

Installation, Operation and Maintenance Manual



PHS High Speed Belt Cleaner

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PHS High Speed Belt Cleaner



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1 General Information

1.1 Overview

The Belle Banne P High Speed (PHS) Belt Cleaner is designed to be positioned on a flat, stable section of belt, in close proximity to the head pulley or a flat return and/or hold-down roller. It is typically referred to as a “secondary” cleaner, as it is usually installed in conjunction with a “primary” belt cleaner that is located at the material discharge point. The PHS Belt Cleaner comprises a pair of side assemblies, a pole, and a series of “blades”, each comprising a rubber cushion and a tip. The blades are 150mm wide.

The side assemblies can be either the standard Bolt Tensioner (BT), a Secondary Spring Tensioner (SST), or an Inverted Secondary Spring Tensioner (SST-I). Tip tension is applied by adjusting the belt cleaner to the point where the tip touches the belt, then further tension is applied so tension is stored in the rubber cushions and the springs when using an SST or SST-I. For all belt widths the pole is 73mm diameter. For belt widths 1800mm and above, the pole is braced with a section of equal angle.

PHS Belt Cleaners cannot handle reversing belt applications.

For more challenging applications, multiple PHS Belt Cleaners can be installed in close series. Also, a water spray can be incorporated separately, or within the belt cleaner pole, known as a PHS Spray Belt Cleaner. Contact Belle Banne Conveyor Products for more information.

1.2 Advantages

Belt cleaners significantly reduce the amount of material build-up on the conveyor belt, known as carryback, which can cause

- material spillage,
- belt tracking problems,
- build up on return idlers,

These issues contribute to unwanted plant downtime, resulting in increased costs.

Installation of appropriate belt cleaning systems (one or more belt cleaners) will minimise these issues.

1.3 Safety

During installation and maintenance of all belt cleaners, ensure all energy sources are isolated in accordance with the relevant site’s procedures.

Ensure all works are conducted by qualified or competent personnel.

Ensure all personnel utilise appropriate personal protective equipment as required.

1.4 Assistance

If assistance is required through any stage of the process: belt cleaner selection, design, drafting, installation and/or maintenance, Belle Banne Conveyor Products have personnel that are able to provide support.

