




	<b>Instructions and Recommendation Guide</b> <b>Hot Air Sealing</b> <b>ESTube – IML PP Tube</b>	Code	X.00.00032
		Version	01
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Drafted by	Equipment Engineer Miguel Diez, Eduardo	
Checked by	Product Engineer Goubel, Marie Christine	
	Quality & SIG Technical Ramos, Ander	
	Chemical Engineering Manager Iriondo, Patxi	
Approved by	Technology Group Director Fdez. De Mendiola, Javier	

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# Instructions and Recommendation Guide


## Hot Air Sealing

### ESTube – IML PP Tube

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## 1. OBJETIVE

The objective of this document is provide a guideline or recommendation to optimize the sealing process of PP plastic tubes, ESTubes, by means of hot air sealing systems.

**ESTubes ≠ Extruded Tubes**  
**Conditions Sealing ESTube ≠ Conditions Sealing Tubes Extrudés**

WHAT HAS CHANGED? ... **The material of the tube!**

The ESTube is made of polypropylene (PP), while the extruded tube is made of polyethylene (PE).

Polypropylene is more fluid than polyethylene, which means working with a lower temperature to properly seal ESTube.

Similarly, with a PP tube, it is very important to avoid touching the inside of the tube with the hot air nozzle in order to prevent the much smoother melted material from being scraped off the nozzle as it exits the tube.

It is for this reason that it is important to select the appropriate nozzle diameter with respect to the inside diameter of the tube in order not to make the sealing difficult.

Therefore:

Adjustments for sealing **ESTubes in PP** ≠ Adjustment for sealing **Tubes Extrudés in PE**

These instructions and recommendations are based on our experience and the test performed with our hot air sealing machine.


Customers must adjust the sealing parameters to the characteristics of their own processes, machines and tools.

## 2. SCOPE

- ESTube plastic tubes (PP).


## 3. DEFINITIONS - ABBREVIATIONS

See glossary, in CTL-TH Packaging internal document, code **X.00.00000**.

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## 4. QUICK SETTING GUIDE


(Work base that must be adapted according to the machine and tooling of each client)




**Temperate the tubes in the conditioning room, at least 24 hours before.**

**Recommendations for ESTubes sealing base on our machine and tooling:**

*KX 501 – Speed 42t/min - Cooling temp: 18°C – Jaws distance around 0.2~0.25 mm – With outer ring (center) – HA nozzle with 3 three rows of holes*





### 1<sup>st</sup> step: SELECT THE CORRECT NOZZLE DIAMETER




- o Measure the inside diameter of the tube
- o Select the appropriate nozzle to our recommendations (We recommend not using the maximum nozzle, start with the nominal nozzle of our recommendations for the first tests or productions).

ESTube Ø 35	<b>WITH Outer Ring</b> <small><math>\varnothing_{outer\_nozzle} \cong -1 \sim -0,6mm (\varnothing_{inner\_tube})</math></small>	<b>WITHOUT Outer Ring</b> <small><math>\varnothing_{outer\_nozzle} \cong -0,7 \sim -0,5mm (\varnothing_{inner\_tube})</math></small>
If Inner tube Ø = 34,3 ~ 34,4	Nozzle Ø = mini 33,3 ~ maxi 33,8	Nozzle Ø = mini 33,6 ~ maxi 33,9

ESTube Ø 40	<b>WITH Outer Ring</b> <small><math>\varnothing_{outer\_nozzle} \cong -1 \sim -0,6mm (\varnothing_{inner\_tube})</math></small>	<b>WITHOUT Outer Ring</b> <small><math>\varnothing_{outer\_nozzle} \cong -0,7 \sim -0,5mm (\varnothing_{inner\_tube})</math></small>
If Inner tube Ø = 39,1 ~ 39,2	Nozzle Ø = mini 38,1 ~ maxi 38,6	Nozzle Ø = mini 38,4 ~ maxi 38,7

ESTube Ø 50	<b>WITH Outer Ring</b> <small><math>\varnothing_{outer\_nozzle} \cong -1 \sim -0,6mm (\varnothing_{inner\_tube})</math></small>	<b>WITHOUT Outer Ring</b> <small><math>\varnothing_{outer\_nozzle} \cong -0,7 \sim -0,5mm (\varnothing_{inner\_tube})</math></small>
If Inner tube Ø = 49,1 ~ 49,2	Nozzle Ø = mini 48,1 ~ maxi 48,6	Nozzle Ø = mini 48,4 ~ maxi 48,7

