

Attachment A:

Push belt user manual



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AutoTransTech s.r.o.

Praha 4, Chodov,
Starochodovská 2338/66a, Zip: 149 00

Tel: + 420 604 354 705 Email: info@attcvr.com
Fax: + 420 604 354 705 Web: www.attcvr.com

General

The Bosch Push belt is a high-tech precision product; however the belt quality will be easily decreased by inappropriate handling during transport, storage and mounting. The content of the text is divided into three parts:

1. General requirements for belt handling.
2. Work instructions for transport and storage.
3. Manually mounting and dismounting of the Push belt in a L-box.

These guidelines must be followed at all times to assure the quality of the belts. Due to the above mentioned facts Bosch recommends on site training at customer site. By this the risk of failures will be minimized.

Note: throughout the document various examples of wrong belt handling & storage are depicted. All these examples are staged only for the purpose of documentation; the shown belts are excluded from production.

1. General requirements for belt handling

There are some specific rules to guarantee the quality of the belts. These rules are always valid, not only at Bosch, but also during transportation and at the customer site. In case of non-compliance with these rules, Bosch can not be held liable for any damage, contamination, etc. on the belts.

1. No smoking, eating and drinking at the work station where belts are handled.
2. Long hair must be worn in a ponytail.
3. Disassembly of the push belt by the customer is not allowed. Belts which are disassembled for any kind of reason must not be used in a transmission.
4. It is forbidden to wear jewelry, for instance rings or watches etc. as shown in Figure 1.1 (a). The sharp edges will damage the loop side area.
5. Plastic (latex) gloves are mandatory while handling the belts, as shown in Figure 1.1 (b).

These general rules, and underlying rules, will be further explained in the following sections.



Figure 1.1; Wear gloves on bare hands



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1.1 Belt handling requirements

When handling the belt, be aware that there is one critical area on the push belt, the sides of the loop set, as shown in Figure 1.2. This is due to its thin and sensitive design features. Specific naming of the element and loop surfaces are to be found in Appendix A.

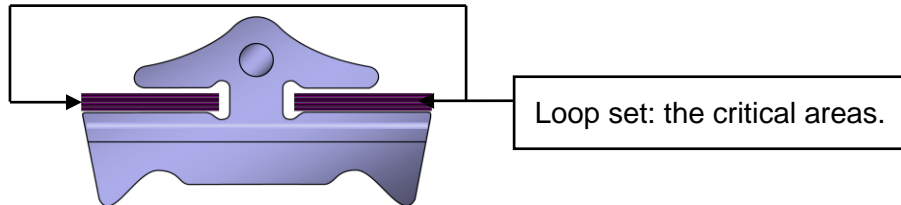


Figure 1.2; Push-belt cross section & critical area

The following points show the points of special interest, when handling the belt. In case of non-compliance with these rules, Bosch can not be held liable for any damage, contamination, etc. on the belts.

1. Avoid external mechanical forces to the loop side area in all cases. Inappropriate handling will damage the loop side area, which later can lead to belt failure in the field, see Figure 1.3.



Figure 1.3; Field failure due to inappropriate handling

2. Handle only one belt at a time in order to ensure stability, as shown in Figure 1.4. The best practice is to hold one belt with both hands, as shown in (a).
3. Sometimes, for instance during mounting & dismounting, it is necessary to hold the belt with only one hand. The correct way to lift the belt is shown in (b). A wrong example is shown in (c); due to the self weight of the belt, the belt will buckle and this will cause mechanical forces on the loop sets. This can lead to loop side damage.





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4. It is not allowed to hold more than one belt at a time, as shown in Figure 1.5. By holding more than one belt the stability of the belts can not be ensured. Therefore it is possible that there is not enough space between the belts, which can cause damage on the belts (when hitting the other belt or a sharp edge).



(a)



(b)

Figure 1.5; Wrong handling

5. Never touch a belt with bare hands, as shown in Figure 1.6 (a), the oil on the belt is bad for the skin and the microscopic filth on the hands can cause contamination on the products.
6. Do not squeeze the belt as shown in (b): sharp bending may lead to microscopic fracture on the loop sets (wearing accessories, like watches, is also forbidden, because of possible metal to metal contact).