2 PHS Belt Cleaner Components

2.1 Pole & Blades

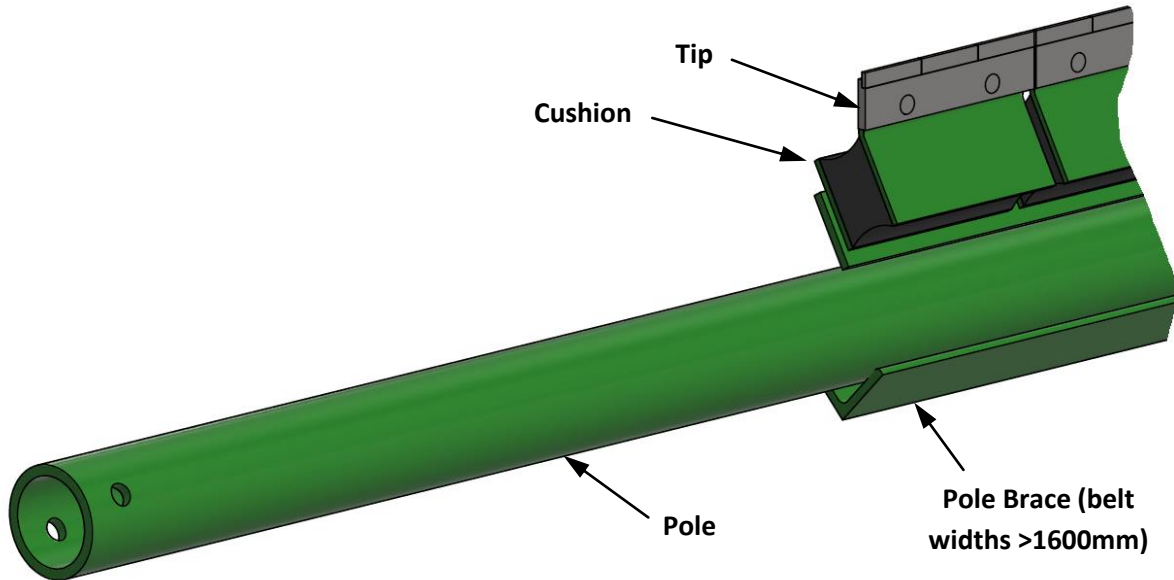


Figure 1 – Pole & Blade Components

2.2 Secondary Spring Tensioner (SST) Side Assembly

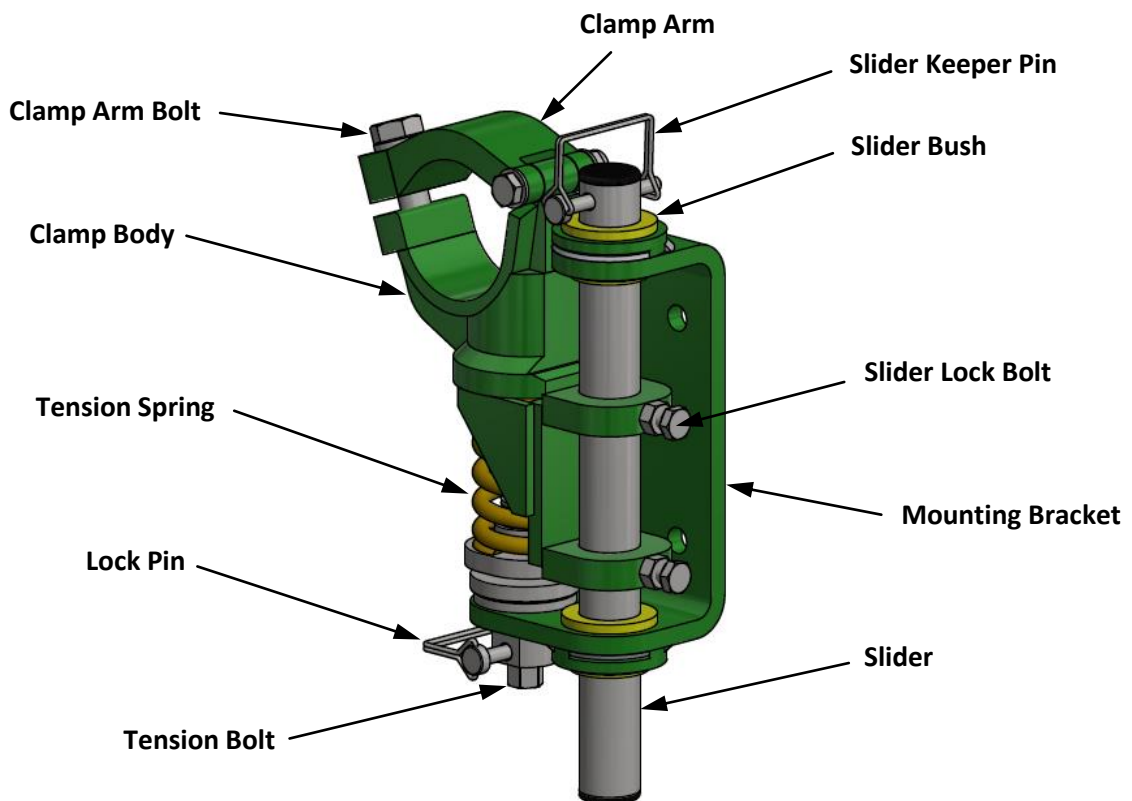


Figure 2 – Secondary Spring Tensioner (SST) Components

2.3 Inverted Secondary Spring Tensioner (SST-I) Side Assembly

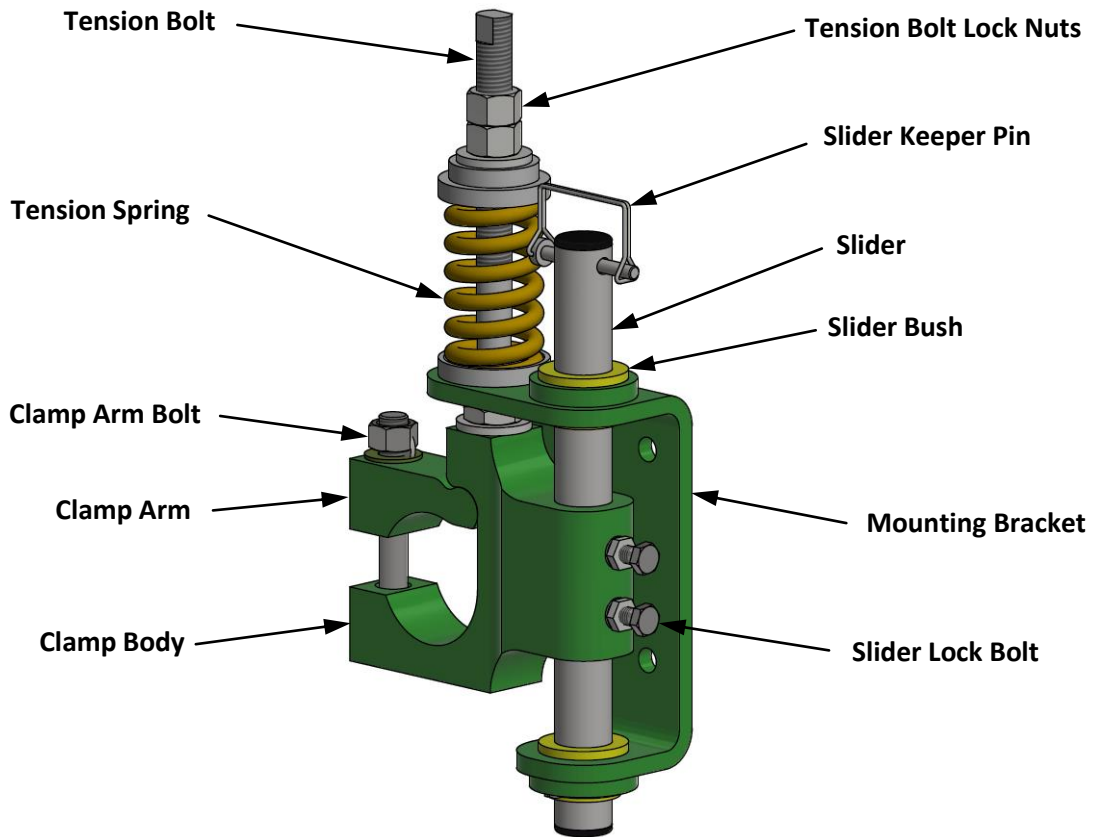


Figure 3 – Inverted Secondary Spring Tensioner (SST-I) Components

2.4 Bolt Tensioner (BT) Side Assembly

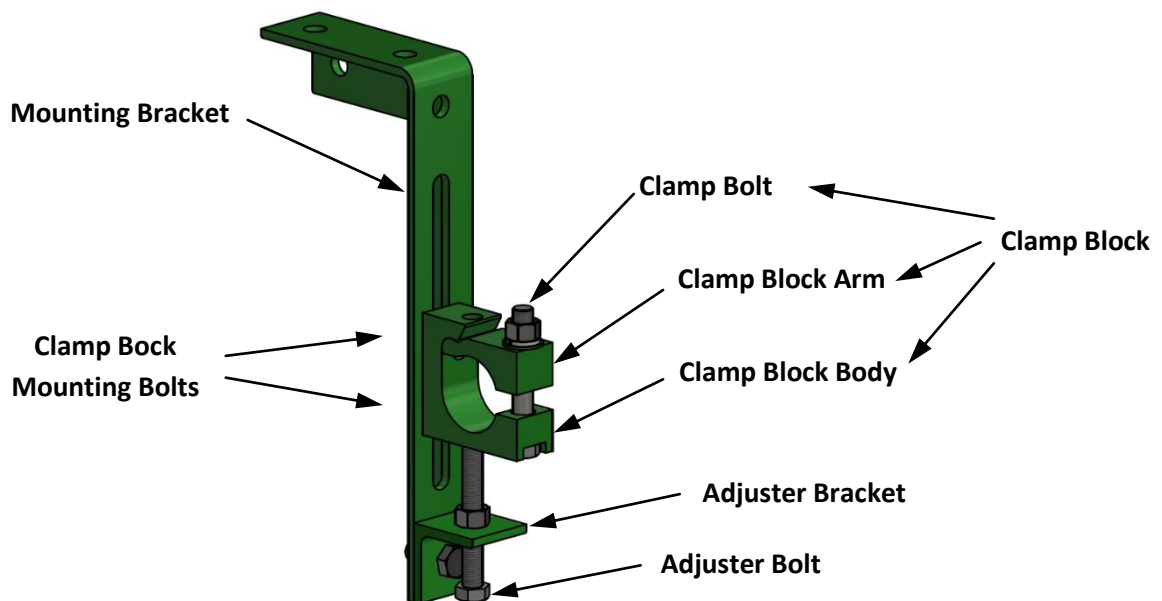


Figure 4 – Bolt Tensioner (BT) Components

3 Tools & Equipment

3.1 Installation

The tools and equipment required to install a PHS Belt Cleaner are:

- Measuring equipment – for marking out pole location, mounting bracket position, and holes in the chute walls (if required).
- Marking pen or chalk.
- Cutting equipment – for cutting holes in the chute walls (if required).
- Drilling equipment – for drilling holes for the mounting brackets (unless they are being welded to the chute wall or structure).
- Welding equipment – for welding the mounting brackets to the chute walls or structure (unless bolted connections are being used).
- Mechanical lifting aids – for lifting larger (heavier) belt cleaners into position.
- 2 x 17mm, 19mm & 24mm spanners (or a socket and a spanner) – for tightening side assembly fasteners.
- PHS Belt Cleaner template – for confirming correct tip alignment.
- Anti-seize – recommended for coating on fasteners prior to installation.
- DENSO tape – recommended for covering exposed thread on the mounting bracket fasteners.

3.2 Maintenance

The tools and equipment required to maintain an existing PHS Belt Cleaner.

- Paint scraper / wire brush – for cleaning away material build-up.
- 17mm, 19mm & 24mm spanners (or a socket and a spanner) – for side assembly fasteners.
- 17mm socket or spanner – for cushion nuts.
- 13mm socket or spanner – for tip nuts.
- Anti-seize – recommended for coating on fasteners prior to installation.
- DENSO tape – recommended for covering exposed thread on the mounting bracket fasteners.

Note: the above tools & equipment are the recommended minimum. Additional tools (adjustable wrench, screw driver, etc.) may also be required.

4 Mounting Location and Chute Modifications

4.1 Pole Position

The PHS Belt Cleaner can be positioned in many locations, and multiple cleaners can be positioned on a conveyor. Figure 5 shows some typical installation positions. Note that dimension X is dependent on several factors including chute angle, belt speed, material type, moisture content, etc. Contact Belle Banne Conveyor Products for more information.

