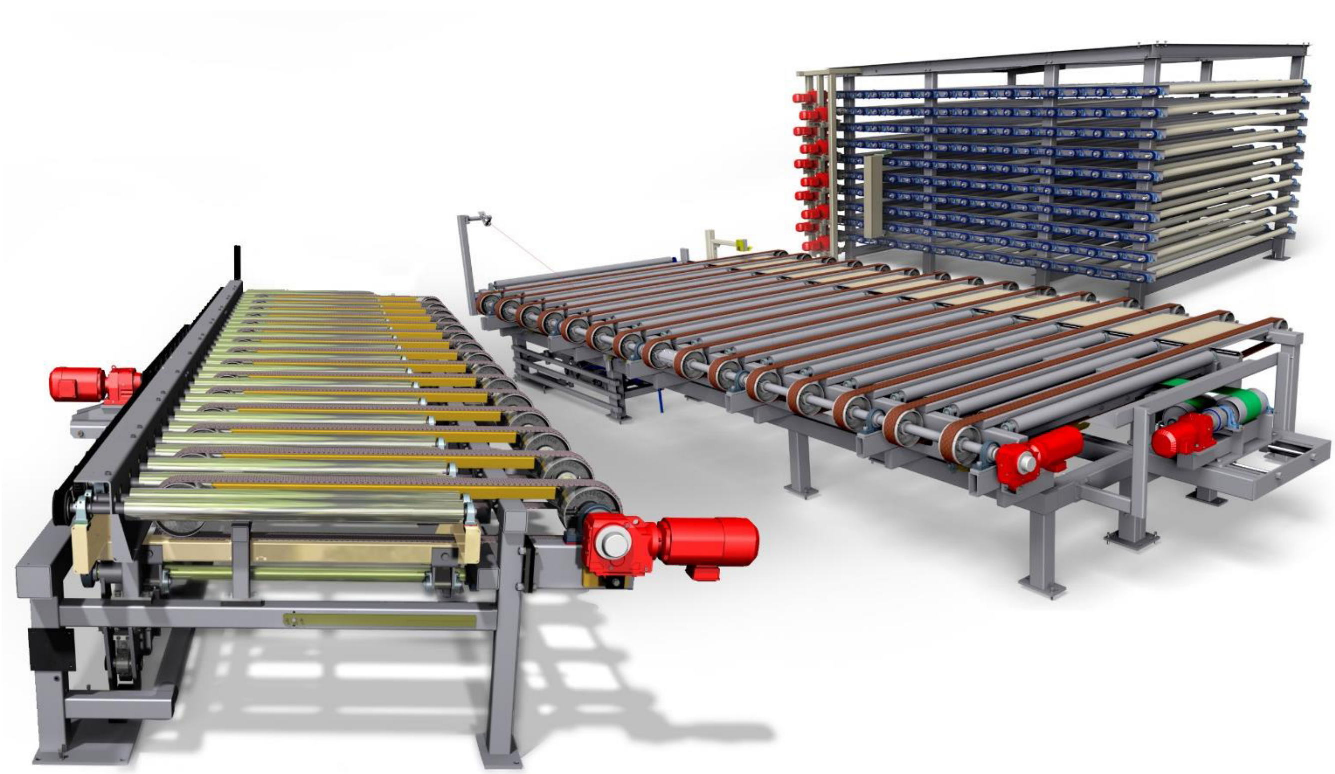
Boardplant

Maintenance Manual



Introduction

This manual contains **Original Instructions** written to assist in the maintenance of the general Boardplant equipment. For information regarding normal operation please refer to the Area Operator's Manual. Maintenance should only be performed by qualified, trained personnel.

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1 Safety Overview

Never put yourself at risk.

Many pieces of equipment have the potential to cause serious injury or even death. Be sure to understand the safety concerns related to a piece of equipment before undertaking or performing any maintenance or clean out procedure. Work with your supervisors to address any safety concerns prior to undertaking work.

This document should be read in conjunction with the Gypsum Technologies Equipment Manuals. This document provides an overview only. Important safety information is contained in the equipment manuals.

1.1 Lockout Procedures

As equipment may start automatically, always lock out any source of motive power (electric, hydraulic, steam, compressed air, etc.) before performing maintenance or cleaning functions. Note that potential energy may also be stored in some equipment such as those held in a raised position by hydraulic or pneumatic pressure and that such equipment may move or fall suddenly if pressure is removed. Also be aware that hazards may arise from equipment or material movement that is upstream or downstream of the machine being locked out.

Depending on the equipment layout, electrical lock out may be performed at the electrical panel or locally with a zone disconnect. Air pressure is removed with the lock out of the manual air disconnect switch. As a further safeguard, you must confirm that any equipment in the system being worked on is not operational after being locked out. Test for this by using the normal means of starting, i.e. the operator controls on the HMI station or the manual HOA switch if available.

The above procedure is recommended where no other lockout procedure is defined. Operating and maintenance staff must follow lockout procedures and operate in compliance with their company policy and local regulations.

1.2 General Safety

Refer to document CAIS130200-AOG-10-SafetyOverview.

2 Roller Conveyors – Synchronous Belt Drive

2.1 Overview

Roller conveyors using synchronous belt driven rollers provide positive engagement to the rollers through shaft mounted timing pulleys. Typical roller conveyors using synchronous belt drives include:

- Live Rolls
- Grouping Table
- Dry Transfer Tables
- Transfer Conveyors

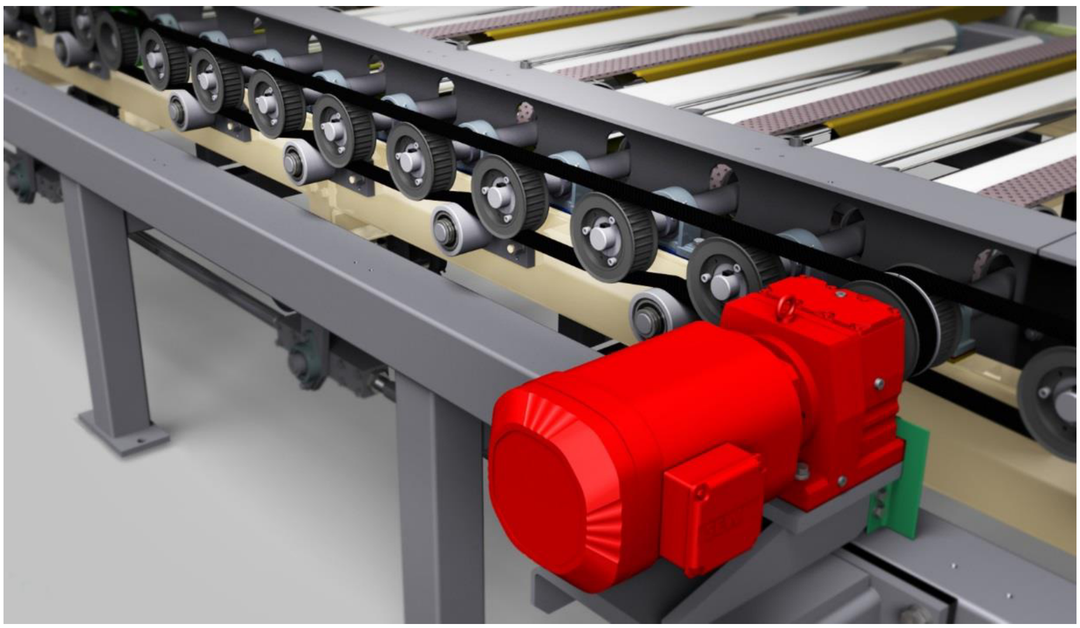


Figure 1: Typical Synchronous Belt Drive

2.2 Safety

CAUTION: Guards/covers may need to be removed to perform the procedures and maintenance below while the belt is running, exposing pulley pinch points. Perform this maintenance only in compliance with Plant Safety Procedures and local regulations.

2.3 Maintenance Procedures

2.3.1 Timing Belt

Certain rollers are powered via timing belts and pulleys mounted on the ends of their shafts. Taper Lock or QD bushings are used to secure the pulleys to the shafts, with keys incorporated to enhance torque transmission.

A typical drive configuration consists of multiple timing pulleys driven by a single timing belt. Tensioner pulleys are utilized to maintain proper belt tension and to increase the wrap angle around driven timing pulleys ensuring proper engagement of the belt teeth. Pulley alignment and tensioners should be adjusted to ensure the timing belt runs clear of the pulley flanges.

Key considerations for optimal performance:

1. **Belt Engagement:** Confirm that the belt teeth are fully seated in the grooves of each timing pulley to ensure positive engagement.
2. **Belt Tension:** Adjust the belt tension to prevent tooth skipping under all operating conditions, particularly during maximum start-up loads.
3. **Avoid Over-Tensioning:** Excessive belt tension can decrease belt life and lead to damage to bearings, shafts, and other drive components.

For precise belt tensioning, use a force gauge to measure belt deflection as specified by the belt manufacturer. Consult the manufacturer's manual for detailed procedures and recommended tensioning guidelines.

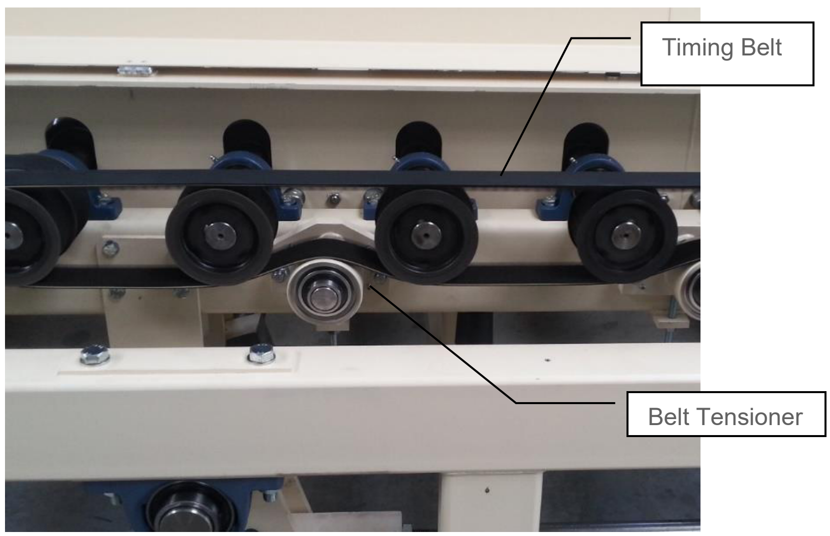


Figure 2: Timing Belts/Pulleys

Caution!

Improper installation of a timing belt, contrary to the manufacturer's specifications, can negatively impact the machine's performance. Ensure the drive components are parallel and properly aligned and maintain the specified belt tension to ensure optimal operation.

2.3.2 Belt Tracking

To start tracking, first ensure the motor drive pulley is parallel to the machine frame. This can be achieved by slightly loosening the frame mounting bolts and then adjusting the set screws in or out. The positioning rods should be adjusted so the drive pulley is centered between the adjacent pulleys.

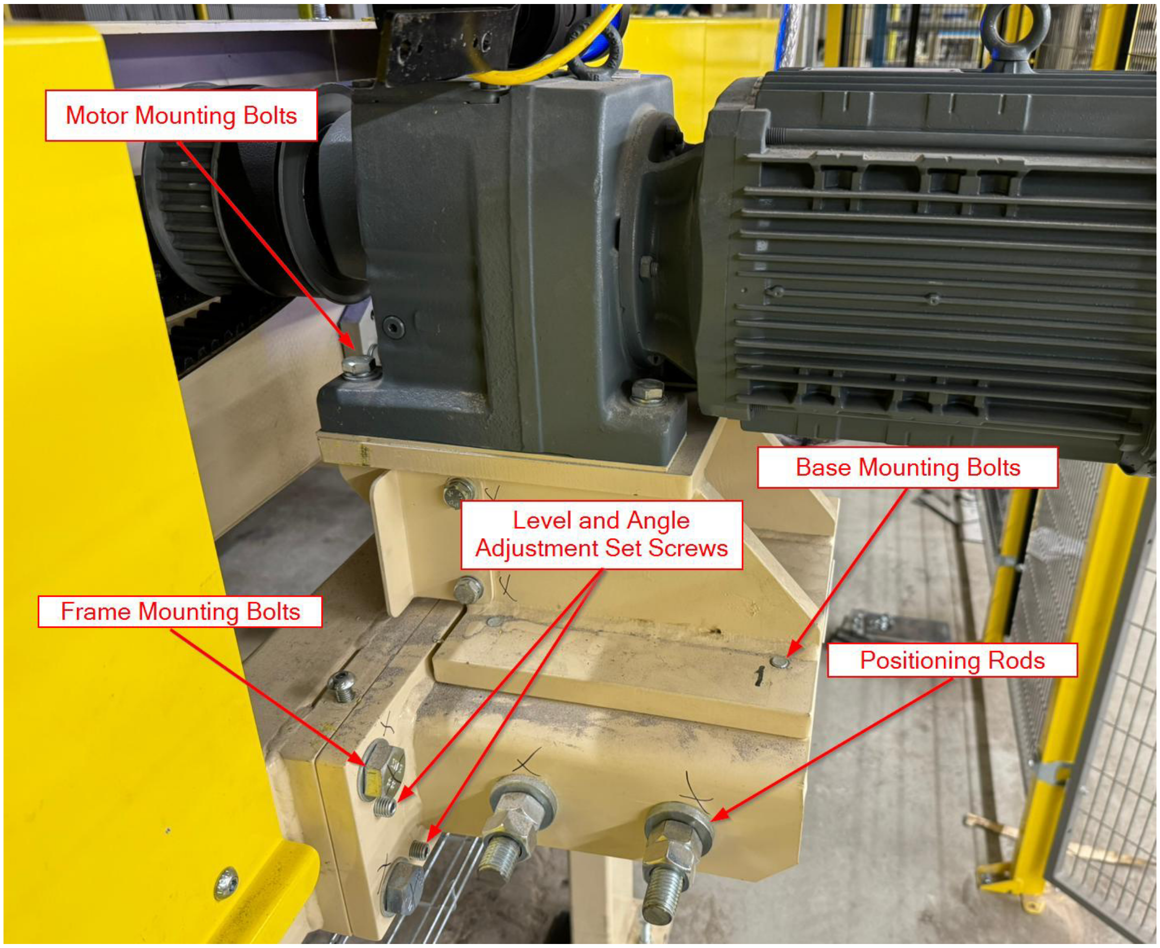


Figure 3: Motor drive pulley alignment

Check that all timing pulley and idlers faces are parallel, square, and in-plane. All taper lock / QD bushings used to secure the pulleys onto the shafts must be tight. Misalignment of the belt may result in reduced belt life and should be minimized.

Optimal performance of the drive system will occur with the belt in light contact with one pulley flange in the system or is in the middle of the pulley. Belt alignment where contact is made between opposite flanges may force the belt into parallel misalignment.

Return belt idler rollers are mounted on an adjustable plate to aid in tensioning and tracking along the length of the return belt side. Adjustments should only be made without the belt running.

1. Starting with the first return idler roller from the head end and working towards the tail end, make adjustments on each idler roller as necessary where a tracking problem is identified.

2. Adjust set screws on the same left or right side of the mounting plate, maintaining a level vertical axis of the idler roller.