(a)



(b)

Figure 1.6; Wrong handling

7. The carton box, containing push belts, must be placed on a stable surface. A comparison is made in Figure 1.7.





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2. Work instructions for transport and storage

This chapter describes the different stages which the push belt goes through, from the assembly line at Bosch till the unpacking at the customer. Every section describes a different stage and how the belt (or packaging) should be handled at this stage.

2.1 Packing the push belt

The Bosch push belt is a high-tech precision product. The quality of which will easily be decreased by inappropriate packing and repacking. Therefore repacking must not be done at the customer, without an agreement between Bosch and the customer. In case repacking is done without the fixed agreement and damages occur on the push belts, Bosch can not be held liable for these damages. The packaging must be done in a designated environment, free of contamination and external mechanical forces on the belt at all times. Brief guidelines of the push belt packaging are mentioned in the following section, specific details are beyond the scope of this document.

1. After dipping the belt in preservation oil, it is placed in a VCI (Volatile Corrosion Inhibitor) bag and properly sealed; see Figure 2.1(a).

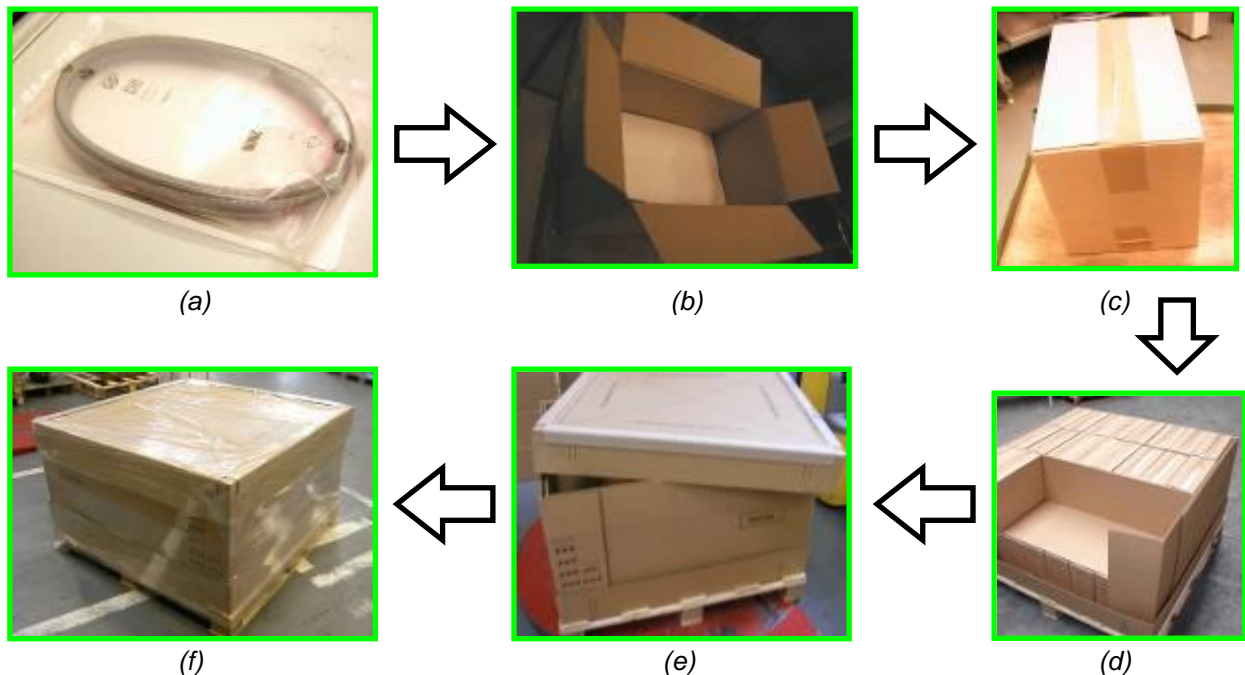


Figure 2.1; Belt packaging at Bosch

2. The belts are placed in carton boxes: first put a carton separator on the bottom of the carton box, as shown in Figure 2.1(b). The sealed belt is placed horizontally on this separator and then another separator needs to be placed on top of the belt. This 'sandwich' structure protects the belt from external mechanical forces and belt-to-belt contact. All belts are placed in the carton box using the same structure. Note: make sure that every belt is stacked horizontally and has a top and bottom separator, including the bottom and top belt in the box. Figure 2.2 shows an example that is inconsistent to both criteria.
3. When the carton box is full, it is sealed with tape, see Figure 2.1 (c).
4. The carton boxes are placed in a Carton Box Shipping unit (CBS-unit). Each CBS-unit is vertically divided in to three segments and horizontally in to two segments for the 24mm belts, three segments for the 30 mm belts and four segments for the 28 mm belts, all separa-



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6. To make sure the CBS-unit doesn't open during transport, a top sheet is placed on the cover and the CBS-unit is then wrapped in stretch foil, shown in Figure 2.1(f).



Figure 2.2; Wrong packaging

2.2 Transportation

The Bosch standard CBS-unit is shown in Figure 2.3. The pallet on which the CBS-unit is mounted has a square shape, which doesn't mean that the lifting tool can be entered on each side. The pallet has an entry-side, marked with an "E" and a non-entry-side, marked with an "N", see Figure 2.3.