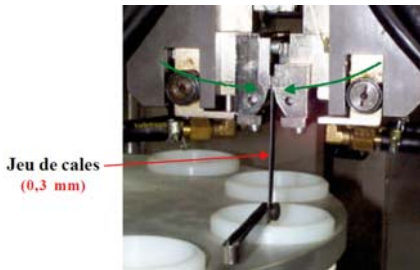
### 2<sup>nd</sup> step: USE OUTER RING

ESTube <b>ROUND</b>	<b>OUTER RING</b> ▼▼▼ <u>HIGHLY RECOMMENDED</u>	ADVANTAGE
		<ul style="list-style-type: none"> <li>➤ Homogeneous sealing</li> <li>➤ Shorter setting times</li> <li>➤ HA temperature lower</li> <li>➤ Less appearance defects</li> </ul>
ESTube <b>ELLIPTIC</b>	 <b>OUTER RING</b> ▼▼▼ <u>REQUIRED</u> 	ATTENTION 
		IMPOSSIBLE to seal without outer ring

### 3<sup>rd</sup> step: REGULATE TRIMMING HEIGHT

The height of the hot air nozzle should be aligned with the compression jaws and the trimming unit.

#### 4<sup>th</sup> step: ADJUST THE COMPRESSION OF THE JAWS



- Clean of any residue.
- Correctly **aligned and parallel**.
- **Separation around 0.2mm and 0.25mm in closed position.**
- Water-cooled approximately between 16° and 18°C

#### 5<sup>th</sup> step: ADJUST HOT AIR TEMPERATURE

<b>Ø 35</b>	<p>Start at <b>300°C</b></p> <ul style="list-style-type: none"> <li>▶ Allow the tube to cool for 5 minutes, then check the seal at 1.5 bar for 10 seconds.</li> <li>▶ If the tube quality is not correct, increase the T° from 10° to 10° until the sealing is correct. Then increase by 5° or 15° to have a safety margin.</li> <li>▶ <i>In our machine, we go to a maximum of 400°C in Ø35.</i></li> </ul>
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<b>Ø 40</b>	<p>Comenzar a <b>325°C</b></p> <ul style="list-style-type: none"> <li>▶ Allow the tube to cool for 5 minutes, then check the seal at 1.5 bar for 10 seconds.</li> <li>▶ If the tube quality is not correct, increase the T° from 10° to 10° until the sealing is correct. Then increase by 5° or 15° to have a safety margin.</li> <li>▶ <i>In our machine, we go to a maximum of 450°C in Ø40.</i></li> </ul>
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<b>Ø 50</b>	<p>Comenzar a <b>390°C</b></p> <ul style="list-style-type: none"> <li>▶ Allow the tube to cool for 5 minutes, then check the seal at 1.5 bar for 10 seconds.</li> <li>▶ If the tube quality is not correct, increase the T° from 10° to 10° until the sealing is correct. Then increase by 5° or 15° to have a safety margin.</li> <li>▶ <i>In our machine, we go to a maximum of 525°C in Ø50.</i></li> </ul>
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#### 6<sup>th</sup> step: OTHERS SETTINGS

(To adapt also according to the each machine)

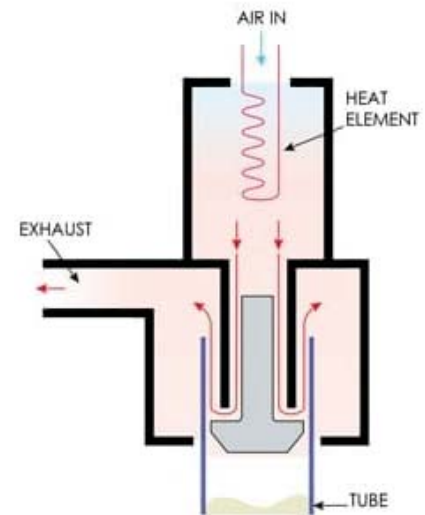
Ø TUBE	HOT AIR PRESSURE	SPEED
Ø35 & Ø40	Between 0.4 bar & 0.6 bar	42 tub/min
Ø 50	Between 0.5 bar & 0.6 bar	

## 5. DESCRIPTION OF ACTIVITIES

### 5.1. PRINCIPLE OF THE SYSTEM

Hot air sealing is based on the following:

1. Heat the inner part of the tube, where it is to be sealed, by means of hot air. The hot air is generated by an electric air heater and its temperature can reach up to 650° C.
2. Subsequently, the tube is sealed by two water cooled jaws (clamps).
3. Finally, the finish of the tube is made by trimming the edge of the sealed area.



### 5.2. RECOMMENDATIONS

#### 5.2.1. Recommendations before the tube filling phase

It is very important to take into account a series of recommendations for the handling of the tubes before to the filling and sealing process.