3. Observe belt rotation allowing the changes to take full effect and repeat or move onto the next idler roller.

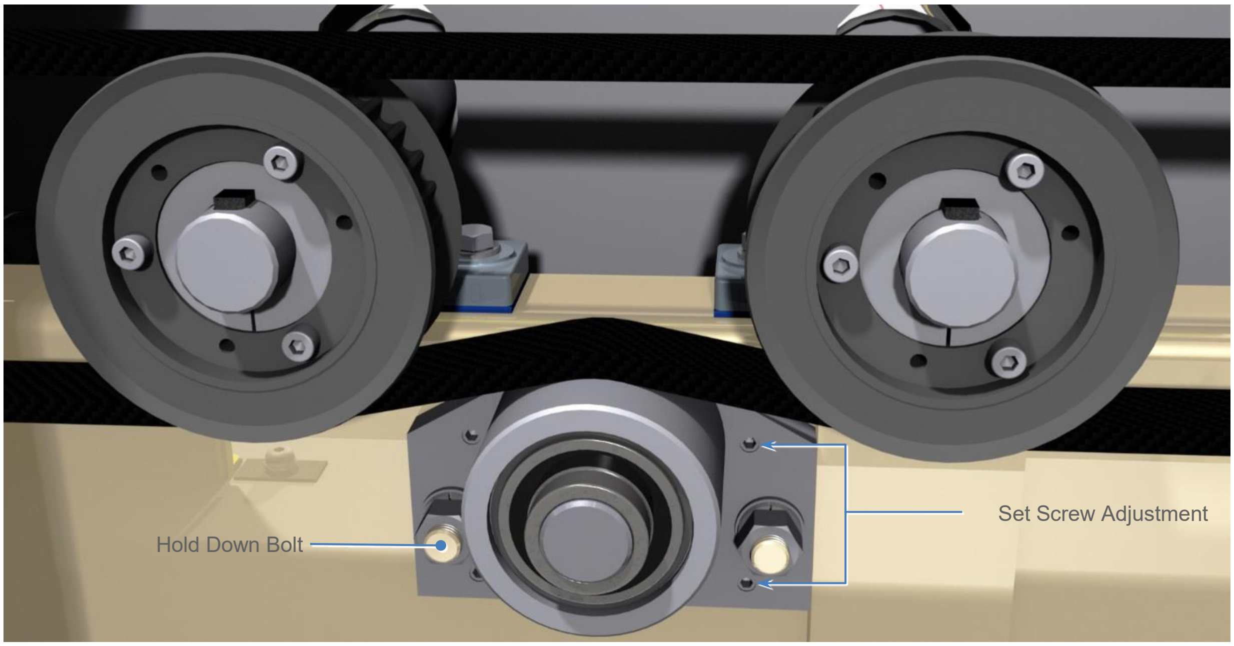


Figure 4: Adjustable mounting plate detail

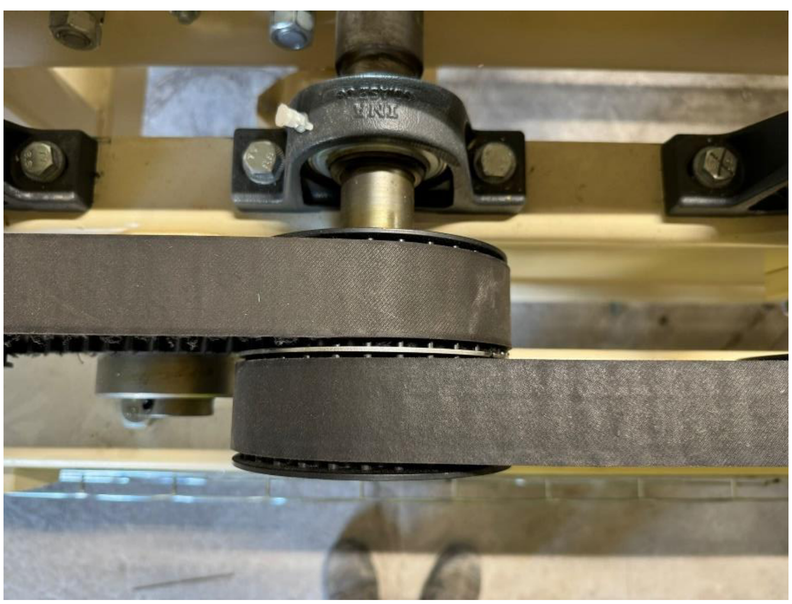


Figure 5: Properly tracked belts. Note even gap on both sides.

2.3.3 Tensioning

Tensioning of the timing belt is achieved by adjusting the tensioner using the jacking bolts on the last roller driven by the timing belt.

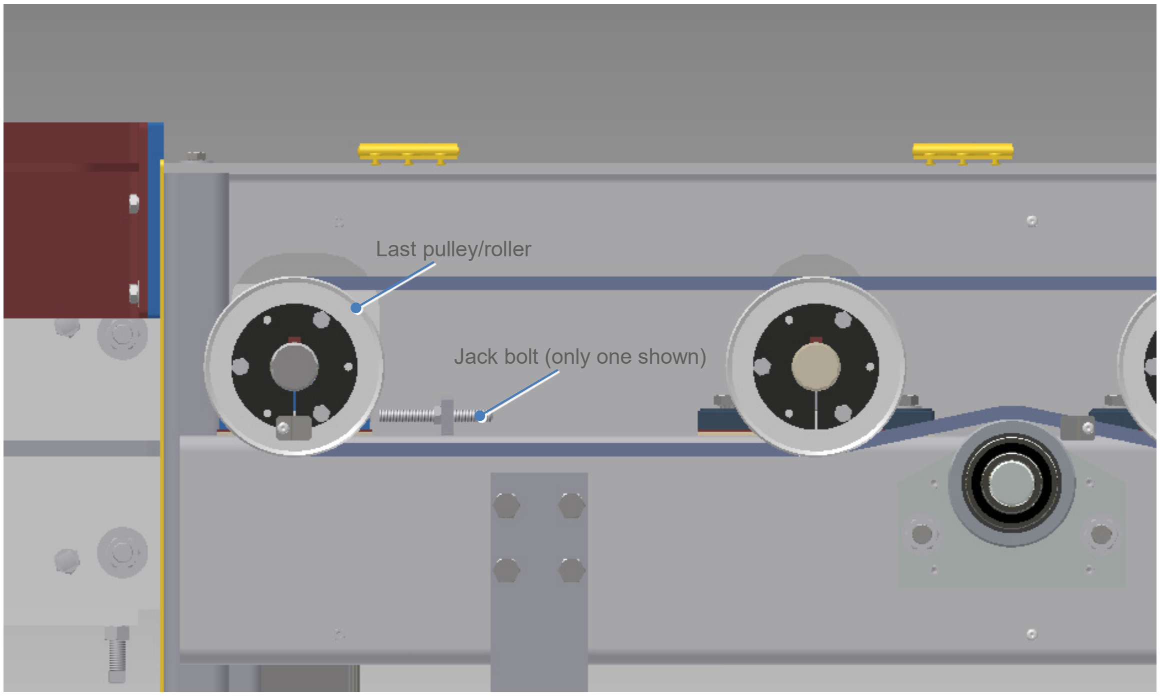


Figure 6: In this case, the left most roller/timing pulley's jack bolts are used to adjust the tension

A loose belt will skip teeth during acceleration and deceleration. While running, a loose belt will vibrate up and down while travelling between sprockets. Proper tension is key to a reliable drive system and optimal belt life. Tension should be adjusted using the procedure shown below.

The test load, Fb [N], is determined based on the drive power, P [kW], and the belt speed, V [m/s].

$$Fb = P \times 50 / V$$

Example: drive power 4 kW, belt speed 1.1 m/s

$$\text{Test load: } Fb = 4 \text{ kW} \times 50 / 1.1 \text{ m/s} = 182 \text{ N}$$

The desired deflection, d [mm], is determined based on the sprocket centrelines, s [mm].

$$d = S / 50$$

Example: sprocket spacing of 1750 mm.

$$d = 1750 \text{ mm} / 50 = 35 \text{ mm}$$

This means that the belt is tensioned correctly when it deflects 35 mm when a test load of 182 N is applied.

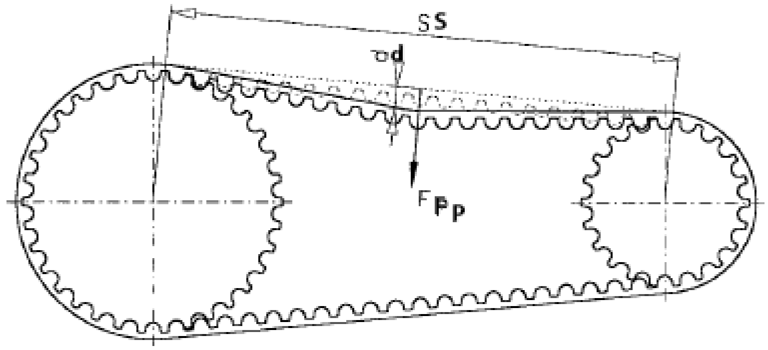


Figure 4: Timing Belt Deflection

2.4 Timing Pulleys

2.4.1 Changing the Timing Belt Pulleys

The timing belt pulleys are secured to shafting with either Taper Lock or QD bushings. When the bushing is tightened, the taper in the bushing causes it to collapse and wedge into the hub of the pulley generating static friction. This allows these bushings to transmit torque between the pulley and the shafting just through this wedging action. Keys are installed in the bushings as an additional measure to prevent slippage.

Figure 7: Taper Lock Bushing

Figure 8: QD Bushing

2.4.2 Installing & Removing Taper Lock Bushings

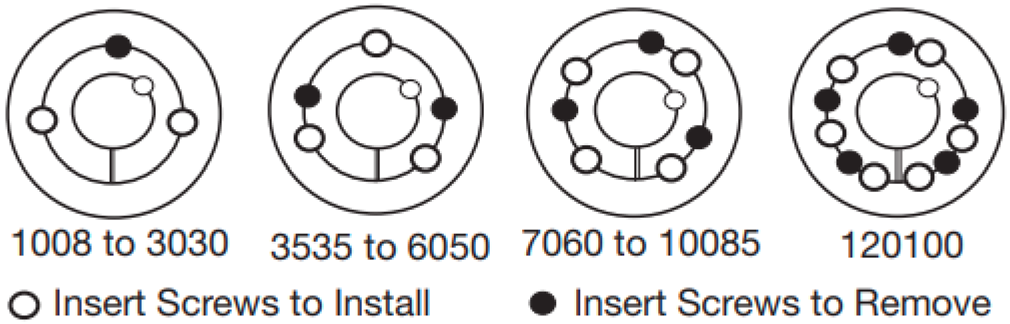


Figure 9: Screw locations

Installation:

1. Clean shaft, bore of bushing, outside of bushing and hub bore of all oil, paint and dirt. File away burrs.
2. Insert bushing into hub. Match the hole pattern, non-threaded half holes with threaded half holes (each complete hole will be threaded on one side only).
3. "LIGHTLY" oil setscrews and thread into those half-threaded holes indicated by ○ in Figure 9. Do not lubricate the bushing taper, bushing bore, hub taper or the shaft. Doing so could result in breakage of the product.
4. Position assembly onto shaft allowing for the small axial movement which will occur during lightening procedure.
5. Alternately torque setscrews to recommended torque setting in chart below. Do not use worn hex key wrenches. Doing so may result in a loose assembly or may damage screws.
6. To increase gripping force, lightly hammer face of bushing using drift or sleeve. (Do not hit bushing directly with hammer.)
7. Re-torque screws after hammering. Where bushing is used with lubricated products such as chain, gear or grid couplings be sure to seal all pathways (where lubrication could leak) with RTV or similar material.
8. Recheck screw torques after initial run-in, and periodically thereafter. Repeat steps 5, 6 and 7 if loose.

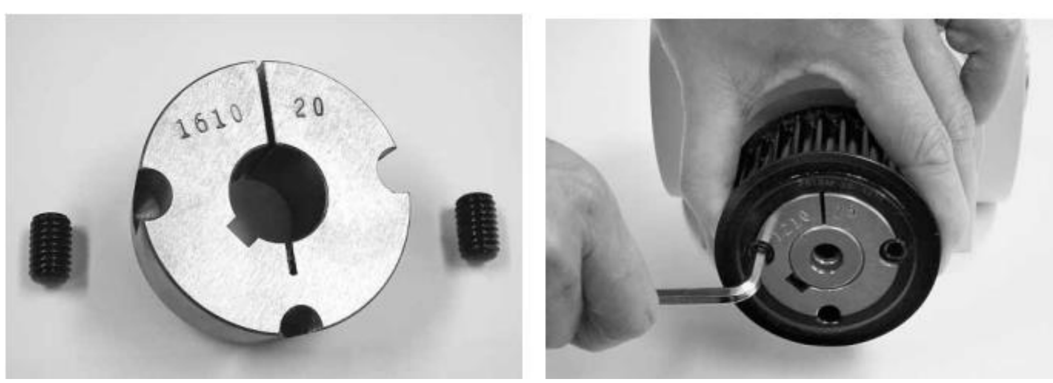


Figure 10: Taper Lock Bushing, grub screws and tightening of screws with a hex key wrench

Recommended Installation Wrench Torque		
Bushing No.	Lb.-In.	Nm
1008	55	6,2
1108	55	6,2
1210	175	19,9
1215	175	19,9
1310	175	19,9
1610	175	19,9
1615	175	19,9
2012	280	31,8
2517	430	48,8
2525	430	48,8
3020	800	90,8
3030	800	90,8
3525	1000	114
3535	1000	114
4030	1700	193
4040	1700	193
4535	2450	278
4545	2450	278
5040	3100	352
5050	3100	352
6050	7820	888
7060	7820	888
8065	7820	888
10085	13700	1556
12010	13700	1556

Figure 11: Recommended torque

Removal:

1. Remove all screws.

2. Insert screws in holes indicated by • in Figure 9. Loosen bushing by alternately tightening screws.

2.4.3 Installing & Removing QD Bushings

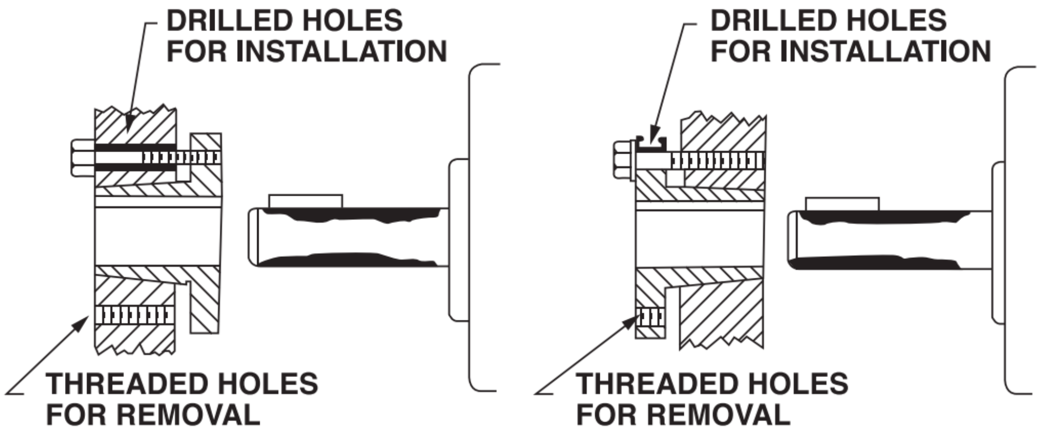


Figure 12: QD Bushing Conventional Mounting (Left) and Reverse Mounting (Right)

Installation

1. Clean shaft, product bore, bushing, tapered surface and bushing bore of oil, paint dirt, etc. Do not use lubricants. The use of lubricants can cause product breakage during installation.
2. QD bushing sizes JA thru W may be assembled in either conventional or reverse mounting. Size H must be assembled in conventional mounting position only. When mounting a product on size M thru S bushings, the hub jack holes should be positioned away from the bushing saw slot to reduce the possibility of bushing breakage and insert cap screws through drilled holes in hub. Conventional Mounting: Place bushing in hub. Tighten cap screws finger tight into threaded holes in bushing flange. Reverse Mounting: Place bushing in hub and insert cap screws thru drilled holes in bushing flange. Tighten cap screws finger tight into threaded holes in hub.
3. With key on shaft, slide loosely assembled unit onto shaft so that cap screw heads are on the outside. Locate unit in desired position on shaft. When using conventional mounting for large or heavy parts, it may be easier to mount the key and bushing on the shaft first, then place the product on the bushing aligning the holes and installing the cap screws. When mounting on a vertical shaft, ensure that the products and/or bushing do not drop during installation.
4. Tighten cap screws alternately and evenly to the wrench torque specified in table below. Note: When tightened there will be a 1/8” to 1/4” gap between bushing flange and hub. Should this gap close, then either undersize shafting or wrong bushing shaft size is indicated. Excessive screw torque may cause damage to either bushing and/or product.
5. Tighten setscrew over key to torque value listed below.