Figure 2.3 shows also that the wooden piles of the pallet, on the non-entry-side are combined with a wooden strip. This wooden strip ensures stability. Because of the wooden strip it is only possible to insert the lifting tool (shown in Figure 2.4) from the entry-side.

If the lifting tool is inserted from the non-entry-side the wheels of the lifting tool will damage the wooden strip, and therefore the wooden piles, as shown in Figure 2.5. The box is no longer stable and this will lead to toppling during transport. This might cause serious human injury and product loss, due to the high self weight of about 600kg.



Figure 2.3; The Bosch CBS-unit



Figure 2.4; The lifting tool



Figure 2.5; Incorrect lifting



To ensure stability of the boxes during transportation, it is recommended to never lift more than 1 CBS at a time during transportation in a warehouse, as shown in Figure 2.6. During transport in a



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(a)



(b)

Figure 2.6; Lift a maximum of 1(a) and stack a maximum of 3 (b) boxes during transportation

2.3 Storage

During storage the following rules must be applied:

1. Assure a clean storage of CBS-units, carton boxes and push belts.
2. Free from any contact with rain, dirt or any kind of chemicals, etc.
3. The push belts should be sealed in the original Bosch packages and kept free from external mechanical forces.
4. The CBS-units are best to be stored on a metal rack, an example of such a rack is shown in



Figure 2.7; Storage, using a metal rack

Figure 2.7.

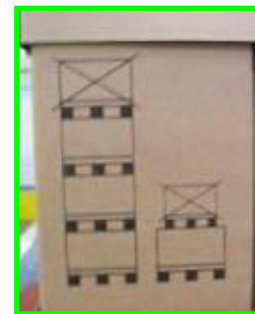
5. Only stack the same type of CBS-units on top of each other, the maximum allowed numbers of stacked boxes is 3. Higher stacking will exceed the loading capacity. Figure 2.8 shows two examples of wrong stacking; (a) shows the stacking of different types of boxes and in (b) there are more than 3 boxes stacked, both are not allowed according the symbols on the CBS-unit (c).



(a)



(b)



(c)



2.4 Unpacking the belt

When unpacking the belt the steps, which are mentioned in Figure 2.1 are done in reverse order.

Note: The VCI bag must only be opened just prior to mounting the belt into the variator. The preservation oil on the belts must never be removed from the belt.

2.4.1 Opening the CBS-unit

The stretch foil, which makes sure that the cover stays on top of the unit during transport can be removed easily by cutting the stretch foil with a Stanley knife.

2.4.2 Opening the carton box

The unpacking procedure is shown in Figure 2.9:

1. On a stable surface (a),
2. Gently cut the carton box with knife (b);
3. Do not make deep cuts or damage the separator (c).
4. Take the belt out of the carton box with two hands, one belt at a time, and put it onto a designated surface. This means for instance, tables with melamine (plastic oil resistend) surface, or on top of a separator.