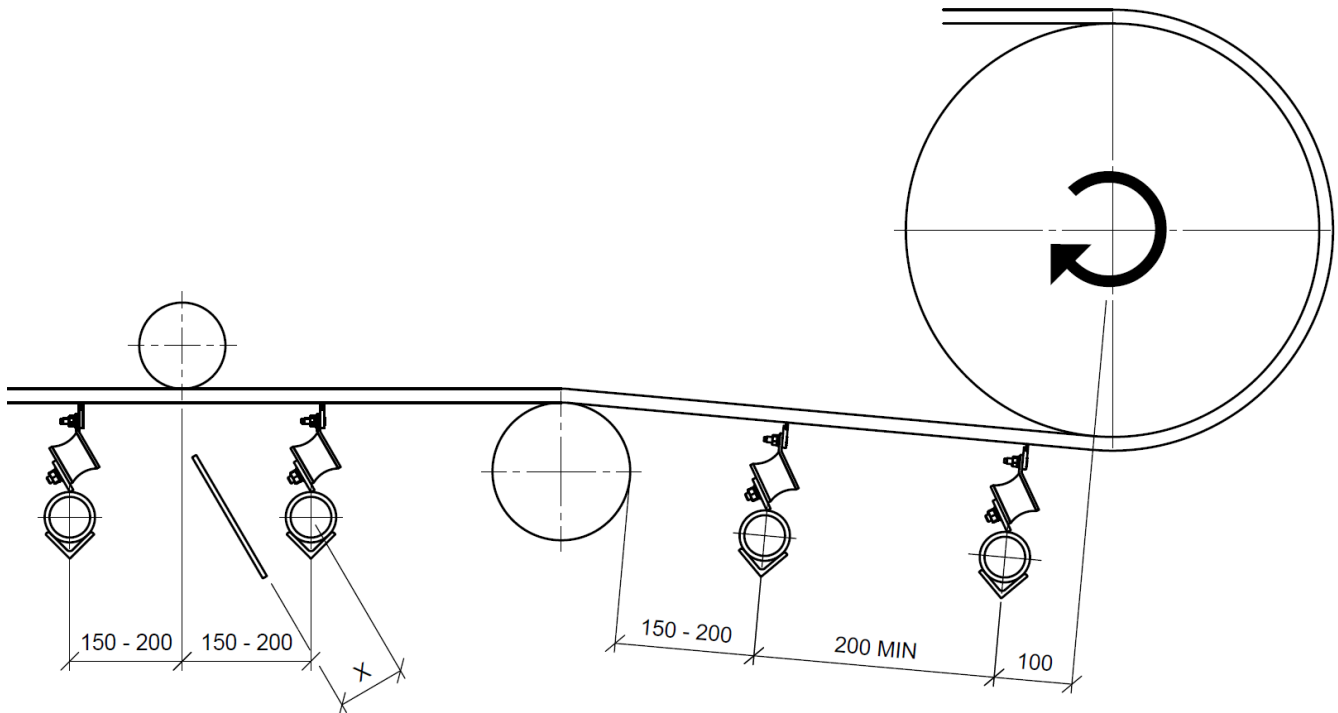


Figure 5 – Installation Positions

For installation set-up purposes, with a 20mm gap between the belt and the tip, the location of the pole as shown in Figure 6.

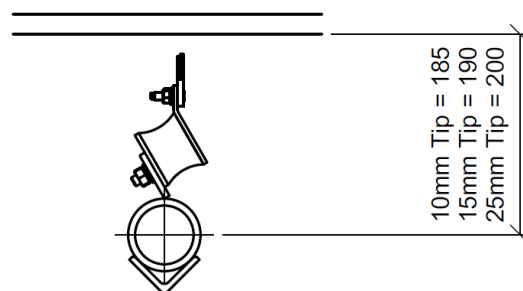


Figure 6 – Pole Position

The distance between the belt and the pole centreline, when the belt cleaner is operating, is nominally:

- 10mm tip: 165mm
- 15mm tip: 170mm
- 25mm tip: 180mm

4.2 Mounting Bracket Position – Secondary Spring Tensioner (SST)

The side assembly must be mounted perpendicular to the belt line. Ideally the mounting brackets should be installed in a position so the pole is “trailing” the mounting bracket, as shown in Figure 7, however having them in a leading position is acceptable also.

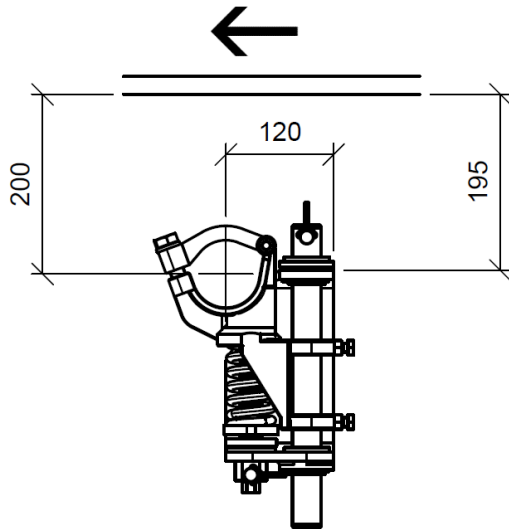


Figure 7 – SST Mounting Bracket Position

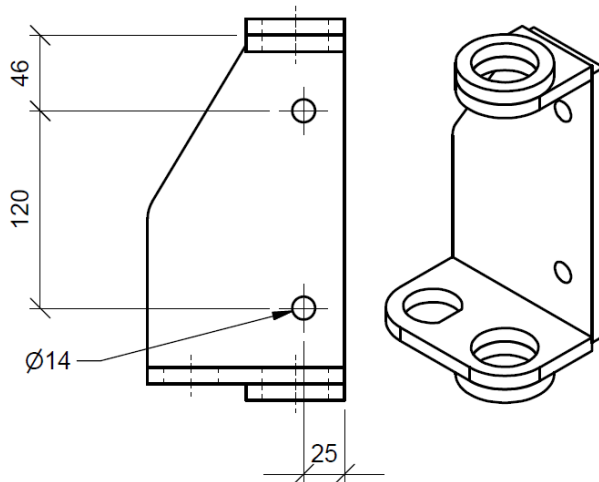


Figure 8 – SST Mounting Bracket Details

Each mounting bracket, shown in Figure 8, has two Ø14mm holes. These holes allow the mounting brackets to be bolted to the chute wall or conveyor structure.

4.3 Mounting Bracket Position – Inverted Secondary Spring Tensioner (SST-I)

The side assembly must be mounted perpendicular to the belt line. Ideally the mounting brackets should be installed in a position so the pole is “trailing” the mounting bracket, as shown in Figure 9, however having them in a leading position is acceptable also.

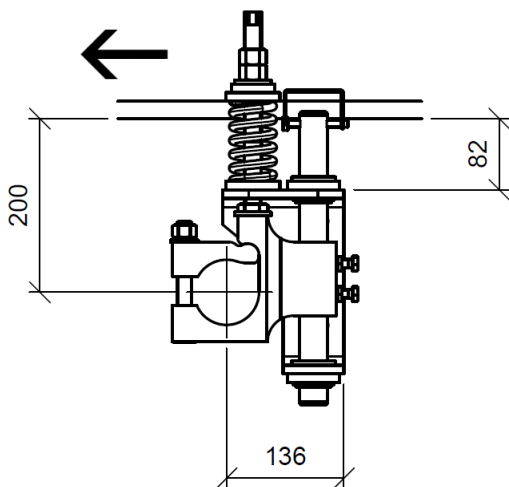


Figure 9 – SST-I Mounting Bracket Position

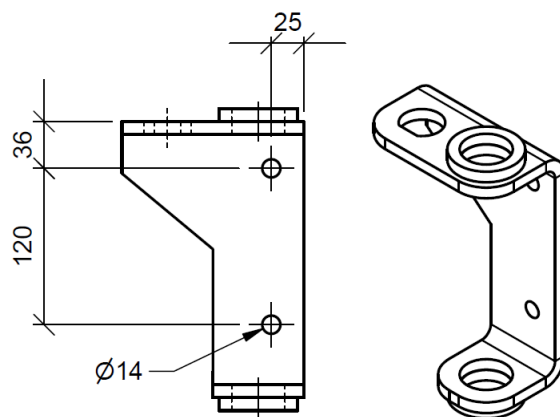


Figure 10 – SST-I Mounting Bracket Details

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Each mounting bracket, shown in Figure 10, has two $\varnothing 14\text{mm}$ holes. These holes allow the mounting brackets to be bolted to the chute wall or conveyor structure.