- Stored tubes must be in perfectly closed boxes and in a clean (not greasy) environment.
- The tubes before the filling and sealing process should be tempered in the conditioning room for at least 24 hours if storage is carried out at relatively lower temperatures than the conditioning room.
- Different batches of tubes should not be mixed. They could have differences in their inner diameters and will lead to problems in the sealing.
- The tubes should not be touched or held internally by fingers.
- The tubes must not be exposed in open boxes for long periods of time. They could be charged with static electricity, with the consequent absorption of dirt, which directly affects the quality of the product and the sealing.

### **5.2.2. Recommendations for filling/sealing tubes with high alcohol concentration bulks**

Due to the nature of the products with high alcoholic concentration, depending on the characteristics of the machine, filling system, conditioning room ... it is recommended to carry out a complete risk assessment of the filling and sealing process of the tubes, taking into account the following aspects:

- Product safety data sheet (percentage alcohol concentration, flammable limits - LEL, UEL- ...)
- Review of the product filling phase (product container/tank, dosing system, probability of accumulation of dangerous vapors ...)
- Review of the tube sealing phase (balancing the hot air blowing / vacuuming process, absence of possible sources of ignition, electrical elements ...)
- Review of the conditioning room, air recirculation...

Based on the experience and knowledge acquired by manufacturers of filling machines and users, it can be estimated that the risks (generation of vapors ...) derived from filling can be of the same nature both in filling tubes and other packaging. (PET-jars, cans...)


The solutions that have been adopted by some manufacturers and users of filling machines are oriented to the following aspects:

- Monitoring devices (volume flow) detection of accumulation of gases / vapors.
- Controlled extraction of gases / vapors.
- Move electrical elements (temperature regulators...) to potentially non-dangerous areas.
- Increased air recirculation in the conditioning room or zone.
- Others

### **5.2.3. Recommendations on the factors affecting the sealing during the filling of the tubes**

The following factors, variables and parameters to be regulated in each machine significantly affect the quality of the final seal:

- Feeding station
- Bulk dosing unit
- Hot air nozzles
- Cleanliness of the hot air nozzle
- Outer ring (cooling ring)
- Hot air pressure
- Hot air temperature
- Speed (tubes/minute)
- Crimping
- Other settings

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### 5.2.3.1. Feeding station

It is very important that the tube feed is done correctly in the tube holders, for that:

- It is recommended that the tube be controlled in the step from the feeding ramp to the tube holder, by means of vacuum or other system, in such a way that the placement of the tube in the tube holder is as effective and controlled as possible.
- The tubes must be held in the tube holders, if they have slack or move easily, can cause them to not fit properly in the hot air nozzle and the sealing is not correct.
- However, the tubes should also not get too hard, or the conical feeding pusher should not be push over-pressure, to avoid deforming or breaking the tubes which can also cause the sealing to be incorrect.
- The tube holders design, in shape and size, should be suitable for each tube format. (pay attention to the nominal outside diameter – see the measurement table)

### 5.2.3.2. Bulk dosing unit

The filler nozzle or pipe must be have the proper diameter and shape depending on the type of tube, to avoid touching the inside the tube. This will prevent staining or deterioration of the tube.

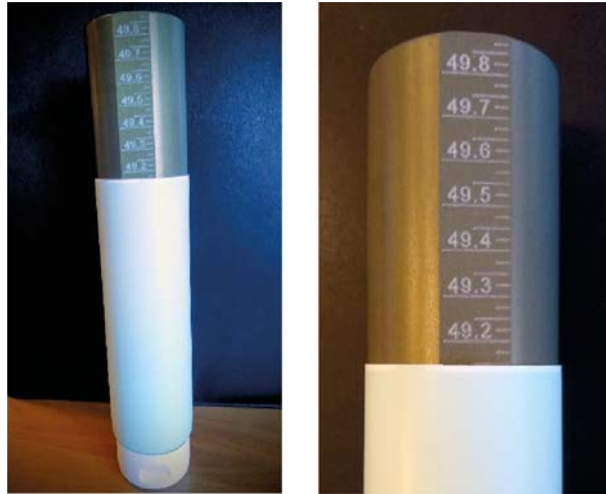
It should be avoided that the dosage will stain the inner area of the tube where the sealing will be carried out with splashed of the product, even if the surface is minimal, as with micro drops, because it will negatively affect the quality/functionality of the sealing.

### 5.2.3.3. Hot air nozzle

It is very important to avoid touching the inside of the tube with the hot air nozzle, because the nozzle would scrape the melted PP out of the tube at the time of its exit, which would stain the nozzle and we could not seal properly. It is therefore very important to correctly select the diameter of the nozzle:

- **Measure the inside diameter of the tube:** we use a tool (see picture below), made-in-house by Tuboplast, which allows us to easily visualize the inside diameter of the tube (for more information on this tool, contact our sales department).