Recommended Torque - English					Recommended Torque - Metric				
	Cap Screws		Key Seat Set Screws			Cap Screws		Key Seat Set Screws	
Bushing	Size	lb-in	Size	lb-in	Bushing	Size	N-m	Size	N-m
QT	1/4–20 × 7/8	90	#10-24	36	QT	M6 × 1 × 25	5.6	–	–
JA	#10–24 × 1	60	#10-24	36	JA	M5 × 0.8 × 22	9.6	–	–
SH	1/4–20 × 1-3/8	108	1/4–20	87	SH	M6 × 1 × 35	11.5	M6 × 1	7.7
SDS	1/4–20 × 1-3/8	108	1/4–20	87	SDS	M6 × 1 × 35	11.5	M6 × 1	7.7
SD	1/4–20 × 1-7/8	108	1/4–20	87	SD	M6 × 1 × 50	11.5	M6 × 1	7.7
SK	5/16–18 × 2	180	1/4–20	87	SK	M8 × 1.25 × 50	20.5	M6 × 1	7.7
SF	3/8–16 × 2	360	5/16-18	165	SF	M10 × 1.5 × 50	34	M10 × 1.5	35
E	1/2–13 × 2-3/4	720	3/8–16	290	E	M12 × 1.75 × 70	77	M10 × 1.5	35
F	9/16–12 × 3-5/8	900	3/8–16	290	F	M14 × 2 × 100	100	M10 × 1.5	35
J	5/8–11 × 4-1/2	1620	3/8-16	290	J	M16 × 2 × 120	194.5	M12 × 1.75	55
M	3/4–10 × 7	2700	3/8-16	290	M	M20 × 2.5 × 180	256	M12 × 1.75	55
N	7/8–9 × 8	3600	1/2-13	620	N	–	–	–	–
P	1–8 × 9–1/2	5400	5/8–11	1325	P	–	–	–	–
W	1-1/8–7 × 11-1/2	7200	1-8	5000	W	–	–	–	–
S	1-1/4–7 × 15-1/2	9000	1-1/4–7	7600	S	–	–	–	–

Figure 13: Recommended torque

Removal

1. Remove all cap screws.
2. Install cap screws into threaded jack holes.
3. Tighten all jackscrews alternately and evenly, beginning with screw farthest from bushing saw slot, until bushing grip is released. Slide unit off shaft.

2.5 Maintenance Schedule

2.5.1 Semi-Annual Tasks

Task	Notes
Check belt tracking and belt surface condition.	Visual inspection of both the teeth and back side for cracks or wear. Check condition of belt edge for signs of misalignment or excess contact with sprocket flanges.
Check timing pulley condition	Verify timing pulley flanges are secure. Visually inspect teeth of pulleys for foreign debris and clear as required
Check idler condition	Verify idlers are spinning freely and belt is not sliding relative to them. Visually inspect there is no build up on idlers and clear as required

3 Diamond Top Belt Conveyors

3.1 Overview

Diamond Top Belt Conveyors are commonly used throughout the Wet Transfer and Takeoff areas to carry board. The belts are looped around a crowned drive pulley and a take-up tail pulley, and supported along its length of travel by a steel structural member or a series of rollers. Typical conveyors using diamond top belts include:

- Wet Transfer Belts
- Tipple Conveyor
- Takeoff Feed Conveyors
- Staging Conveyors
- Transfer Conveyors
- Holding Conveyors

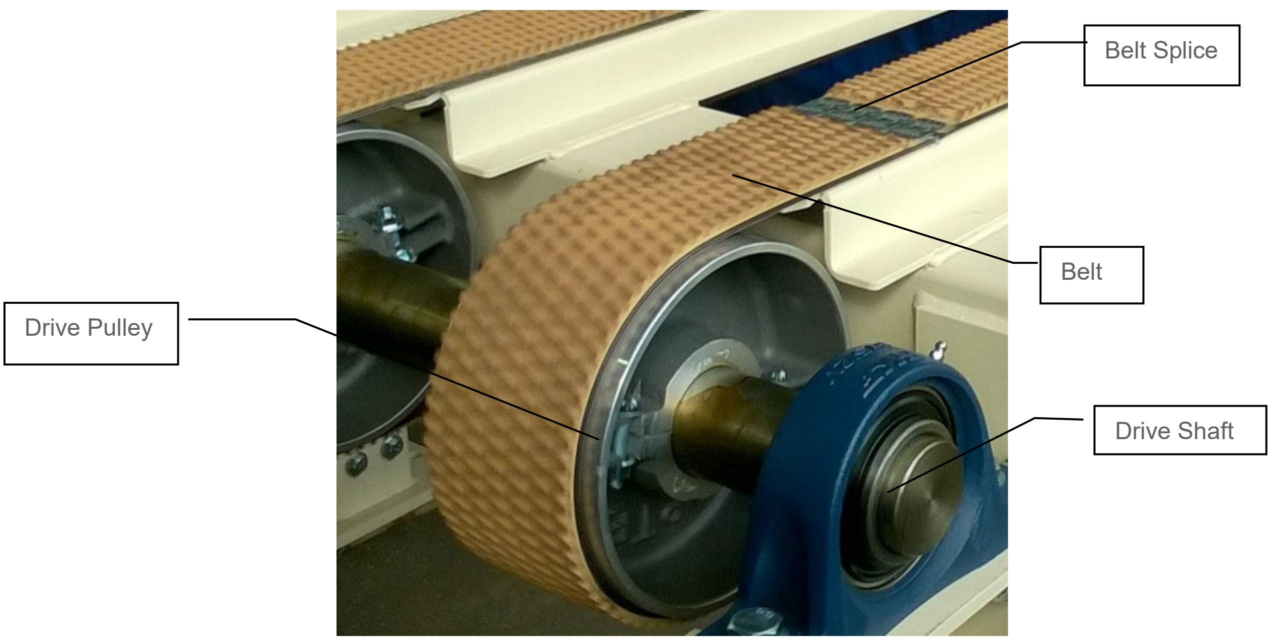


Figure 14: Flat Belt Drive Pulley

Caution!

Failure to install a flat belt in accordance with the manufacturer's guidelines can adversely affect the performance of the machine. Ensure proper belt alignment for centered operation and maintain the specified tension to achieve optimal functionality.

3.2 Maintenance Procedures

3.2.1 Belt Splice

Belt splicing for diamond top belts uses a splicing clip with splicing wire to join the ends.

1. First check to have the proper belt length for splicing by measuring the existing belt length.

2. Next ensure belts ends are cut perfectly square. After the cuts are made, the belt ends may be skived to remove the diamond pattern from the ends allowing a smooth flat surface for the splicing clips to be fastened.

3. Splicing clips are fastened by means of crimping the staple ends to the belt. A special tool is generally required to align and fasten the clips to the belt – see figure below. Ensure that all splicing staples are crimped completely flat with the skived surface of the belt so that it will not nick or mark the board or conveying equipment.

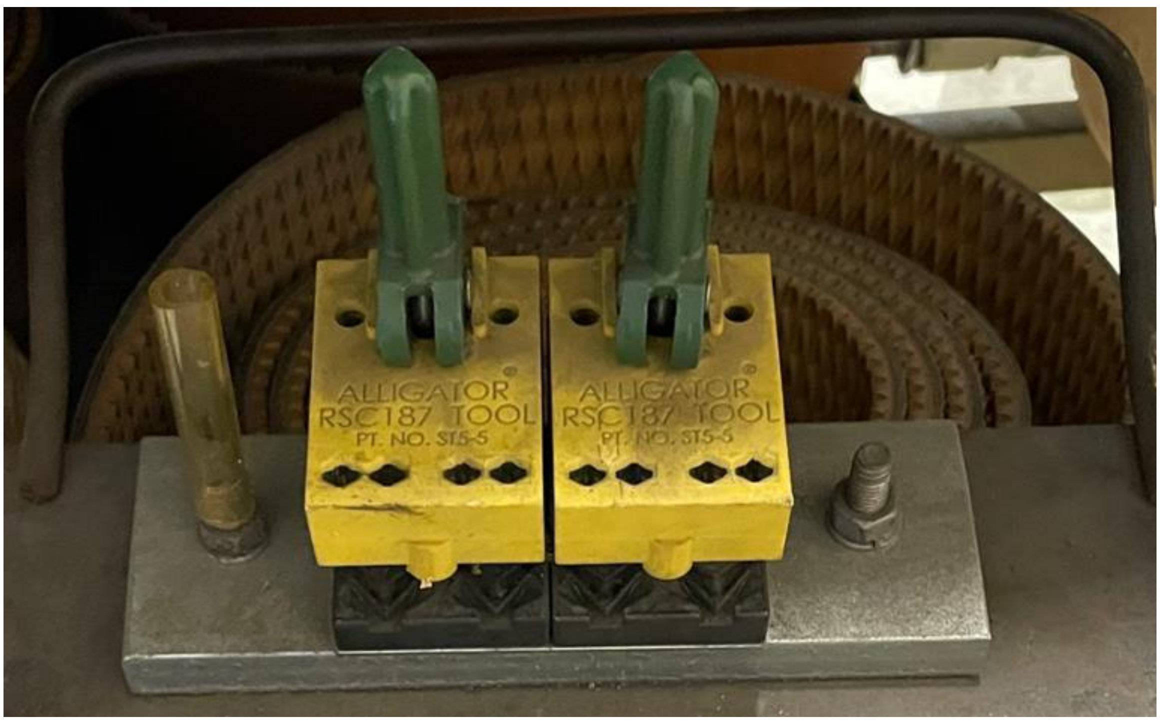


Figure 15: Belt splicing tool

The appropriate style hinge pin is then pushed in between the overlapping clips from each end of the belt. Wire ends should be trimmed to length. Crimp one end of the clip to secure the hinge pin as shown in the figure below.

Refer to manufacturer manuals for additional details on splicing requirements.

Figure 16: Diamond top belt splice

3.2.2 Belt Tensioning

Tensioning of flat belts is performed at the takeup (tail) pulley using threaded rod adjustments. The clamping nuts on the threaded rods are adjusted to move the tail pulley away from the frame, thereby increasing belt tension.

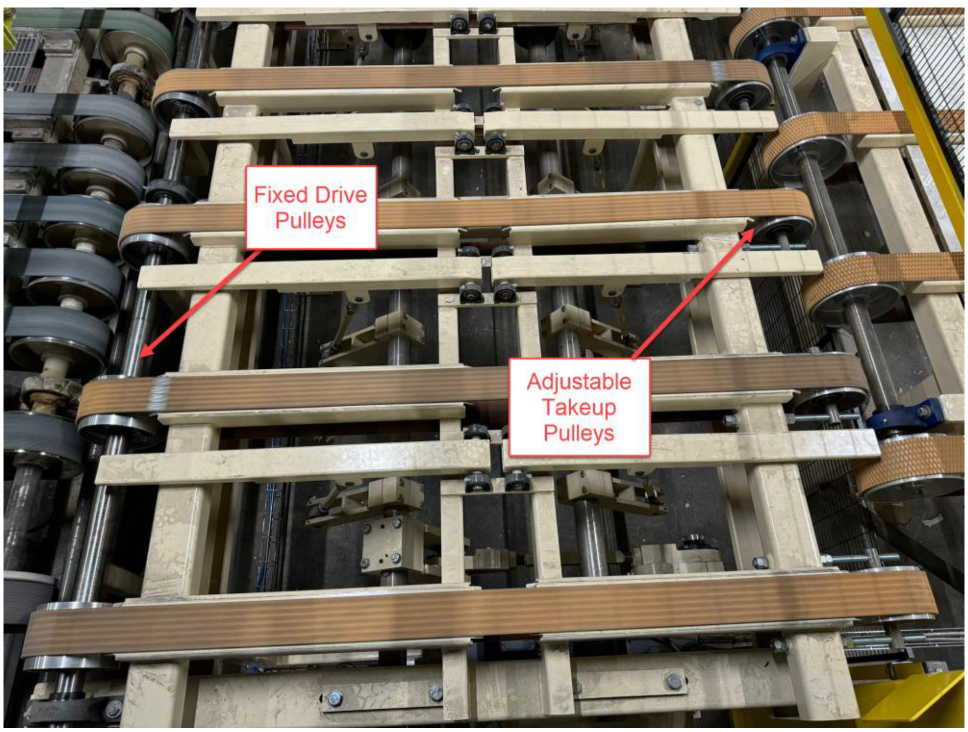


Figure 17: Typical diamond top belt pulley arrangement

The belt strain should be set to 0.25%. For example, in a 10-meter-long conveyor belt, this corresponds to a length increase of 25 mm. To measure this, mark two points on the belt at a known distance and tension the belt until the distance between the marks increases by 0.25%.

When the belt is properly tensioned, the drive shaft should rotate freely when the belt is manually pulled (ensure the motor brake, if equipped, is disengaged).

The following steps outline the tensioning process:

1. **Preparation:** Ensure the belt is at room temperature before proceeding. Lay the belt flat and make match marks at a known distance:
    - For longer belts: 100 inches (2 m) apart.
    - For shorter belts: 50 inches (1 m) apart.
2. **Tension Adjustment:** Gradually tension the belt until the distance between the match marks increases by 0.25%. For reference:
    - At 50 inches, stretch by 1/8 inch
    - At 1 m, stretch by 2.5mm.