4.4 Mounting Bracket Position – Bolt Tensioner (BT)

The ideal orientation of the mounting brackets is perpendicular to the belt line. If the belt line is on an incline or decline, the mounting bracket can still be installed vertically, for ease of installation, however the angular variation will need to be taken into consideration when adjusting the cleaner up to the belt (i.e. more turns of the adjuster bolt may need to be applied to account for the angle).

The mounting brackets should be installed in a position so they are “trailing” the pole, as shown in Figure 11.

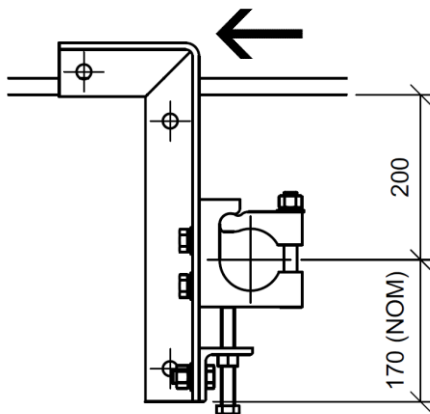


Figure 11 – BT Mounting Bracket Position

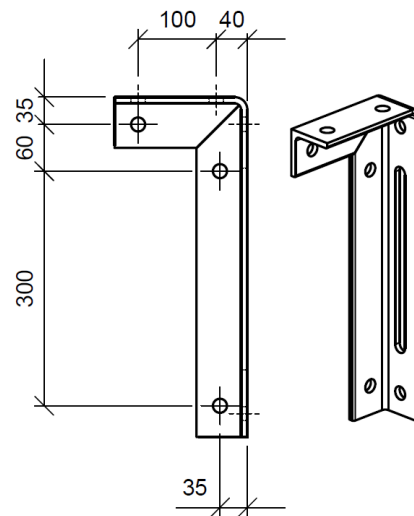



Figure 12 – BT RH Mounting Bracket Details

The mounting brackets are a LH & RH pair (the RH bracket is shown in Figure 12). Each bracket has three $\varnothing 18\text{mm}$ holes on one face (visible in Figure 11). These three holes allow the mounting bracket to be bolted to the chute wall or conveyor structure. There are two $\varnothing 18\text{mm}$ holes in the top of the bracket (visible in Figure 12 RHS), which allow the bracket to be mounted to the underside of a stringer or beam.

The other face, to which the clamp block is mounted, has a long slot and two $\varnothing 18\text{mm}$ holes.  as secure the adjuster bracket and the slot allows the clamp block to slide up and down the mounting bracket. The side assembly can be set up so the clamp block is **pushed** up towards the belt (Figure 11, or the clamp block is **lifted** up (Figure 13). Details about the set up of the adjuster bracket and screw for the **push** or **lift** option are provided in Section 5.2 Set Up.

The nominal 170mm & 215mm dimensions shown in Figures 11 & 13 locate the bracket in a position that allows ample room for the pole to be installed, adjusted up to the belt, then lowered again for maintenance, with the adjuster bracket mounted in the hole at the end of the slot. In tight situations, the adjuster bracket can be

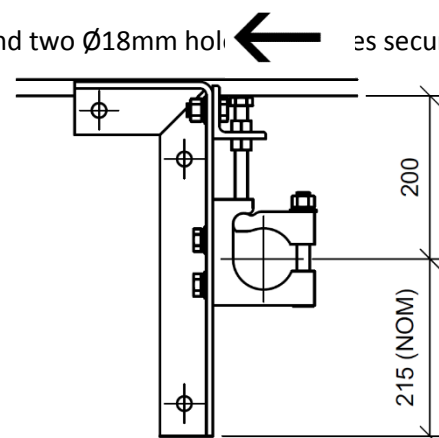


Figure 13 – BT Mounting Bracket Position (Lift)

mounted somewhere in the slot, with the clamp block. When using this set up there is a risk that the adjuster bracket slides in the slot when tightening the adjuster bolt.

4.5 Mounting an SST or SST-I to an existing BT Side Assembly

In instances where a Bolt Tensioner (BT) side assembly is already installed, adaptor brackets can be used to mount Secondary Spring Tensioner (SST) mounting brackets (shown in Figure 14) or Inverted Secondary Spring Tensioner (SST-I) mounting brackets. Note: a longer pole may be needed to allow this option.