- **Select the appropriate nozzle diameter**, based on the inside diameter measured with the tooling. For the following cases:

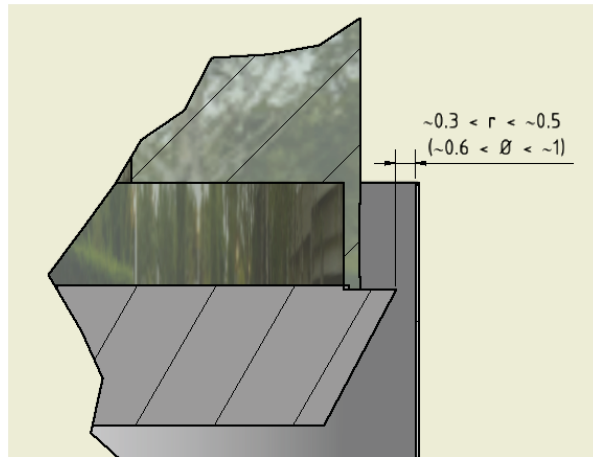
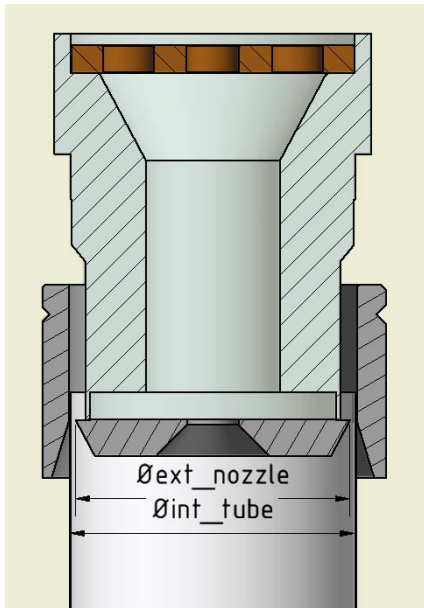
- Machine WITH outer ring or cooling ring (see chapter 4.2.2.5)

**$\varnothing_{inner\ tube} - \varnothing_{outer\ nozzle} \cong 0,6 \sim 1\text{mm}$  (in diameter)**

- Machine WITHOUT outer ring or cooling ring

**$\varnothing_{inner\ tube} - \varnothing_{outer\ nozzle} \cong 0,5 \sim 0,7\text{mm}$  (in diameter)**

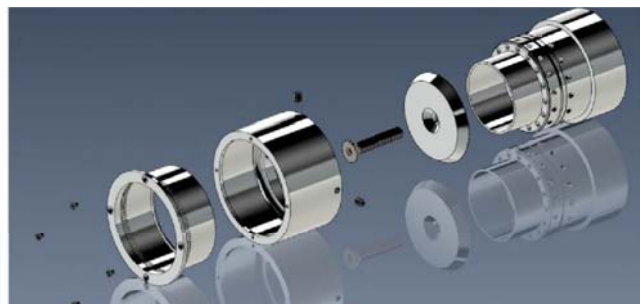
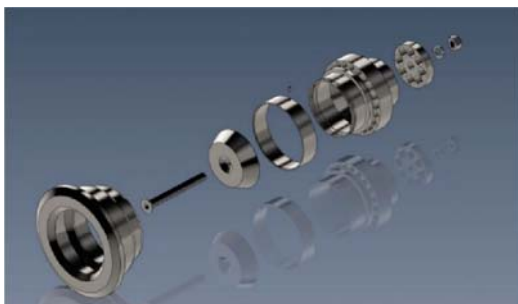
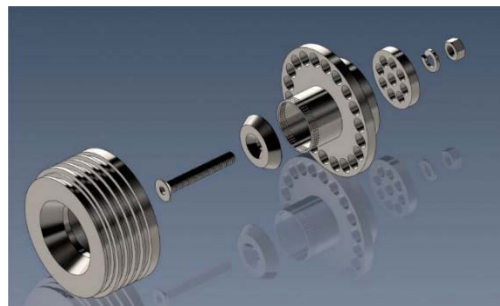
**The most important thing is to avoid touching the inside of the tube with the nozzle, it is for this reason that it is recommended to use the outer ring or cooling.  
It will allow the centering of the tube relative to the nozzle.**




For each batch, the inside diameter of the tubes must be checked to select the hot air nozzle which outside diameter is suitable.

Depending on each sealing machine manufacturer, to adapt the diameter of the nozzle to the diameter of the tube, it has to change the entire nozzle or just the washer.