   Note: There should be a small gap between the locking/adjustment nuts to allow the tensioner rods to spin freely. The double nuts do not have to be loosened to adjust tension.
3. **Belt Alignment:** Operate the conveyor to verify proper belt tracking and uniform tension along its length.
4. **Verification:** Recheck the match marks after initial operation. Adjust tension as needed, repeating the process until the match marks remain at the desired distance.
5. **Re-Tensioning:** After the initial run-in period (1–2 days of operation), release the tension completely and repeat the above steps using new match marks to re-tension the belt.

These steps ensure optimal belt performance and longevity.

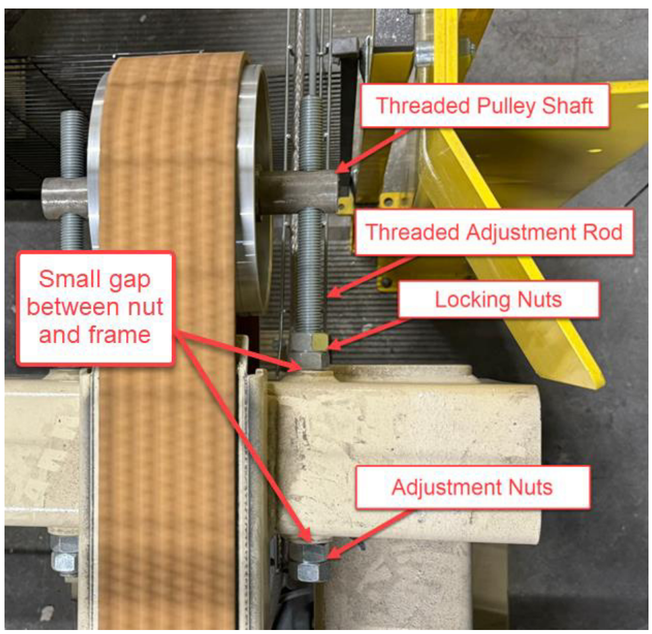


Figure 18: Tensioning arrangement

For long conveyors equipped with multiple belts designed to transport two or three board widths, it is essential to equalize the tension across all belts. This ensures that the boards remain aligned and prevents staggering during transport. This procedure is particularly critical for longer conveyors such as return conveyors, tipples, and take-off feed conveyors exceeding 50 feet (15 meters) in length.

After setting the initial belt tension as described earlier, follow these steps to equalize tension:

1. **Mark Alignment:** Use a chalk line to create a straight reference line across all belts near the tail pulley, perpendicular to the direction of board travel.

2. **Run the Conveyor:** Start the conveyor to move the chalk line toward the head pulley. Stop the conveyor before the marks reach the head pulley.

3. **Identify Tension Variations:** Observe the positions of the chalk marks. Belts with lower tension will move faster, causing their marks to lead. Measure the deviation of the worst-case leading and lagging marks relative to the average position.

4. **Adjust Tension:** Adjust the tension of the leading and lagging belts by moving the tail pulley. Based on experience, shifting the tail pulley by 1/4 inch (6 mm) typically results in approximately 1/2 inch (13 mm) of adjustment in the chalk line position over a 100-foot (30-meter) conveyor.

5. **Verify Alignment:** Repeat the process until all belts are synchronized within a tolerance of 1 inch (25 mm) over a 100-foot (30-meter) conveyor length.

This ensures uniform belt movement, promoting smooth and consistent board transport along the conveyor.

3.2.3 Belt Tracking

The crowned aluminum head pulley is self-tracking during normal operations. Ensure that the head and tail pulleys are parallel and square to the direction of travel. If the belt is supported by a series of rollers, also check to ensure that all supporting rollers are level and square to belt travel. Check tracking after several belt rotations.

3.3 Maintenance Schedule

3.3.1 Weekly Tasks

Task	Notes
Check belt tracking and belt surface condition	Visual inspection
Check belt splices	Verify splice is intact Verify hinge pin in secured in place

3.3.2 Semi-Annual Tasks

Task	Notes

Inspect head and tail pulley surface conditions	
Check fasteners for tightness on take-ups	

3.3.3 Annual Tasks

Task	Notes
Check bearings in take-up tail pulleys for excessive wear	

4 Roller Conveyors – Flat Belt Drive

4.1 Overview

Roller conveyors employing the use of flat belt drives provide frictional drive contact to the board carrying rollers. Typical roller conveyors using flat belt drives include Transfer Conveyors.

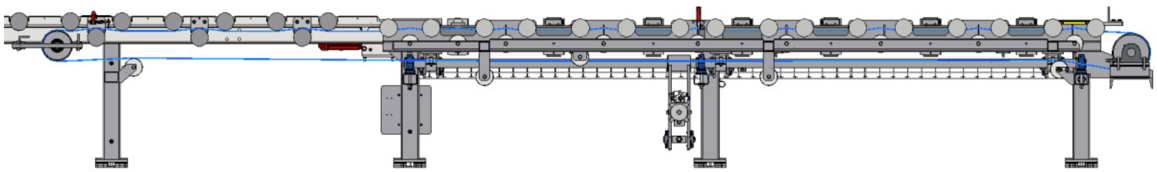


Figure 19: Transfer Conveyor Flat Belt Drive

4.2 Maintenance Procedures

4.2.1 Belt Splice – ESPOT 30/40CC

Some conveyors may be equipped with the ESPOT 30 or 40 CC series belts. These flat belts are spliced as described below.

Required tools:

- Stanley utility knife or Olfa carpet knife - used for cutting plies
- Carpenters square – used for drawing straight lines and knife guide
- 2 pairs of ply lifting pliers (carpenters pliers) – used for stripping plies
- Green ink pen – used for making layout reference marks (note: green ink should be used, as it is the only color that can be removed from belt with solvent)
- Soldering gun – used for tacking splice together
- Spatula or putty knife – used for applying splice paste
- Appropriate sized water cooled vulcanizer/press – used for vulcanizing splice
- Compressed air supply – used for pressurizing vulcanizer/press
- Cold water supply – used for cooling down vulcanizer/press after heating cycle

Prep of the belt:

When preparing ends we recommend preparing them in a belt shop and wrapping the ends in plastic to protect them during the process of threading the belt on the system. This is not always possible so when preparing in the field; take precautions to maintain a clean oil and dirt free surface when preparing the ends.

Splice layout:

1. Using a solid flat surface, place one end of belt, top cover side down on work surface.

2. Draw a pen line across the width of the belt, 12” back from belt end and 90 degree’s to belt edge.

3. Multiply the belt width by .4 (e.g. 11”belt x .4 = 4.4”) This will give the splice a 22 degree angle. A greater angle can be used, however 22 degree’s is sufficient to minimize the stress on the splice area when travelling around pulleys. Use the result of the calculation to measure along the belt edge from the 90 degree line towards the belt end. Make an ink mark at this point.

4. Using a straight edge, draw a pen line connecting the mark to the 90 degree line on the opposite belt edge.

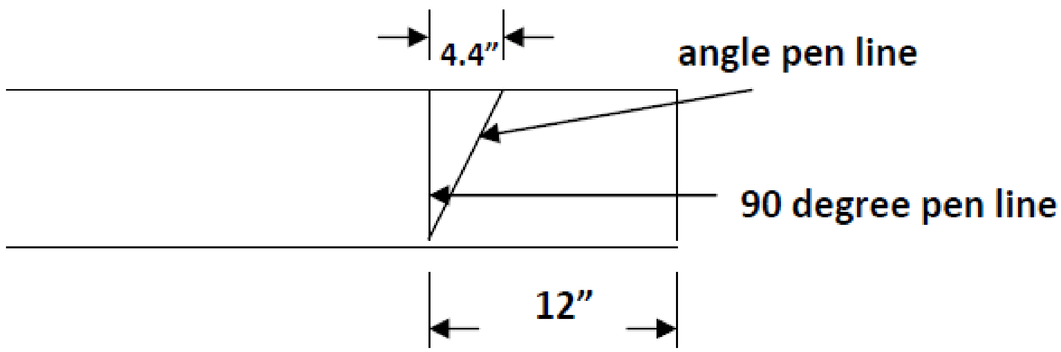


Figure 20: Splice Layout

Cutting & Removing Plies:

1. Using a straight edge as a guide, cut along the angle line cutting through the bottom cover and first ply only. Ensure ply is cut. This can be achieved by bending belt and exposing cut area. If ply is not completely cut through, carefully make a second cut to complete the process. “DO NOT CUT THROUGH TO THE NEXT PLY” if the next ply is nicked or cut the splice will be damaged and preparation should be started over.

2. Along either edge of belt from the angle line to belt end, make a small cut in the vertical belt edge 1/8” to 1/4” in depth between the first ply and the skim coat of PVC between the first and second ply. Make this cut as close to the first ply as possible. “DO NOT CUT THROUGH TO THE NEXT PLY”

3. Using two pairs of pliers, obtain a firm grip on the bottom cover and first ply and the remaining plies and top cover. Forcefully pry and lift the bottom cover and ply until it separates from the remaining portion of belt. Skim coat of PVC should remain on the belt portion. If separation becomes difficult, cut the material to be removed in 2” strips (see below).

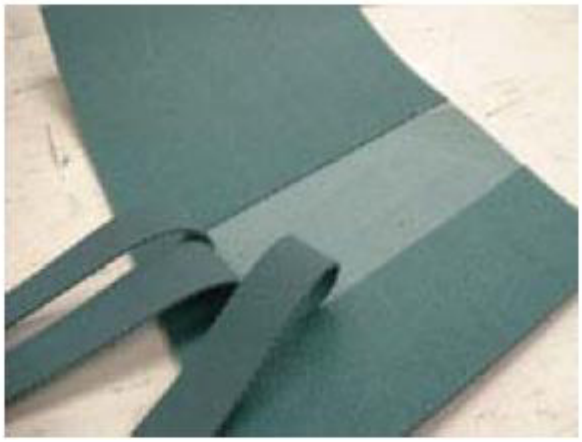


Figure 21: Ply removal

4. Once first ply is removed, measure 3-1/4" along belt edge from angled cut line to belt end and make a pen mark at this point. Repeat for opposite belt edge. Lay down straight edge on belt joining the two marks. Using the straight edge as a guide, cut the second ply in the same manner as the first.

5. Use the same process of removal for the second ply as the first ply.

6. Repeat step 4 measuring 3-1/4" from the second angle cut. Using the straight edge as a guide, cut and discard the remaining belt end.

7. One belt end is now prepared for vulcanizing.

8. Beginning at point "A" measure required length of belt and make a mark on the opposite end (un-prepared end) along the same edge as "A".

9. Fold over belt ends to meet one another, laying the prepared end on top of the unprepared end. Align point "A" with reference point made in step 8.

10. Ensure splice alignment by checking overlapped belt edges and using a straight edge to ensure alignment beyond splice area.

11. Using the prepared belt end as a guide, trace a line on the top of the unprepared belt end.

12. Fold back prepared end from work area. Repeat step 1, this time cutting through top cover and nearest ply.

13. Repeat steps 2 through 7. Where section 3, step 3 states to leave skim coat of PVC on belt end, ensure skim coat is removed during preparation of second belt end. By doing this, uniform belt thickness will be achieved through the splice area when belt ends are placed together. Overlay the end on each other and check for alignment.

14. Both belt ends are now prepared for vulcanizing. If belt needs to be threaded on the system ends should be cleaned with a solvent or solution that completely evaporates and does not leave any residue that can contaminate the splice area. After cleaning the laps the ends should be wrapped in plastic to protect them from dirt and contamination during threading process. Check for direction of travel based on type of system.

Vulcanizing the Belt:

1. Using a spatula, coat inner plies of prepared end of belt, which does not have PVC skim coat with a thin layer of ITR00 Flomil splicing paste. (approx. 1/32" in thickness) Flomil paste is a specialty product and matched to the PVC compound used in the belt.

2. Align prepared ends of belt together so they overlap by 3/16"

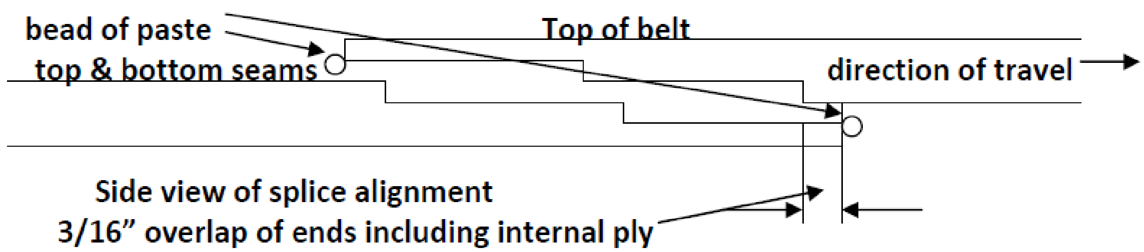


Figure 22: Belt alignment

3. Ensure alignment by using step 10 of the last section.

4. Using a soldering gun, insert hot tip between overlapped belt edges to temporarily hold splice in place.

5. Run a small bead (1 / 8") of EBL 00 Flomil paste at belt end locations. Top and bottom.

6. Place splice area in vulcanizer/press. Center splice over heating platen and use scrap pieces of Espot 30cc to fill remaining platen area. Make certain to fill more than 80% of the press platen area with belt material to ensure equal pressure across splice. Butt scrap pieces tightly against side of splice area to reduce splice "flow-out" and splice movement. Check for splice alignment using a straight edge.

7. Make sure entire are to be spliced fits within press platens. Secure in place using Vulcanizer/press hold down clamps.

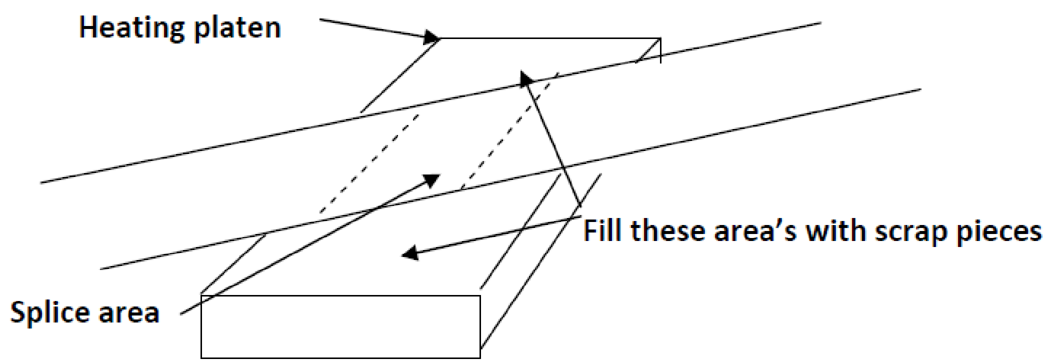


Figure 23: Entire splice area shown within heating platen

8. Cover area with Teflon release sheet. Place stainless steel plate on Teflon and place top portion of vulcanizer in place.

9. Refer to Esbelt specification sheets for setting press temperatures for top and bottom platens along with appropriate dwell time once press reaches temperature. Pressure settings are shown at the bottom of each specification sheet.

10. Make all vulcanizer/press connections (power, air lines and water cooling lines)

11. Set pressure to 28.45 PSI (approx. 2 Bar)

12. Set platen temperatures (top and bottom platen) to 347°F and once temperature is reached dwell at this temp for: Espot 30CC 8 minutes and Espot 40CC 9 minutes.