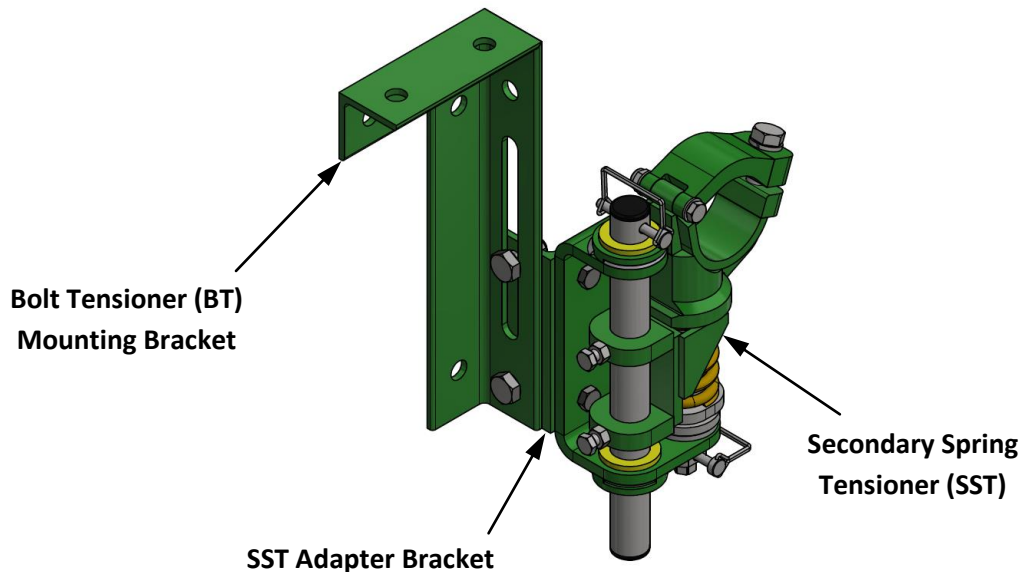


Figure 14 – SST Adaptor Bracket

4.6 Chute Wall Modification

If the belt cleaner needs to be installed through the side of a chute wall, a hole must be cut into the chute wall to allow the belt cleaner to pass through.

Figures 15 (unbraced pole) & 16 (braced pole) provide suggested dimensions for the rectangular hole that will enable the entire pole/blade assembly to pass through the chute wall.

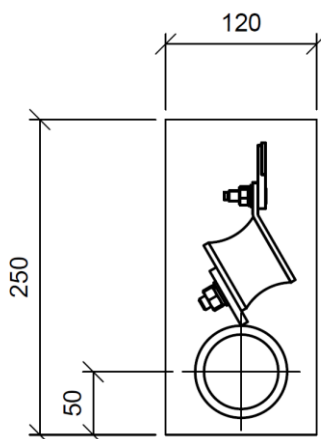


Figure 15 – Chute Hole – Unbraced Pole

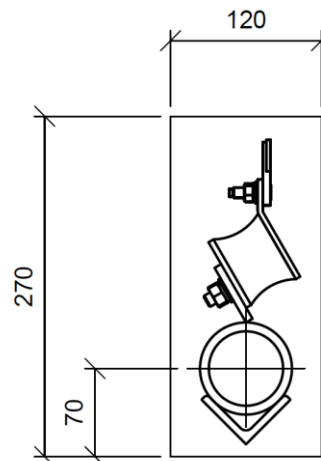


Figure 16 – Chute Hole – Braced Hole

5 Installation – Secondary Spring Tensioner (SST) or Inverted Secondary Spring Tensioner (SST-I)

5.1 Installing the Pole/Blade assembly

The following steps are required to install a PHS Belt Cleaner with SST or SST-I side assemblies correctly. They are based on the mounting brackets already being installed.

1. Ensure the mounting brackets are securely fastened to the chute wall or suitable structure by either welded or bolted connection.
2. Coat all fasteners with anti-seize.
3. Install the slider/clamp body/tension spring/tension bolt assembly and adjust the clamp arm up (SST – Figure 17) or remove the clamp block arm (SST-I – Figure 18). Ensure the clamp body travels freely up and down the mounting bracket and that the slider protrudes at least 10mm from the slider bushes. Ensure the slider keeper pin is installed to ensure the slider cannot drop out of the bracket assembly and create a “dropped object” hazard.

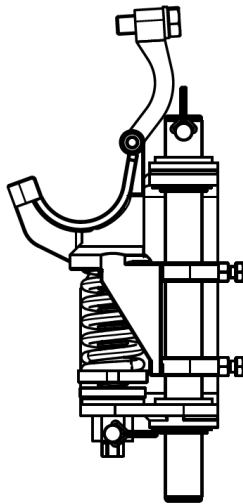


Figure 17 – SST

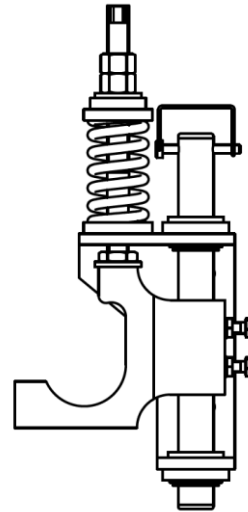


Figure 18 – SST-I

4. After ensuring the cleaner is oriented correctly, install it so each end of the pole is resting on the clamp block body, and the cleaner ends up hanging upside down. This can be done by:
 - a. sliding the belt cleaner through a hole in the chute wall, or
 - b. lowering the belt cleaner down into the chute, one end first, then feeding that end through the hole in the chute wall, then sliding the other end through the other hole. Note: this may not be possible if the pole is too long. The ends of the pole can be trimmed if required.

Note: whichever method is used, make sure the tungsten tips are protected – they are brittle and will chip easily.

5. Position the belt cleaner so it is central on the conveyor (the belt may not be tracked centrally).
6. Close and tighten each clamp arm into place, then finger-tighten them so the pole is secure but can be rotated in the clamp blocks.
7. Using your hands, or by inserting a screwdriver through one of the holes in the end of the pole, rotate the pole/blade assembly upward so the tips are pointing toward the belt and lightly tighten the clamp block bolts.
8. Now that the belt cleaner is loosely installed, the final set up can be done.

5.2 Set Up

1. Remove the lock pins and use the tension bolts to raise the belt cleaner so it approaches the belt, until the tips are about 5mm from the belt and parallel with it.
2. Position the PHS belt cleaner so the tips are perpendicular to the belt, as shown in Figure 19. Rotate the pole and/or adjust the clamp bodies up or down, using the tension bolt, as required.