Below it can see different nozzle designs, depending on each manufacturer:



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A bad decision when choosing the nozzle can lead to defects such as:

- **Nozzle too large:** it can generate friction when introducing and removing the nozzle from the tube and that implies risk of:
  - Damage the sealing area.
  - Spot the nozzle with molten material.
  - Moving the tube, therefore, will seal incorrectly.
- **Nozzle too small:** the hot air does not properly heat the sealing area. It will require a higher temperature than if a suitable nozzle was selected for the inner diameter of the tube.

This table shows the inner diameter of each kind of tube and its tolerances. (Valid at the date of this document, for an updated information request it to your CTL-TH Packaging Group contact.


ESTube PLASTIC TUBES			
ESTube	Outer nominal Ø	Inner nominal Ø	Tolerance
Ø 35	Ø 35,3	Ø 34,3	± 0,3
Ø 40	Ø 40,3	Ø 39,2	
Ø 50	Ø 50,3	Ø 49,1	

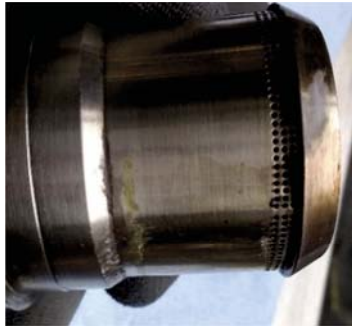
The values of the inner diameters are in the following General Standards (NG) defined in the technical specifications of the CTL-TH Packaging Group:

- **NG 313** → E.00.00002 (ESTube Plastic Tube).

#### **5.2.3.4. Cleanliness of the hot air nozzle**

The hot air outlet holes in the nozzle should be perfectly clean and unobstructed. Sometimes they tend to become clogged with molten plastic (**usually when the HA nozzle selected is too large for the inner diameter of the tube or when it doesn't use the outer ring or cooling ring**), not allowing the flow of hot air to pass properly and causing sealing problems in that area of the tube.

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### 5.2.3.5. Outer ring (Cooling Ring)

Some hot air sealing machines are equipped to be able to use an outer ring or cooling ring.



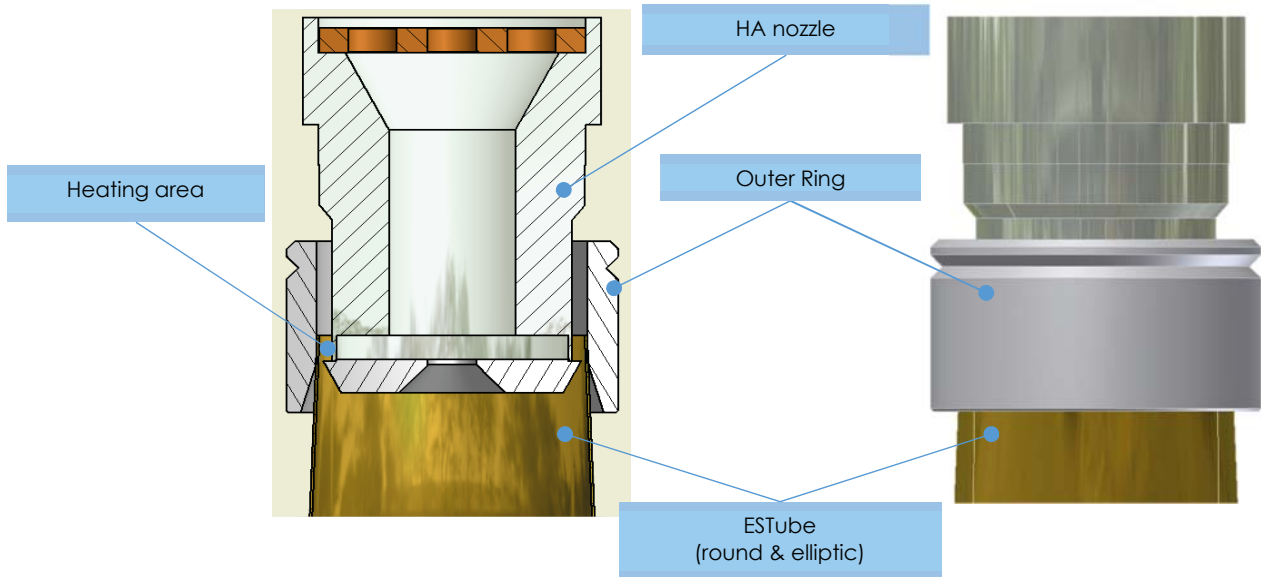
**Its main function is to ensure that the tube remains as round as possible** when the hot air nozzle enters. In such a way that the heating of the inside of the tube is as uniform as possible and also helps us **to ensure the centering of the tube during the entrance of the nozzle**, avoiding or minimizing the risk of contact between the hot air nozzle and inside the tube.