13. Initiate cooling cycle and cool to room temperature. Open press and remove scrap pieces. Using a straight edge carefully trim the edge bumpers from the belt and inspect the splice for square and a clean cook free of bubbles, bumps and voids in the seams.

14. When installed belt has cooled to room temperature and all equipment is clear tension can be applied using the match marks on the belt cover to measure tension.

4.2.2 Belt Splice – SLGLR-100

Some conveyors may be equipped with the SLGLR-100 series belts. These flat belts are composed of a spiral-link polyester monofilament carcass that is encased in a PVC jacket. The spiral-link belt carcass allows for quick splicing with minimal tools as shown in the figures below. No vulcanizing is required.

Required tools:
- Stanley utility knife or Olfa carpet knife - used for cutting plies
- Hand pick with 90° tip
- Needle nose pliers

Splice Prep:

1. Locate center of the spiral link hinge.

2. Make a mark and cut the cover on either side of the hinge. Ensure not to cut the spiral-link monofilaments.

3. Pull up cover to expose the hinge and pick out the lacing.

4. Install hinge pin.

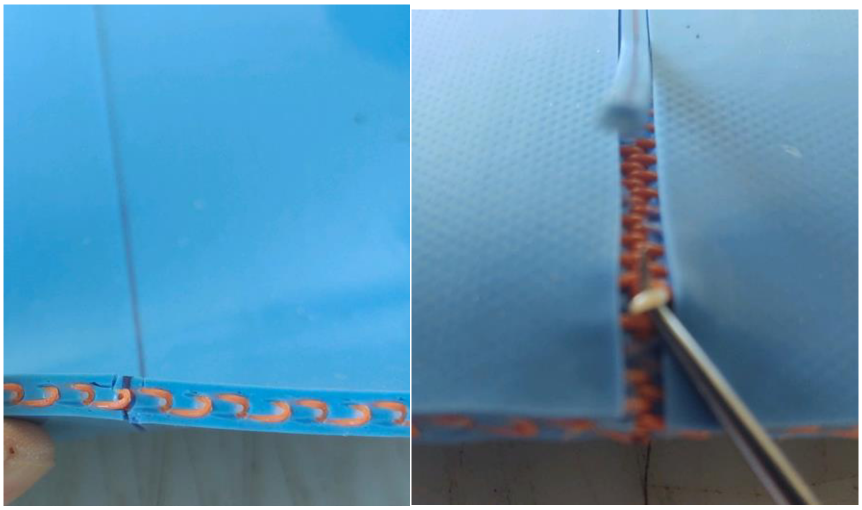


Figure 24: Spiral Link belt splice prep. Left image shows blue cover being gently scored to expose the spiral filaments. Right image shows the filaments and hinge exposed and lacing being picked out.

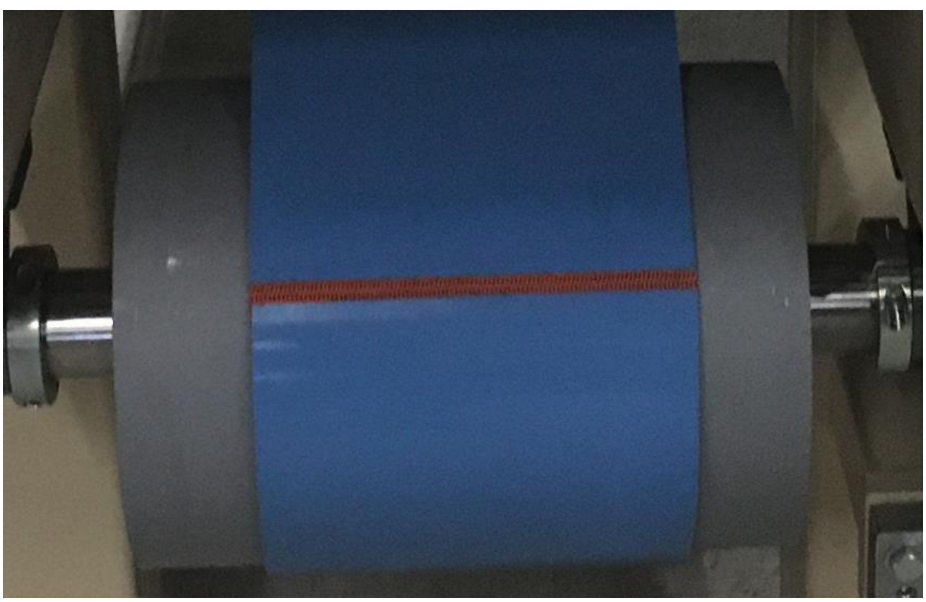


Figure 25: Completed splice

4.2.3 Belt Tensioning

Threaded rod adjustment on a take-up pulley is used to tension the belt. The following procedure outlines tensioning the belt:

1. With the belt pulled straight, make match marks near the middle of the belt 100” apart (or 2m). Use 50” (or 1m) on shorter belts.

2. Tension the belt until the distance between the match marks increases by 0.5%. (A belt tension of 0.5% is generally a good initial tension for the ESPOT 30/40CC belts. 0.8% is generally a good initial tension for the SLGLR-100 belts. Some manufactures may have a different recommendation for their belt. Please confirm tension recommendation with the manufacturer). For example, using a value of 0.5%:
   At 100” → stretch 1/2”
   At 50” → stretch 1/4”
   At 2m → stretch 10mm
   At 1m → stretch 5mm

3. Run the belt to check tracking and equalize tension throughout the length.

4. Check the match marks and adjust accordingly, cycling again if necessary, until the match marks remain at the desired dimension.

5. Re-tension belts after initial run in period of 1-2 days operation. To re-tension, release all belt tension and then repeat all steps using new match marks.

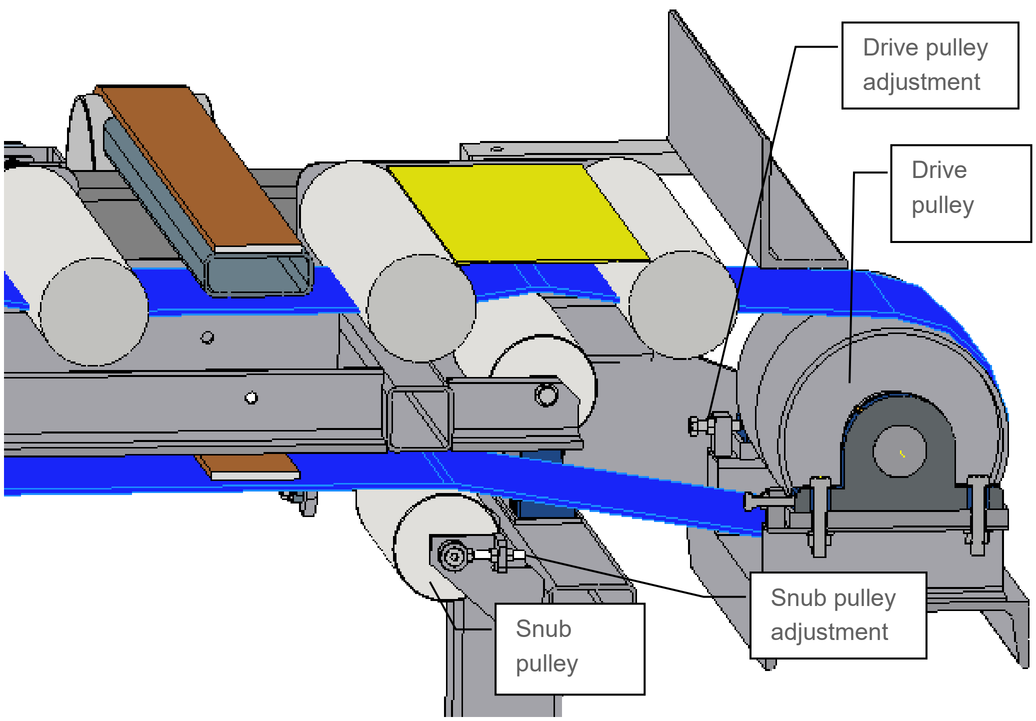


Figure 26: Drive and snub pulleys

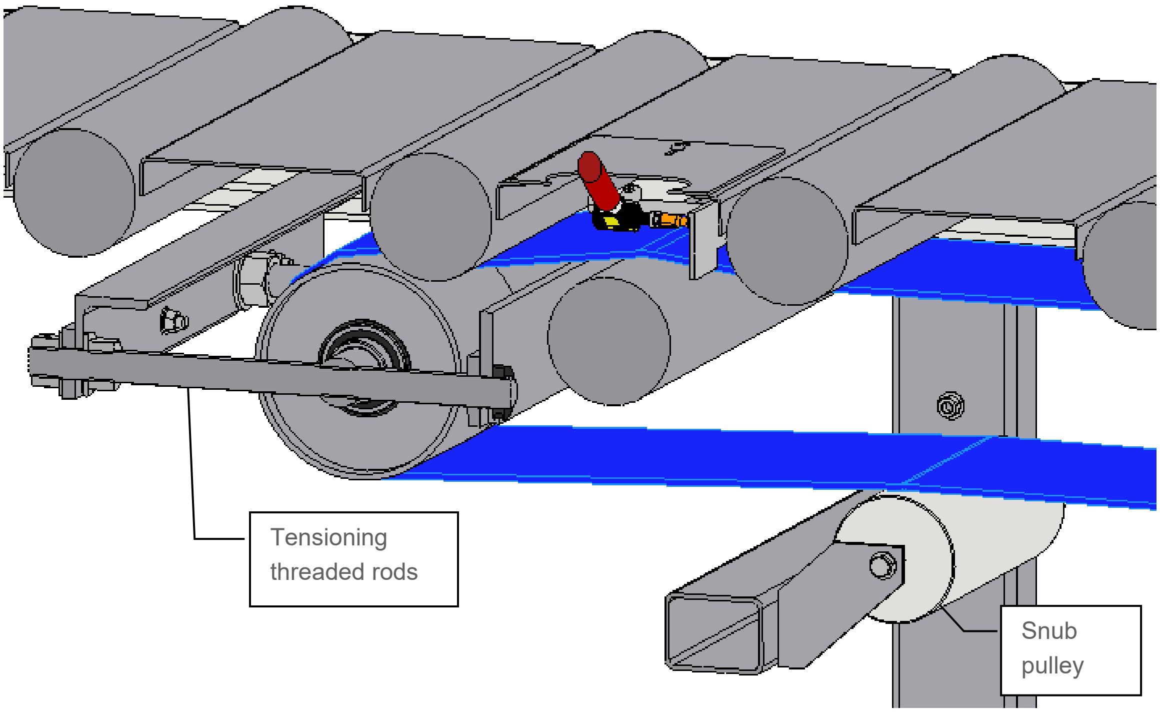


Figure 27: Takeup and snub pulleys

4.2.4 Belt Tracking

The crowned head pulley is self-tracking during normal operations. For belts that run in both forward and reverse directions, it will be necessary to check belt tracking in both directions.

- Check that the head pulley, tail pulley, and snub pulleys are all parallel and level.
- Check all driven rollers are parallel and level.
- For tracking adjustments, with the belt running at reduced speed, adjust the last snub pulley that feeds the belt into the tail end based on belt travel direction. Adjust as necessary to achieve belt running on centerline.

4.3 Maintenance Schedule

4.3.1 Monthly Tasks

Task	Notes
Check belt tracking and belt surface condition.	Visual inspection.
Check belt splice.	

4.3.2 Annual Tasks

Task	Notes
Lubricate pulley and roller bearings.	
Check all jack bolts for tightness on rollers and pulleys.	
Check driven roller surface conditions.	

5 Roller Conveyor – Chain Drive

5.1 Overview

Dryer rolls, Infeed and Outfeed, Tipple hoist, and Dunnage Cube Feed Conveyor are typical machines that use chain drives.

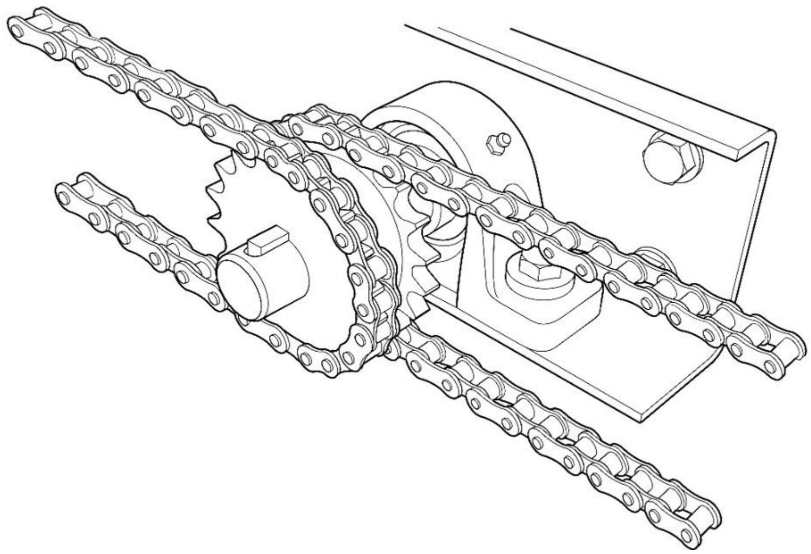


Figure 28: Chain Drive

Caution!

Improper installation of a chain, contrary to the manufacturer's guidelines, can compromise the machine's functionality. Ensure the chain edges are parallel and correctly aligned and maintain the specified tension to achieve optimal performance.

5.2 Maintenance Procedures

5.2.1 Regular Inspection

The components of the chain drive need to be inspected regularly, e.g. every 4 weeks. The components of the chain drive are:

- Chain
- Sprocket
- Tensioner
- Guides

If there are signs of tarnishing or wear, the following components need to be inspected:

- Alignments of the links of the chain
- Overwork
- Short supply of lubricant

5.2.2 Lubricating the chain

Check the chain's lubrication regularly, e.g. every 4 weeks. To assure a proper run of the chain drive, the chain needs sufficient lubrication. The lubricant needs to reach the bolts and the bushings (joint) as well as every sprocket.

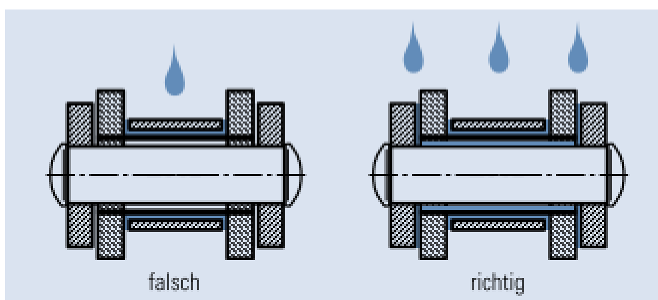


Figure 29: Lubrication Points

- Use lubricants similar to the first lubricant.
- Do not use fat.

Recommendation: LUBCON TURMOFLUID ED13

5.2.3 Chain Splicing

To install a chain with a removable link, follow these steps:

1. Check the sprockets to make sure they are in alignment.
2. Measure the chain to make sure it is the correct length. If the chain is new and needs cutting, wrap the chain around the sprockets. Mark which link needs cutting. Cut the chain. Use a chain-cutting or detaching tool.

The chain should have a roller link on both ends. If it does not, install a half link.