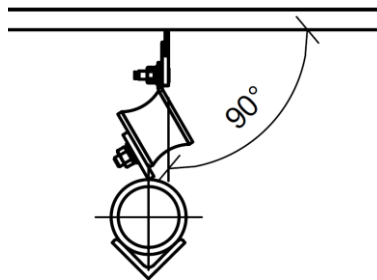


Figure 19 – Blade Alignment

3. Once the tips are correctly aligned, securely tighten the clamp arm bolts and wrap the nuts and exposed thread with DENSO tape.
4. For the SST, gradually tighten each of the tension bolts, lifting the belt cleaner towards the belt, until the spring compression matches the values in the table below. For the SST-I gradually tighten the lower lock nut.

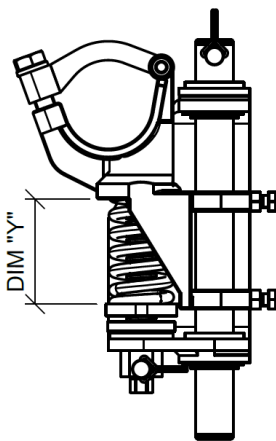


Figure 20 – SST

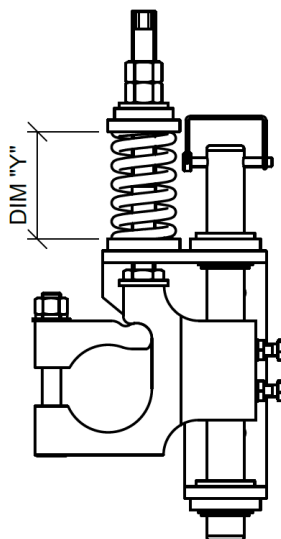


Figure 21 – SST-I

BLADE WIDTH	DIMENSION "Y"	
	BLACK SPRING	GOLD SPRING
450	90	N/A
600	87	N/A
750	85	90
900	82	88
1050	80	87
1200	77	85
1350	75	84
1500	72	82
1800	67	79
2100	N/A	76
2400	N/A	73

5. For the SST, rotate the tension bolt until the hole in the bush aligns with the threaded bolt and insert the lock pin on both side assemblies. For the SST-I tighten the upper lock nut up against the lower lock nut.
6. Double check that all nuts and bolts are tight, and wrapped in Denso tape.
7. The PHS Belt Cleaner is now ready for operation.
8. Test run the conveyor and observe the belt cleaner for at least 10 minutes, running both empty and conveying material. If the blades vibrate, slightly increase or decrease tip tension by tightening or loosening the tension bolt. Note: this will be a trial and error process that can be influenced by several factors.

6 Installation – Bolt Tensioner (BT)

6.1 Installing the Pole/Blade assembly

The following steps are required to install an PHS Belt Cleaner with BT side assemblies correctly. They are based on the mounting brackets already being installed.

1. Ensure the mounting brackets are securely fastened to the chute wall or suitable structure by either welded or bolted connection.
2. Coat all fasteners with anti-seize.
3. Install the adjuster bracket, adjuster bolt and the clamp block body on each mounting bracket, as shown in Figure 22. The clamp block mounting bolts should be loosely tightened (the blocks need to be able to slide up and down along the slotted holes), with the clamp block positioned so the pole centre is roughly 200mm from the belt surface.

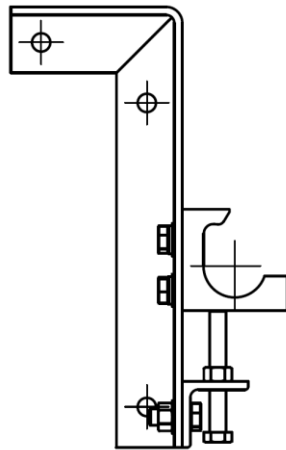


Figure 22 – BT

4. Install the PHS belt cleaner so each end of the pole is resting on the clamp block body, and the belt cleaner is hanging upside down (ensure the tips are oriented correctly). This can be done by:
 - a. sliding the belt cleaner through a hole in the chute wall, or
 - b. lowering the belt cleaner down into the chute, one end first, then feeding that end through the hole in the chute wall, then sliding the other end through the other hole. Note: this may not be possible if the pole is too long. The ends of the pole can be trimmed if required.Note: whichever method is used, make sure the tungsten tips are protected – they are brittle and will chip easily.
5. Position the belt cleaner so it is central on the conveyor (the belt may not be tracked centrally).
6. Slide each clamp block clamp arm into place and install each clamp arm bolt, then finger-tighten them so the pole is secure but can be rotated in the clamp blocks.
7. Using your hands, or by inserting a screwdriver through one of the holes in the end of the pole, rotate the pole/blade assembly upward so the tips are pointing toward the belt and lightly tighten the clamp block bolts.
8. Now that the belt cleaner is loosely installed, the final set up can be done.

6.2 Set Up

1. Using the adjuster bolts raise the belt cleaner so it approaches the belt, until the tip surfaces are about 5mm from the belt and parallel with it.
2. Rotate the pole and/or adjust the clamp blocks up or down as required until the tips are perpendicular to the belt, as shown in Figure 23.

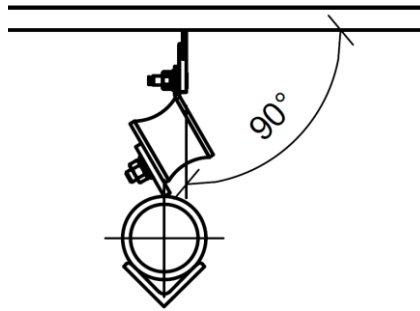


Figure 23 – Blade Alignment

3. Once the tips are correctly aligned, securely tighten the clamp block clamp arm bolts and wrap the nuts and exposed thread with DENSO tape.
4. Gradually tighten each of the adjuster bolts, lifting the belt cleaner towards the belt, until light contact is made between the tips and the belt across the entire width of the belt cleaner. Note: if the edges of the belt are sagging, raise the belt cleaner until the central tips are making contact with the belt.
5. Give an additional two turns to both adjuster bolts then securely tighten both sets of clamp block mounting bolts and wrap with them Denso tape.
6. Tighten both the adjuster bolt lock nuts and wrap the bolts and nuts with Denso tape.
7. Double check that all nuts and bolts are tight, and wrapped in Denso tape.
8. The PHS Belt Cleaner is now ready for operation.
9. Test run the conveyor and observe the belt cleaner for at least 10 minutes, running both empty and conveying material. If the blades vibrate, slightly increase or decrease tip tension by raising or lowering the belt cleaner. Note: this will be a trial and error process that can be influenced by numerous factors.