In other cases it is used to cool the outside of the tube.

Each manufacturer has a particular design of this element, as well as its specific functionality and its machine placement.

In any case, to ensure a uniform heating throughout the inner perimeter of the tube, such that the sealing is correct, we consider the use of the outer ring for PP ESTube plastic tubes:

- ❖ **REQUIRED for elliptical tubes**
- ❖ **HIGHLY RECOMMEND for cylindrical tubes**



### 5.2.3.6. Hot air pressure

According to our experience, the design of the hot air nozzle is specific to each manufacturer of filling machine. The diameter of the holes and number of rows of holes can affect the hot air pressure with which to work.




That is, the hot air pressure can change depending on each manufacturer nozzle design. Therefore, in different types of machines with different types of nozzles, the hot air pressure is completely different.

Usually, ESTubes can be sealed with hot air pressures, ranging from 0.4bar to 0.6bar, although we have had experience with a customer, with air pressures up to 1bar.

Ø TUBE	HOT AIR PRESSURE	SPEED
Ø35 & Ø40	Between 0.4 bar & 0.6 bar	42 tub/min
Ø 50	Between 0.5 bar & 0.6 bar	

### 5.2.3.7. Hot air temperature

The temperature of the hot air is directly related to the other parameters that affect the heating of the inside of the tube such as hot air pressure, machine speed, heating time, type of tooling.

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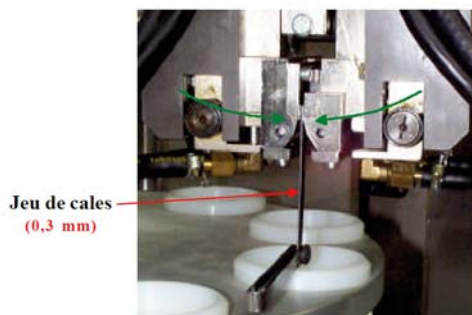
Therefore depending on these parameters, the hot air temperature may change with respect to the table of temperatures indicated below:

PRODUCT	Temperature Range (*)	
ESTube Plastic Tube (PP)	Ø35 EST	350°C a 400°C
	Ø40 EST	375°C a 450°C
	Ø50 EST	440°C a 525°C

**(\*) Sealing temperature range:** in working conditions with hot air machine available on Tuboplast for tests made at a speed of 42tubes per minute and hot air pressure between 0.4 and 0.6bar.

#### 5.2.3.8. Crimping

The jaws can be flat or grooved, with or without batch marking. It is recommended to take into account the following aspects:




- Clean of any residue.
- Correctly **aligned and parallel.**
- Separation around 0.2mm and 0.25mm in closed position.
- Water-cooled approximately between 16° and 18°C.

#### 5.2.4. Other settings

##### 5.2.4.1. Heating time

The heating time is the time that the nozzle stays inside the tube heating it. Depending on the manufacturer of the machine, it can be:

- Heating time as a function if the speed of the machine:
  - Higher machine speed, shorter heating time.
  - Slower machine speed, longer heating time.
- Heating time, controlled by an independent parameter. The heating time is selected regardless of the speed of the machine.

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#### 5.2.4.2. Sealing thickness

It is recommended to adjust the clamp (jaws) in such a way that the thickness of the sealing (defined in the photo) measures approximately 75 – 85% of the total thickness of the tube.

#### Example:



If the thickness of the tube is 0,43mm, the total thickness would be 0,86mm. Therefore, the sealing thickness should be around 0,64 – 0,74mm (75 – 85%).

If the sealing is too compressed (for example around 0,40mm) there is a risk of rupture of the label, on the other hand if the sealing is less compressed (for example 0,80mm), the sealing would not be good and there is a risk that the tube could open.


#### 5.2.4.3. Sealing height

It is recommended a sealing height around 5 o 6mm as shown in the following photo:



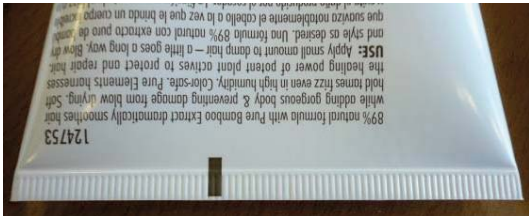
The variation of thickness in the sealing line must have maximum difference of 0.05mm, as indicated in the picture. This control is performed to verify the parallelism between the jaws (clamps).

#### 5.2.4.4. Trimming system

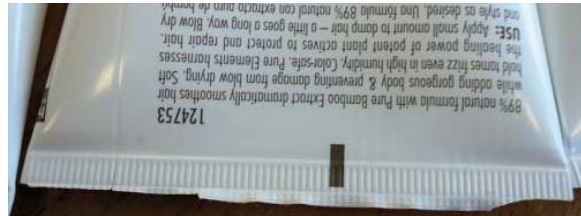
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The trimming system is used to remove the end of the sealing and give a suitable aesthetic finish to the tube.