Figure 2.9; Opening the carton box with care

2.4.3 Opening the VCI

There are two methods for opening the VCI bag, depending on the space between the VCI sealing and the belt. If there is enough space, use method one, if not, choose method two. The general rules for unpacking the VCI bag are stated:

1. The packed belt must be placed on a designated surface, for instance, tables with melamine surface or on top of a separator.
2. Never drop belts on the table, this may cause loop side damages.
3. The disposal of the VCI must be categorized as oil related waste.

- Method one: Enough space between sealing and the belt

Opening the VCI is best done with a cutter tool as shown in Figure 2.10 (a). This tool has a plastic cover, which minimizes the risk of belt damage by the cutting tool. Gently lift the edge of VCI bag, while keeping the belt stable on the table, cut the VCI open with cutting tool as from one side to the other, as shown in Figure 2.10 (b). Carefully take out the belt (c).



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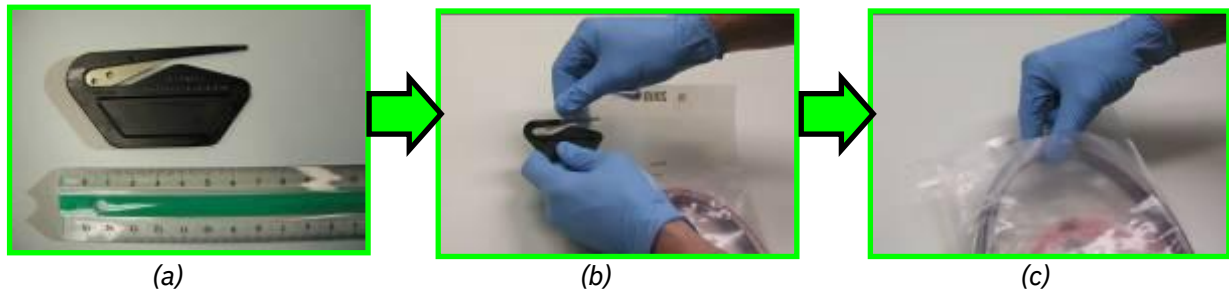


Figure 2.10; Unpacking method 1

- Method two: Belt tight in VCI

Opening the VCI is best done with a cutting tool as shown in Figure 2.10(a). Figure 2.11 (a) shows a different cutting tool which can also be used for opening the VCI bag. Cut the VCI in the middle (a). Make sure that during the cutting the knife doesn't make contact with the belt and/or the loops (b), therefore keep enough space to loop sets at all time. Gently tear the bag open with two hands (c), while holding the belt stable on the table.

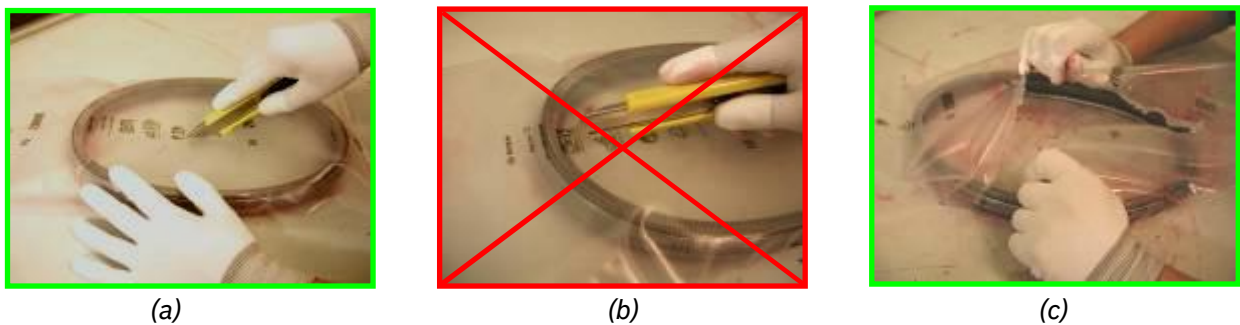


Figure 2.11; Unpacking method 2

2.5 Non functional area anomalies

Belt performance is determined by the quality of the functional areas. These functional areas are monitored and controlled during production.

Due to belt processing differences can occur between one batch of belts and another. These differences do not affect belt performance and can be mounted into the variator without any problems.

Customer should only check the belt number and mounting direction.