7 Operation

Once the belt cleaner has been installed and set up correctly, the only operational activities required are regular inspections. The frequency of inspections will depend upon a number of factors including the conveyor duty cycle and the material type. During conveyor operation only a Visual Inspection (looking) can be done. When the conveyor is isolated a Physical Inspection (touching) can be done – refer to Section 8.

7.1 Visual Inspections

Visual Inspections can be done while the conveyor is operating. The following steps are recommended to perform a Visual Inspection on a PHS Belt Cleaner.

1. Wash away any material build-up on the tips, arms, cushions or pole.
2. Check for correct installation (see Section 5 or 6).
3. Check tip condition (see Section 8.2).
4. Estimate and record tip wear (see Section 8.3).
5. Check for any damaged cushions or tips that may:
 - a. damage the belt,
 - b. damage the belt cleaner,
 - c. compromise belt cleaning efficiency.
6. Check for dirty strips on the belt, or signs of excess carryback.
7. Check pole for straightness.
8. Check spring tension (for SST & SST-I).
9. Check side assembly fasteners are all tight.
10. Record all observations and estimates (eg. tip wear).

8 Maintenance

8.1 Physical Inspections

Physical Inspections can only be done when the conveyor is isolated. The following steps are recommended to perform a physical inspection on a PHS Belt Cleaner.

1. Follow all plant isolation procedures.
2. Wash away any material build-up on the tips, cushions or pole.
3. Confirm correct installation (see Section 5 or 6).
4. Check tip condition (see Section 8.2).
5. Measure tip wear (see Section 8.3). Replace any tips if required (see Section 8.4).
6. Check cushion condition.
7. Check pole for straightness.
8. Check spring tension (for SST & SST-I).
9. Check side assembly fasteners are all tight.
10. Record all observations and measurements (eg. tip wear, tip tension).

8.2 Evaluating Tip Condition

PHS tips use R Belt Cleaner tips, which comprise a 150mm wide steel body with a strip of 3mm wide tungsten elements as shown in Figure 24. The height of each tungsten element is 10mm, 15mm or 25mm.

During normal tip wear the protruding section of tungsten wears to the point where both the tungsten and the steel body begin wearing away.

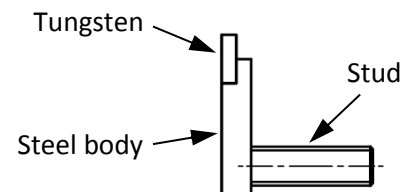


Figure 24 – Tip Elements

Refer to Section 8.3 below for details on how to measure the tip wear.

Tips may also become chipped. There is no fixed rule on how much chipping is acceptable, rather it needs to be a judgement made based on factors including the condition of the belt, the risk of belt damage, etc.

8.3 Measuring Tip Wear

The minimum amount of tungsten on a new tip is 10mm, 15mm or 25mm. The amount of tungsten remaining is measured as shown in Figure 25. This measurement is to be recorded for each tip. If a single tip has uneven wear, the two end measurements are to be recorded (eg. 5mm RHS, 7mm LHS).

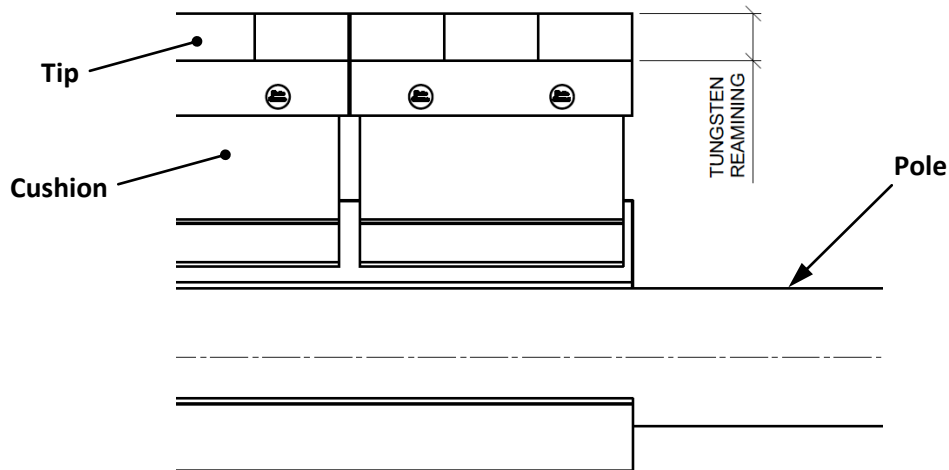


Figure 25 – Tip Wear

8.4 Replacing Tips

In order to replace one or more tips the tension must be backed off the belt cleaner. The following steps should be taken:

1. Remove the lock pin from each side assembly.
2. Loosen the tension bolts until the scraper moves away from the belt and the tips are ~ 5mm from the belt. Note: if the belt cleaner was set up correctly prior to releasing the tension, the pole will be positioned at the correct angle so there is no reason to loosen the clamp arm bolts.
3. Remove the worn or damaged tip(s) and replace with new tips.
4. Ensure the tips are all aligned.
5. Ensure the gap between tips is adequate to ensure adjacent tips do not bind with each other.
6. Tighten up the tip nuts.
7. Reinststate belt cleaner tension (refer to Section 5.2, Steps 4-8 or Section 6.2, Steps 4-8).

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9 Item Codes