The cutting blade must be perfectly clean, sharp and tight, in order to make a perfect cut that is not made by tearing, as indicated in the following image:



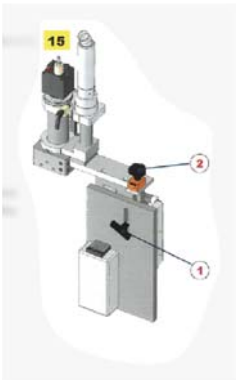
**RIGHT TRIMMING**



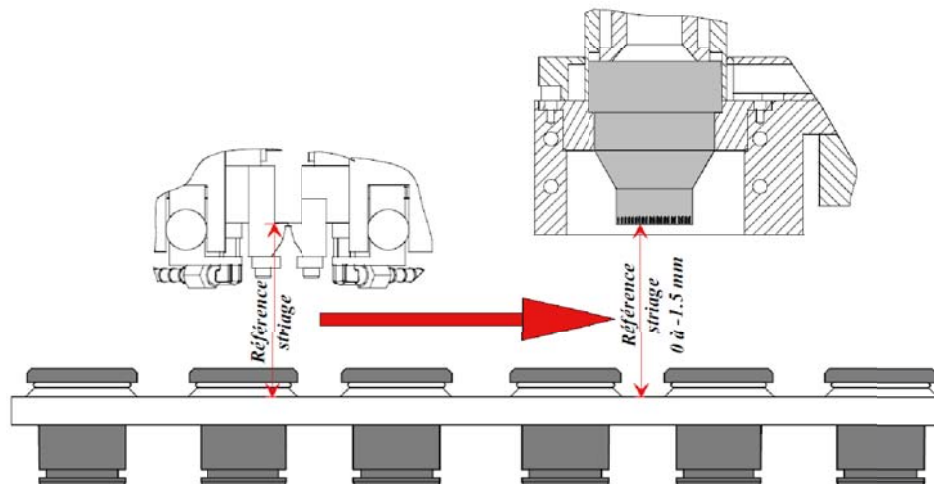
**WRONG TRIMMING**

### 5.2.4.5. Height of hot air nozzle


On some machines the height of the hot air nozzle can be adjusted independently of the rest of the machines movements.



The height of the hot air nozzle should be aligned with the compression jaws and the trimming unit.





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### 5.3. OPERATING METHOD OF SETTING THE FILLING-SEALING MACHINE.

Check that the following parameters are correctly set:

- Hot air nozzle selection, suitable for inner tube diameter.
- Dosing/Filling regulation.
- Hot air pressure regulation.
- Check crimping. Compression of the sealing.
- Check trimming.
- Machine speed, depending on the production.

Then, continue with the hot air temperature selection:

**Taking into account the recommended temperature range for each type of tube, select a lower temperature than the established in the table.** So we could verify that the tube does not seal correctly.

The temperature is increased by 10° in 10°C, checking with each increase the quality and resistance of the sealing of the tubes, until reaching the minimum temperature that correctly seals the tubes.

Once we determine the minimum sealing temperature for this batch of tubes, the temperature of the hot air will be increased, as a safety margin of 5°C to 15°C

NOTE: It must be borne in mind as explained in previous chapters that a change of machine speed, heating time or air pressure can also affect the quality and resistance of the sealing. It is not recommended to make two changes at the same time, so it is easier to evaluate how the change affects to the tube sealing.

On the other hand, it should be taken into account that if exceed heat is produced on the inner of the tube (by high temperature, high hot air pressure and/or high heating time) it can deteriorate the tube material, causing it to not seal properly.

## 5.4. ASPECTS TO BE CHECKED AFTER SEALING

### 5.4.1. Seal testing

There are two methods to verify that the seal resistance is correct:

- Method 1. Internal pressure resistance
- Method 2. External pressure resistance

#### 5.4.1.1. Method 1. Internal pressure resistance


This method **is recommended for seal resistance testing of empty tubes**, the system used may be an "in house" system. It is enough with pressurized air intake, a flow regulator and a nozzle that fits to the head of the tube or cap.

1. The tubes must be tempered in the room where the test is performed.
2. If the tubes are just sealed, wait at least 5 minutes to do the test. So the sealing will be cooled and stabilized.
3. Hold the tube with one hand. Adjust the pressure gauge to 1.5bar.
4. Afterwards, with the other hand, insert the blower cone into the head of the tube or the perforation of the cap and circulate the air into the tube for a defined time in the table shown below:



TUBE	PRESSURE	TIME
ESTube Plastic Tubes (PP)	<b>1,5 bar</b>	<b>10 sec.</b>

The results are positive if the seal supports the test without showing deficiencies.