3. Install chain onto the drive. Make sure the chain is routed around all sprockets and there is no slack between sprockets. Have chain end on the largest sprocket in the drive. This will help insert the removable link. If a half link is used, the link should overlap the roller link on the end of the chain
4. Insert the removable link. If a half link is used, insert a pin into the link.
5. Install side plate and pins into the removable link.
6. Adjust chain tension, if necessary.

Removing a chain from a drive - detaching the chain - is a simple procedure. Most chains have a removable link. To remove a chain with a removable link, follow these steps:

1. Secure the machinery to prevent rotation of the drive.
2. Release tension from the tensioner.
3. Turn the chain so that the master link is on the middle teeth of the largest sprocket in the assembly. Teeth on both sides of the master link will grip the chain. This relieves pressure on the master link.
4. Remove the pins or snap ring that holds the removable-link's side bar in place.
5. Remove the side bar from the removable link.
6. Remove the rest of the link from the chain. It may be required to have to drive the link from the chain using a small pin punch and hammer.

If the chain does not have a removable link, remove one sprocket from its shaft. (Most silent chains do not have a removable link.) After the sprocket is removed, the chain can be lifted from the sprockets and removed.

If the chain is removed by removing one of the sprockets, reverse the procedure to reinstall the chain. Be careful to align the shafts so the timing is not changed when the sprocket is reinstalled. Usually, the sprockets have timing marks that must be lined up.

5.2.4 Chain Tensioning

Proper chain tension is very important to the life of the chain and its sprockets.

Chains that are too tight cause excessive chain and sprocket wear. Chains that are too loose cause cyclic vibrations and can be thrown off their sprockets.

Tightness is measured by the amount of slack in the chain. Chain drives operate best with just enough slack to allow slight sagging between sprockets. The chain should flex slightly when lifted by hand. Chains are adjusted to sag. They should sag about two percent of the distance between the mid-points of the sprockets on which they run. For example, a chain drive 12 inches long should sag 1/4 inch. One with a slack side of 100 inches should sag 2 inches.

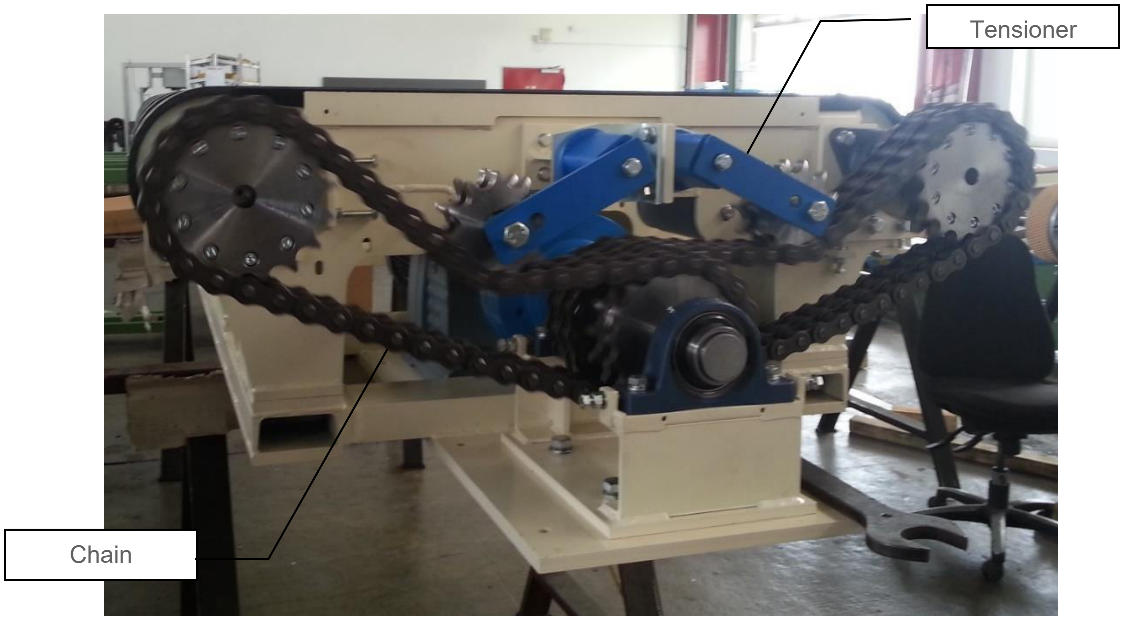


Figure 30: Chain Drive (equipment may not be equipped with all features shown)

5.3 Maintenance Schedule

5.3.1 Weekly

Task	Notes
Inspect sprocket for hooked teeth.	Visual inspection.
Inspect for worn teeth.	Visual inspection.
Inspect chain connecting links to ensure they are not damaged or loose.	Visual inspection.

5.3.2 Monthly

Task	Notes
Inspect for worn side bars.	Visual inspection.
Inspect for chain stretch.	Visual inspection.
Inspect for worn sprocket teeth.	Visual inspection.

Note: Never replace a worn sprocket without replacing the chain.

5.3.3 Malfunctions

ISSUE	PROBABLE CAUSE	REMEDIES
One-sided wear out at the chain and wheels	Shafts not parallel, wheel and sprocket not aligned	Realign
Wear out at the inner plate or on the side of the cog	Wheel and sprocket not aligned or have axial run-out to the shaft	Realign wheels
Wear out at the tip	1. Extension of the chain 2. Gearing error	1. Exchange the chain 2. Exchange the wheel and the sprocket
Wear out at the tooth flanks	1. Little material strength	1. Exchange for hardened wheels
Wear out at the outer plate	1. Chain hits	1. Assure free run
Chain swings high frequently	1. Eccentricity or axial run out of the wheels 2. Broken chain sprocket	1. Replace wheels 2. Replace chain link
Premature extension of the chain	1. Insufficient lubrication or chain too light	1. Increase oil supply and check the size of the chain
Ferruginous colouring of the chain, bolt and oil	1. Too little lubrication	1. Improve lubrication
Chain overleaps	1. chain’s slack span too big 2. Insufficiently grasp at the big wheel caused by wear out of chain	1. Readjust distance to center or spraining gear 2.Replace chain
Broken chain parts	1. Driver overstrained 2. Chains slack span too big and chain overleaps 3. Strike at fixed object	1. Exchange chain or avoid overload 2. Periodical check and adjust the dimensions between axes 3. Assure free run of the chain

	4. Too much speed of the chain 5. imprecise toothing at the wheels 6. Insufficient lubrication 7. Corrosion	4. Check the chain design 5. Exchange wheels 6. / 7. Improve lubrication and increase the mass
Strong noise	1. Chain hits 2. Insufficient lubrication 3. Broken or missing pulley part 4. Alignment error 5. Chain overleaps	1. Assure free run of the chain 2. Improve lubrication 3. Exchange chain or replace broken parts 4. level Corrugations and Wheels 5. Adjust the dimensions between axes

6 Linkage Arm Assemblies

6.1 Overview

Linkage arm assemblies are used throughout the boardplant equipment to leverage a mechanical advantage and may be powered by pneumatic actuator or a gearmotor. Typical equipment where linkage arm assemblies may be found include:

- Pitch and Catch Arms on the Inverter or Booker
- Raising and Lowering Rollers on Transfer Conveyors and Dry Transfer Tables

Figure 31: Linkage arm assemblies

6.2 Maintenance Schedule

6.2.1 Semi Annual Tasks

Task	Notes
Check for excessive play in bearing and shafts/pins	Visual inspection.
Verify any adjusters are tight	

7 Gearmotors

See SEW manuals for gearmotor additional maintenance information. Most of the drives use a TorqLOC shaft mounting system.

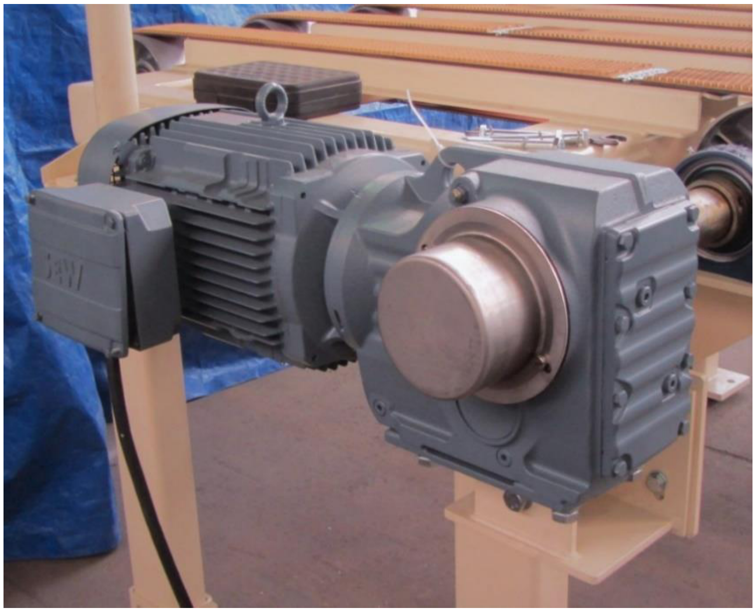


Figure 32: Typical gearmotor

7.1 Oil

The motor name plate indicates the type of oil and quantity. An example of this shown in the figure below.

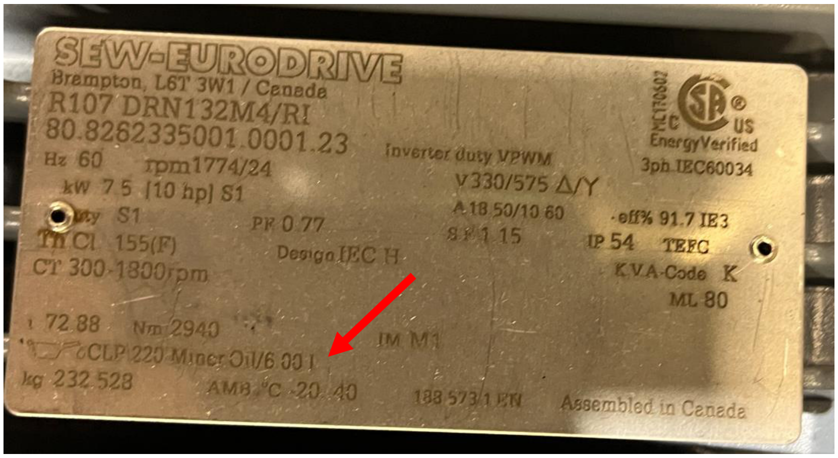


Figure 33: Name plate shows CLP 220 Mineral Oil, 6.00L capacity

Do not intermix synthetic lubricants and do not mix synthetic and mineral lubricants together!

The standard lubricant is mineral oil (except for Spiroplan® gear units).

The position of the oil level and oil drain plug and the breather valve depends on the mounting position. Refer to the diagrams of the mounting positions.

Checking the oil level

1. **De-energize the gearmotor and secure it to prevent it from being switched on inadvertently!**

   Wait until the gear unit has cooled off – Danger of burns!
2. Refer to Sec. "Installing the gear unit" when changing the mounting position!
3. For gear units with an oil level plug: Remove the oil level plug, check the fill level and correct it if necessary. Screw the oil level plug back in.

Checking the oil

1. **De-energize the gearmotor and secure it to prevent it from being switched on inadvertently!**

   Wait until the gear unit has cooled off – Danger of burns!
2. Remove a little oil from the oil drain plug.
3. Check the oil consistency.
   – Viscosity
   – If you can see that the oil is heavily contaminated, we recommend that you change the oil even if this is outside the service intervals specified in "Inspection and maintenance periods".
4. For gear units with an oil level plug: Remove the oil level plug, check the fill level and correct it if necessary. Screw the oil level plug back in.

Changing the oil

Only change the oil when the gear unit is at operating temperature.

De-energize the gearmotor and secure it to prevent it from being switched back on inadvertently!

Wait until the gear unit cools down - Danger of burns!

Note: The gear unit must still be warm otherwise the high viscosity of excessively cold oil will make it harder to drain the oil correctly.

With oil drain plug / oil level screw

1. Place a container underneath the oil drain plug
2. Remove the oil level plug, breather plug/breather valve and oil drain plug.
3. Drain all the oil.
4. Screw in the oil drain plug.
5. Pour in new oil of the same type through the vent hole (if changing the oil type, please first contact our customer service). Do not mix synthetic lubricants.
   – Pour in the volume of oil in accordance with the mounting position (see Sec. "Lubricant fill quantities") or as specified on the nameplate.
   – Check at the oil level plug.
6. Screw the oil level plug back in
7. Screw in the breather plug/breather valve.

Without oil drain plug / oil level plug

1. Remove cover plate.
2. Drain the oil through the cover plate opening.
3. Pour in new oil of the same type through the vent hole (if changing the oil type, please first contact our customer service). Do not mix synthetic lubricants.
   – Pour in the volume of oil in accordance with the mounting position (see Sec. "Lubricant fill quantities") or as specified on the nameplate.
4. Check the oil level (→ Sec. "Check oil level for gear units with oil level plug")
5. Attach cover plate (observe the tightening torque and series → Sec. "Check the oil level for gear units without an oil level plug")

Changing the oil seal

1. **De-energize the gearmotor and secure it to prevent it from being switched on inadvertently!**

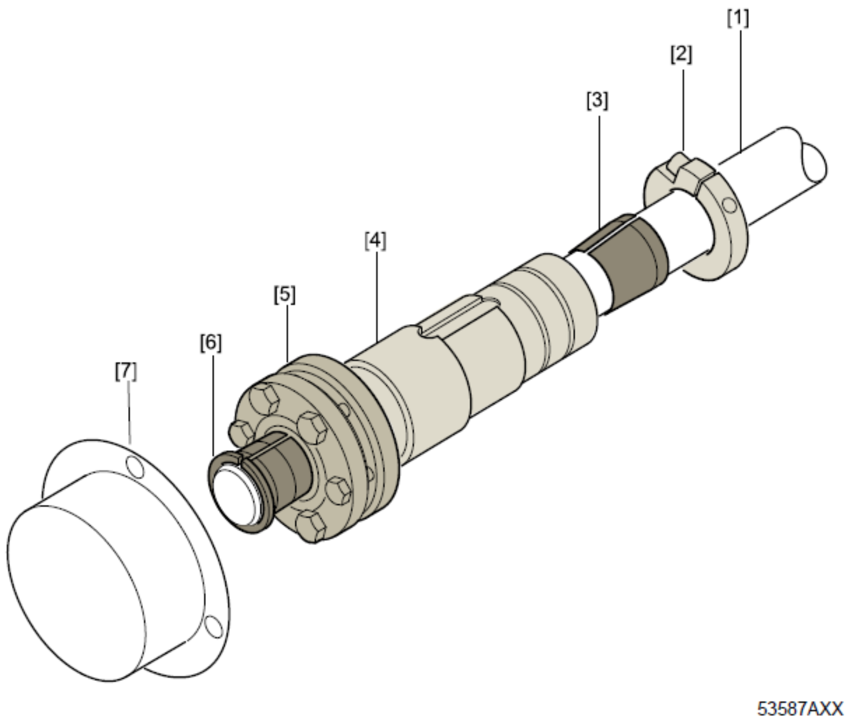
   Wait until the gear unit has cooled off – Danger of burns!
2. When changing the oil seal, ensure that there is a sufficient grease reservoir between the dust lip and protective lip, depending on the type of gear unit.
3. If you use double oil seals, the space has to be filled one-third with grease.

	6) °C -50 0 +50 +100	DIN (ISO)	ISO,NLGI	Mobil	Shell	Klüber	Aral	bp	Tribol	Texaco	Optimol	Fuchs	Total
R...	Standard -10 +40	CLP(CC)	VG 220	Mobilgear 630	Shell Omala 220	Klüberoil GEM 1-220 N	Aral Degol BG 220	BP Energol GR-XP 220	Tribol 1100/220	Meropa 220	Optigear BM 220	Renolin CLP 220	Carter EP 220
	-25 +80	CLP PG	VG 220	Mobil Glygoyle 30	Shell Tivela S 220	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220	Tribol 800/220	Synlube CLP 220	Optiflex A 220		Carter SY 220
K...(HK...)	4) -40 +80	CLP HC	VG 220	Mobil SHC 630	Shell Omala HD 220	Klübersynth GEM 4-220 N	Aral Degol PAS 220		Tribol 1510/220	Pinnacle EP 220	Optigear Synthetic A 220	Renolin Unisyn CLP 220	
	4) -40 +40		VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N				Pinnacle EP 150			Carter SH 150
	-20 +25	CLP (CC)	VG 150 VG 100	Mobilgear 627	Shell Omala 100	Klüberoil GEM 1-150 N	Aral Degol BG 100	BP Energol GR-XP 100	Tribol 1100/100	Meropa 150	Optigear BM 100	Renolin CLP 150	Carter EP 100
F...	-30 +10	HLP (HM)	VG 68-46 VG 32	Mobil D.T.E. 13M	Shell Tellus T 32	Klüberoil GEM 1-68 N	Aral Degol BG 46		Tribol 1100/68	Rando EP Ashless 46	Optigear 32	Renolin B 46 HVI	Equivis ZS 46
	4) -40 +10	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32				Cetus PAO 46			Dacnis SH 32
	4) -40 -20	HLP (HM)	VG 22 VG 15	Mobil D.T.E. 11M	Shell Tellus T 15	Isoflex MT 30 ROT		BP Energol HLP-HM 15		Rando HDZ 15			Equivis ZS 15
S...(HS...)	Standard 0 +40	CLP (CC)	VG 680	Mobilgear 636	Shell Omala 680	Klüberoil GEM 1-680 N	Aral Degol BG 680	BP Energol GR-XP 680	Tribol 1100/680	Meropa 680	Optigear BM 680	Renolin CLP 680	Carter EP 680
	-20 +60	CLP PG	VG 680 1)		Shell Tivela S 680	Klübersynth GH 6-680		BP Enersyn SG-XP 680	Tribol 800/680	Synlube CLP 680			
	4) -30 +80	CLP HC	VG 460	Mobil SHC 634	Shell Omala HD 460	Klübersynth GEM 4-460 N				Pinnacle EP 460			
	4) -40 +10		VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N				Pinnacle EP 150			Carter SH 150
	-20 +10	CLP (CC)	VG 150 VG 100	Mobilgear 627	Shell Omala 100	Klüberoil GEM 1-150 N	Aral Degol BG 100	BP Energol GR-XP 100	Tribol 1100/100	Meropa 150	Optigear BM 100	Renolin CLP 150	Carter EP 100
	-25 +20	CLP PG	VG 220 1)	Mobil Glygoyle 30	Shell Tivela S 220	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220	Tribol 800/220	Synlube CLP 220	Optiflex A 220		Carter SY 220
	4) -40 0	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32				Cetus PAO 46			Dacnis SH 32
R...,K...(HK...), F...,S...(HS...)	4) -30 +40	HCE	VG 460		Shell Cassida Fluid GL 460	Klüberoil 4UH1-460 N	Aral Eural Gear 460				Optileb GT 460		
	-20 +40	E	VG 460			Klüberbio CA2-460	Aral Degol BAB 460				Optisynt BS 460		
W...(HW...)	Standard -20 +40	SEW PG	VG 460 2)			Klüber SEW HT-460-5							
	4) -40 +10	API GL5	SAE 75W90 (~VG 100)	Mobilube SHC 75 W90-LS									
	-20 +40	CLP PG	VG 460 3)			Klübersynth UH1 6-460							
R32 R302	-25 +60	DIN 51 818 5)	00	Glygoyle Grease 00	Shell Tivela GL 00	Klübersynth GE 46-1200				Multifak 6833 EP 00			Marson SY 00
	Standard -15 +40		000 - 0	Mobilux EP 004	Shell Alvania GL 00		Aralub MFL 00	BP Energrease LS-EP 00		Multifak EP 000	Longtime PD 00	Renolin SF 7 - 041	Multis EP 00

Figure 34: Oil cross reference table

7.2 TorqLOC

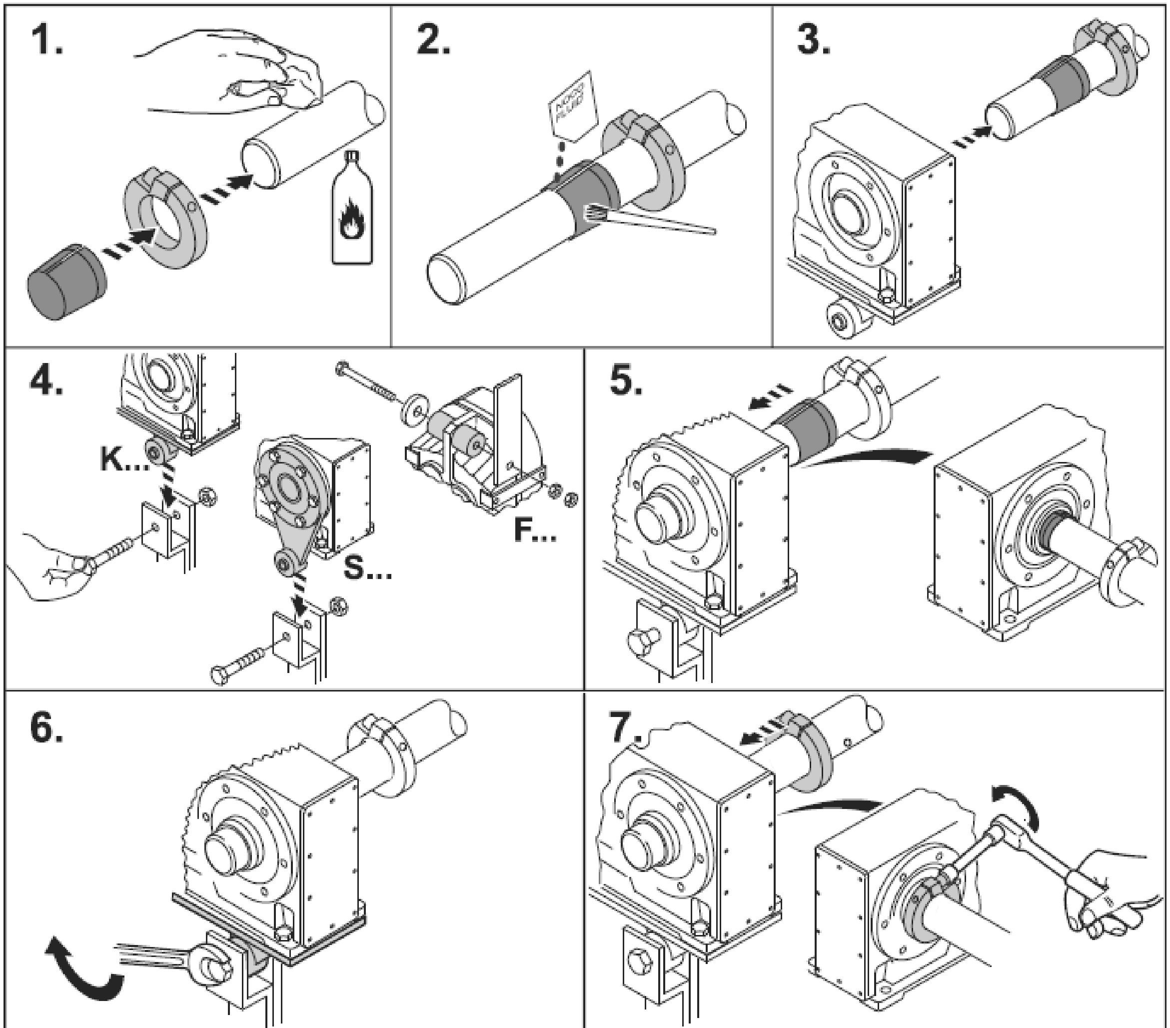
The TorqLOC hollow shaft mounting system is used for achieving a non-positive connection between customer shaft and the hollow shaft in the gear unit. It consists of the components shown in the below figure.

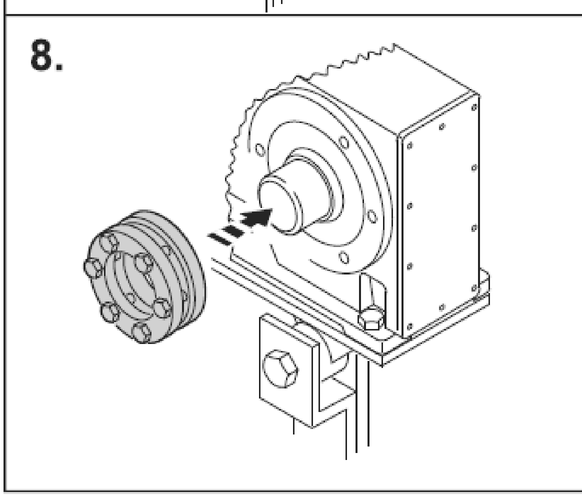


[1]	Customer shaft	[5]	Shrink disk
[2]	Clamping ring	[6]	Conical steel bushing
[3]	Conical bronze bushing	[7]	Fixed cover
[4]	Hollow shaft in gear unit		

Figure 35: TorqLOC components

7.2.1 Installation

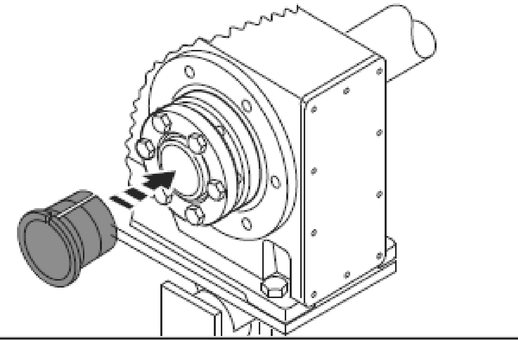




Anzugsdrehmomente Klemmring
tightening torques retaining ring
Couples de serrage de l'anneau de serrage

Typ type Type		**Drehmomente (Nm)** torques Couples	
KT/FT	**ST**	**nickelbeschichtet** nickel plated avec couche de nickel	**Edelstahl** stainless steel Acier spécial
-	37	18	7.5
37	47	18	7.5
47	57	18	7.5
57,67	67	35	18
77	77	35	18
87	87	35	18
97	97	35	18

9.



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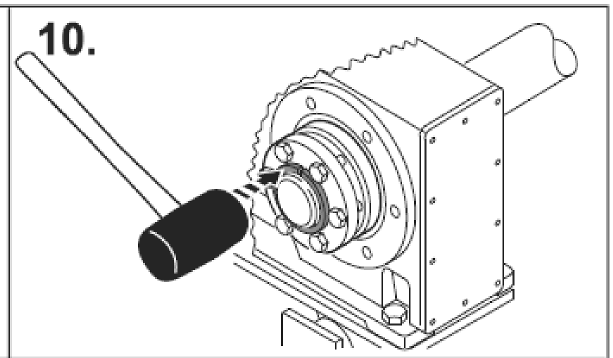
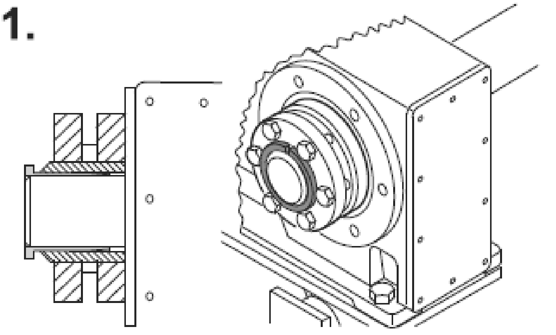
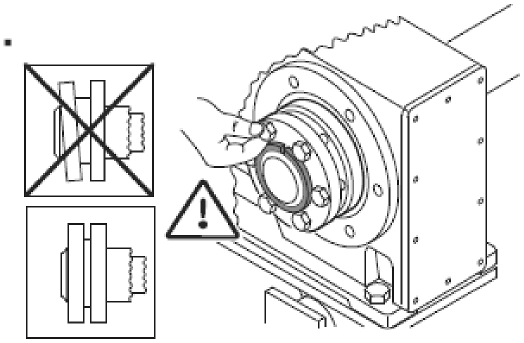


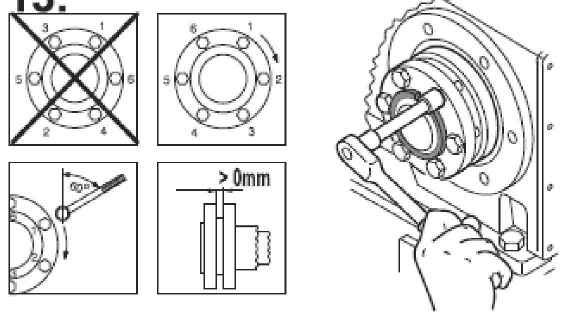
11.



12.



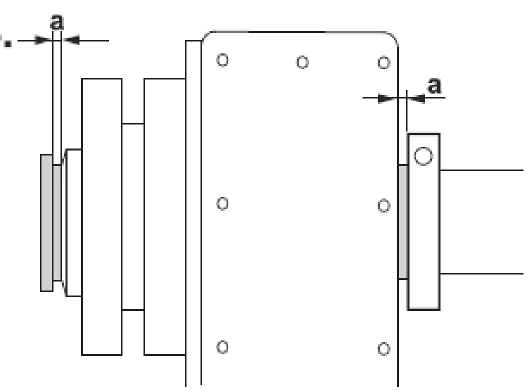
13.



Anzugsdrehmomente Schrumpfscheibe
tightening torques shrink disc
Couples de serrage de la frette

Typ type Type KT/FT	ST	**Drehmomente (Nm)** torques Couples — **nickelbeschichtet** nickel plated avec couche de nickel	**Edelstahl** stainless steel Acier spécial
-	37	4.1	6.8
37	47	10	6.8
47	57	12	6.8
57,67	67	12	15
77	77	30	30
87	87	30	50
97	97	30	50

14.



Abstandsmaß a (mm)
distance dimension a (mm)
Cote d' écartement a (mm)

Typ type Type KT/FT	ST	a min.	a max.
-	37	3.3	5.6
37	47	3.3	5.6
47	57	5.0	7.6
57,67	67	5.0	7.6
77	77	5.0	7.6
87	87	5.8	8.6
97	97	5.8	8.6

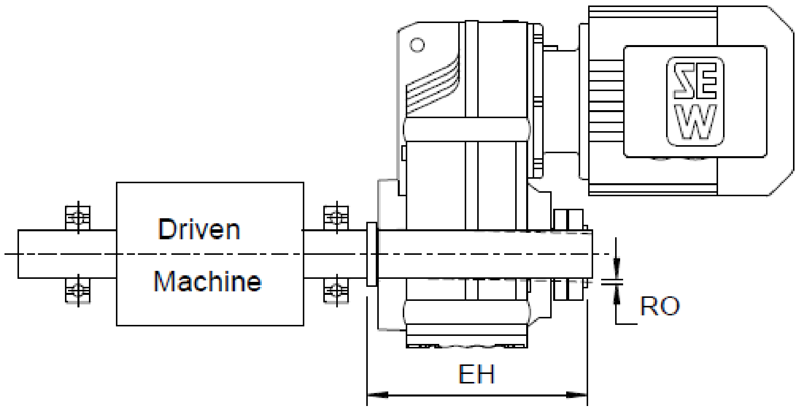
Gypsum Technologies Inc.
578 King Forest Court
Burlington, Ontario
Canada L7P 5C1
Tel: +1 (905) 567-2000
Fax: +1 (289) 288-0570
info@gyptech.ca

Gyptech AB
Norrgatan 15
Växjö SE-352 31
Sweden
Tel: +46 470 705640
Fax: +46 470 705650
info@gyptech.se

Gyptech GmbH
Eulatalstrasse 31
86633 Neuburg/Donau
Germany
Tel: +49 8431 5387 0
Fax: +49 8431 5387 20
info@gyptech.de

7.2.2 Shaft Runout Allowance

The following table shows the maximum allowable solid shaft deflection (dimension RO) of the customer's solid shaft over the length, EH. EH is the distance from the split ring on one end of the reducer to the torque bushing on the other end of the reducer.



Unit	EH (inches)		RO (inches)
	Symmetrical	Non-symmetrical	
ST 37	7.24	6.54	0.0051
FT/KT 37 ST 47	7.60	6.69	
FT/KT 47 ST 57	9.17	8.15	
FT/KT 57	10.43	9.13	0.0062
ST 67	10.39	9.17	
FT/KT 67	10.91	9.65	
FT/KT/ST 77	13.21	11.61	
FT/KT 87	15.28	13.19	0.0074
ST 87	15.47	13.50	
ST 97	16.97	15.00	
FT/KT 97	17.72	15.59	
FT/KT 107	20.08	17.76	0.0083
FT/KT 127	23.90	20.94	0.0083
FT/KT 157	28.39	25.24	0.0083

Gypsum Technologies Inc.
578 King Forest Court
Burlington, Ontario
Canada L7P 5C1
Tel: +1 (905) 567-2000
Fax: +1 (289) 288-0570
info@gyptech.ca

Gyptech AB
Norrgatan 15
Växjö SE-352 31
Sweden
Tel: +46 470 705640
Fax: +46 470 705650
info@gyptech.se

Gyptech GmbH
Eulatalstrasse 31
86633 Neuburg/Donau
Germany
Tel: +49 8431 5387 0
Fax: +49 8431 5387 20
info@gyptech.de

7.3 AQ Adapter for Servomotors

An adapter with a square flange is used for mounting servomotors onto SEW helical, parallel shaft helical, helical-bevel and helical-worm gear units. The torque is transmitted via a jaw-type coupling. Possible vibrations and shocks which occur during operation are effectively cushioned and dissipated by an inserted polyurethane annular gear.

Figure 36: Gear unit with AQ Adapter

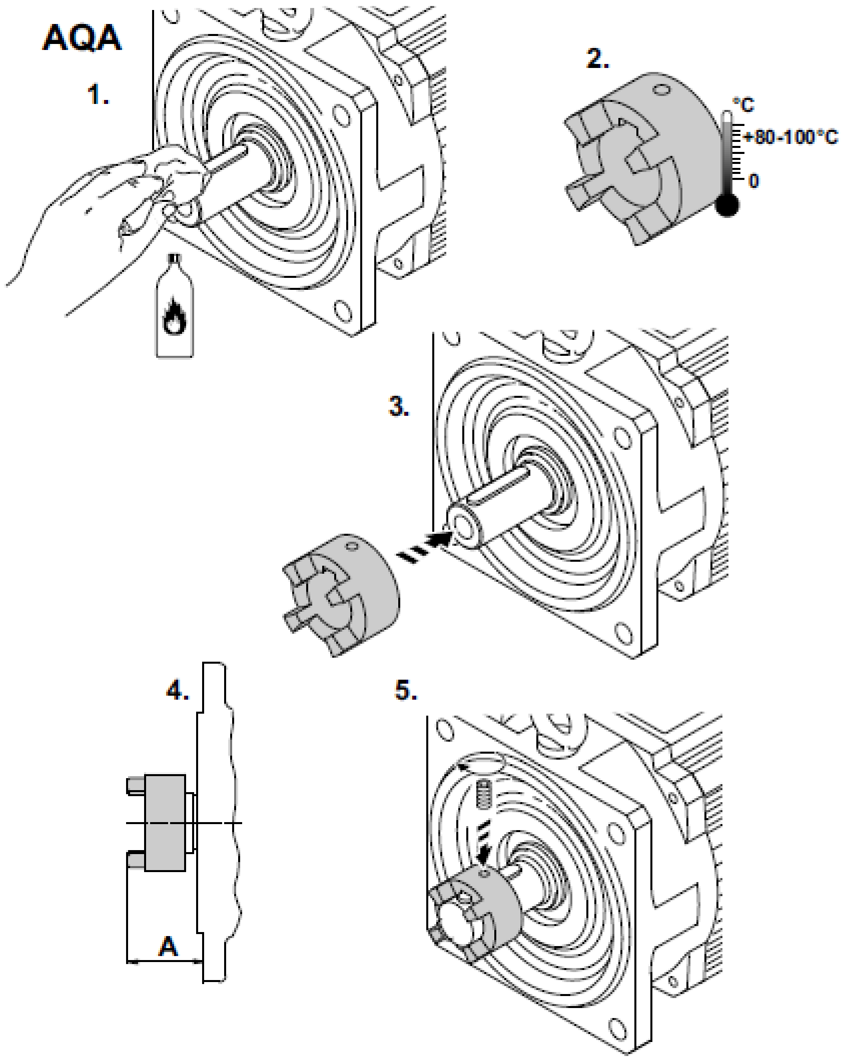
AQH variant comes with a clamping ring hub while the AQA variant comes with a keyway.

Gypsum Technologies Inc.
578 King Forest Court
Burlington, Ontario
Canada L7P 5C1
Tel: +1 (905) 567-2000
Fax: +1 (289) 288-0570
info@gyptech.ca

Gyptech AB
Norrgatan 15
Växjö SE-352 31
Sweden
Tel: +46 470 705640
Fax: +46 470 705650
info@gyptech.se

Gyptech GmbH
Eulatalstrasse 31
86633 Neuburg/Donau
Germany
Tel: +49 8431 5387 0
Fax: +49 8431 5387 20
info@gyptech.de

7.3.1 Installation

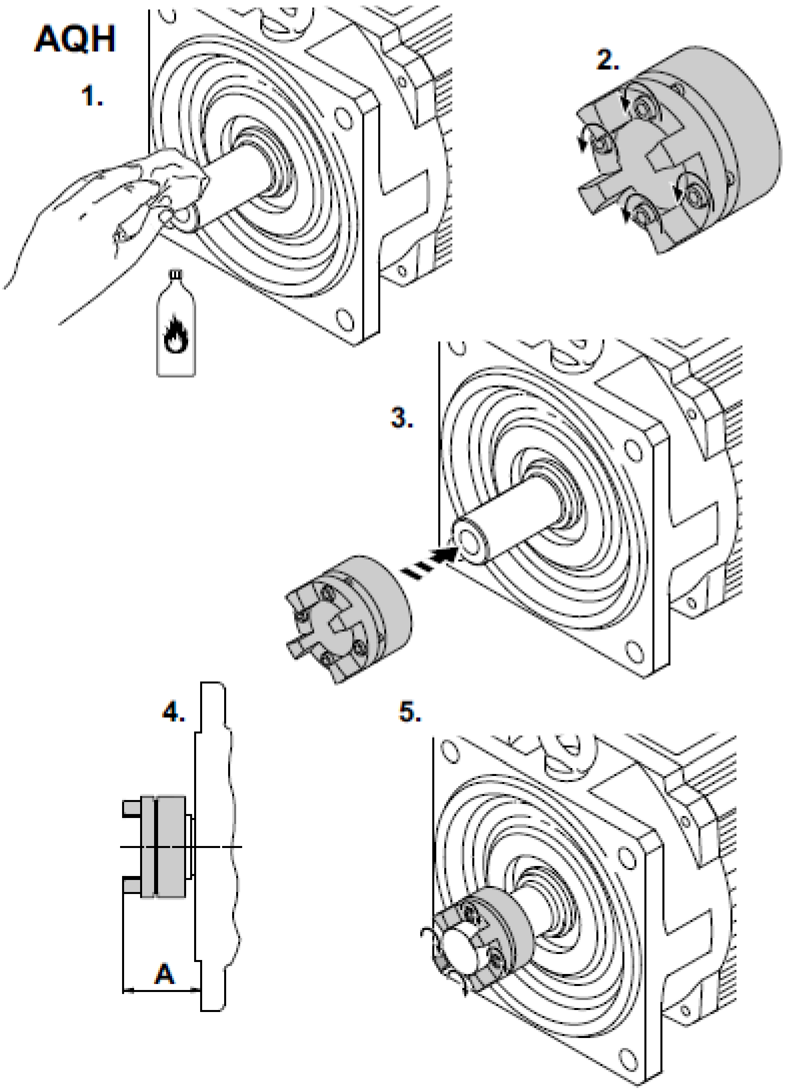


AQA		A [mm]	DIN 912	TA [Nm]
AQA 80 /1/2/3	19	44,5	M5	2
AQA 100 /1/2		39		
AQA 100 /3/4		53		
AQA 115 /1/2		62		
AQA 115 /3	24	62	M5	2
AQA 140 /1/2		62		
AQA 140 /3/4	28	74,5	M8	10
AQA 160 /1		74,5		
AQA 190 /1/2		76,5		
AQA 190 /3	38	100	M8	10

Gypsum Technologies Inc.
578 King Forest Court
Burlington, Ontario
Canada L7P 5C1
Tel: +1 (905) 567-2000
Fax: +1 (289) 288-0570
info@gyptech.ca

Gyptech AB
Norrgatan 15
Växjö SE-352 31
Sweden
Tel: +46 470 705640
Fax: +46 470 705650
info@gyptech.se

Gyptech GmbH
Eulatalstrasse 31
86633 Neuburg/Donau
Germany
Tel: +49 8431 5387 0
Fax: +49 8431 5387 20
info@gyptech.de



AQH		A [mm]	DIN 912	TA [Nm]
AQH 80 /1/2/3	19	44,5	6x M4	4,1
AQH 100 /1/2		39		
AQH 100 /3/4		53		
AQH 115 /1/2		62		
AQH 115 /3	24	62	4x M5	8,5
AQH 140 /1/2		62		
AQH 140 /3/4	28	74,5	8x M5	8,5
AQH 160 /1		74,5		
AQH 190 /1/2		76,5		
AQH 190 /3	38	100	8x M6	14

Gypsum Technologies Inc.
578 King Forest Court
Burlington, Ontario
Canada L7P 5C1
Tel: +1 (905) 567-2000
Fax: +1 (289) 288-0570
info@gyptech.ca

Gyptech AB
Norrgatan 15
Växjö SE-352 31
Sweden
Tel: +46 470 705640
Fax: +46 470 705650
info@gyptech.se

Gyptech GmbH
Eulatalstrasse 31
86633 Neuburg/Donau
Germany
Tel: +49 8431 5387 0
Fax: +49 8431 5387 20
info@gyptech.de

7.4 Manual Brake Release

On SEW gearmotors equipped with a brake, the brake can be manually released, typically for maintenance activities, by tightening the setscrew until there is no more play in the release lever. The setscrew is shown in the figure below. After the maintenance activity is complete, ensure this set screw is loosened until the release lever is free to move to allow for electric actuation of the brake.

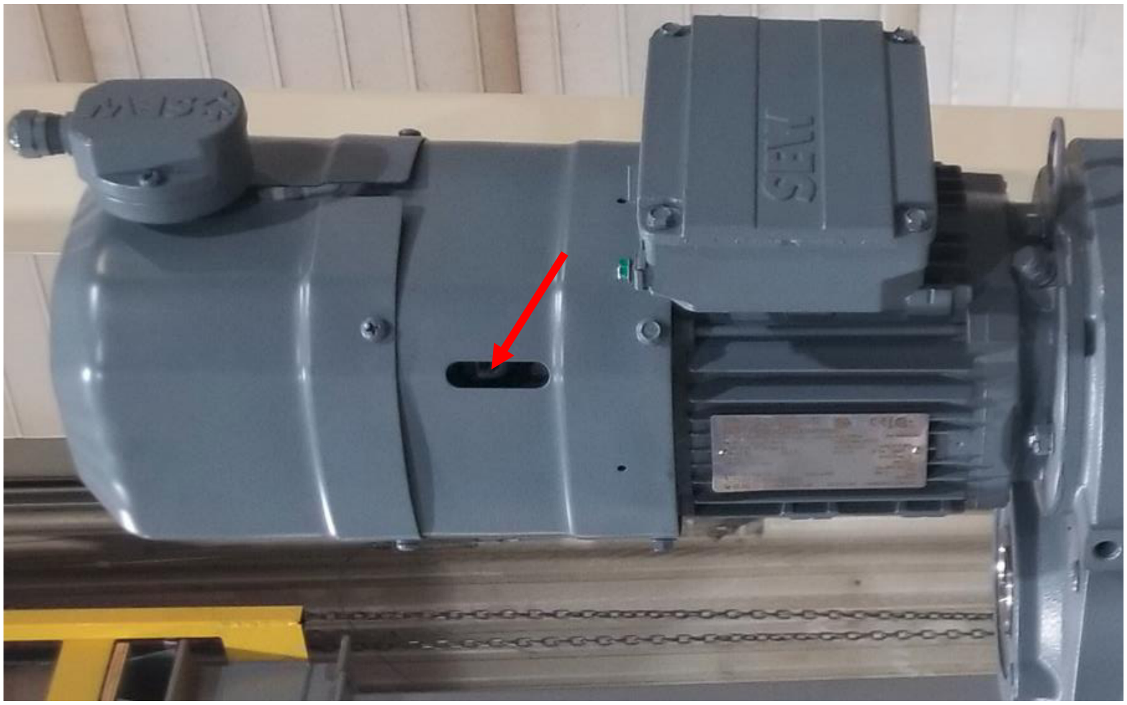


Figure 37: Release lever set screw location

Caution!

Releasing the brake can drop a suspended load. Secure load before releasing the brake.

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Gypsum Technologies Inc.
578 King Forest Court
Burlington, Ontario
Canada L7P 5C1
Tel: +1 (905) 567-2000
Fax: +1 (289) 288-0570
info@gyptech.ca

Gyptech AB
Norrgatan 15
Växjö SE-352 31
Sweden
Tel: +46 470 705640
Fax: +46 470 705650
info@gyptech.se

Gyptech GmbH
Eulatalstrasse 31
86633 Neuburg/Donau
Germany
Tel: +49 8431 5387 0
Fax: +49 8431 5387 20
info@gyptech.de