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#### 5.4.1.2. Method 2. External pressure resistance

This test method is not used by CTL-TH Packaging as a validation method for tube sealing, however it is used by numerous fillers and customers, so we include it in this guide for information.

This method **is recommended for filled tube seal resistance tests**. The system used is how the supplied by manufacturers like ACRN, JACOMEX, ACF-MEASUREMENT, among others...



JACOMEX – Tube Tester




ACRN – ATS Tube Seal Tester

1. The tubes must be tempered in the room where the test is performed.
2. **If the tubes are just sealed, wait at least 5 minutes to do the test. So the sealing will be cooled and stabilized.**
3. Adjust the cylinder pressure according to the manufacturers' recommendations, so that an output pressure of 1.5bar is generated inside the tube.
4. Place the tube in the base of the system enabled for this purpose. It is recommended/optional to introduce the tube in a plastic bag (type ZIPLOCK) to avoid products projections in case of seal rupture.



5. Close the protection and start the system for the time indicated by the manufacturers (around 10 or 20 seconds).

The results are positive if the seal supports the test without showing deficiencies.

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## 5.5. DIVERS


### 5.5.1. Distance Label Overlap / Sealing line

In the case of ESTubes, the distance between the label overlap and the edge of the sealing is taken into account.

The deviation of the central axis of the rear face of the tube implies a variation of the distance between the overlap of the label and the edge of the sealed tube.



Recommendation: **8mm**

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## 5.6. TROUBLESHOOTING

### 5.6.1. Sealing resistance

In case of defects after the sealing resistance test, the following table define the possible causes and recommendations to solve it:


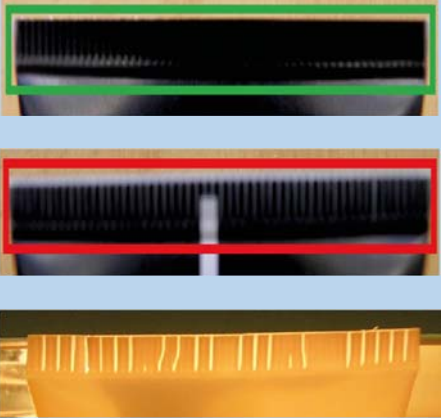

The most typical problems are **shaded in yellow**:


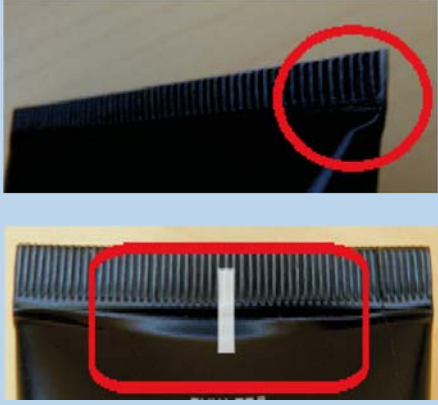
Possible causes	Recommendations
Nozzle or tooling wrong selection	Check that both, nozzle and tooling are adequate to the characteristics of the tube to be sealed, according to our recommendations (see chapter 4.2.2.3)
Hot air pressure and/or temperature settings are wrong at machine speed set	Adapt the hot air pressure and temperature to the machine speed setting.
Incorrect air pressure used in the test for checking the sealing, for ESTube is recommender 1.5bar	Check the air pressure for testing the sealing according to our recommendation (1.5bar during 10").
Hot air nozzle and tube are not correctly axial alignment	Ensure concentricity between nozzle and tube, ► if it's possible, use outer ring
Hot air nozzle holes are clogged by molten material	* Clean the hot air nozzle * Ensure concentricity between nozzle and tube * Check that both, nozzle and tooling are adequate to the characteristics of the tube to be sealed, according to our recommendations (see chapter 4.2.2.3) * Use outer ring
Incorrect clamp / jaws compression distance/pressure	Check crimping setting Check the parallels between jaws Distance between jaws = 0.2 ~ 0.25
Tubes stained with bulk in the sealing area	Check that the filler nozzle is correctly centered and clean.
It isn't used the outer ring for cylindrical tube.  (possibly the hot air nozzle touches the inside of the tube and staining, affecting the quality of sealing and its performance)	Outer ring is recommended.  It allows to center properly HA nozzle with respect to the tube, reducing the risk of contact between HA nozzle and tube.
It isn't used the outer ring for elliptical tube.	It is essential to use the outer ring.  For round the tube and ensure a uniform heating of the inside of the tube.



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### 5.6.2. Appearance



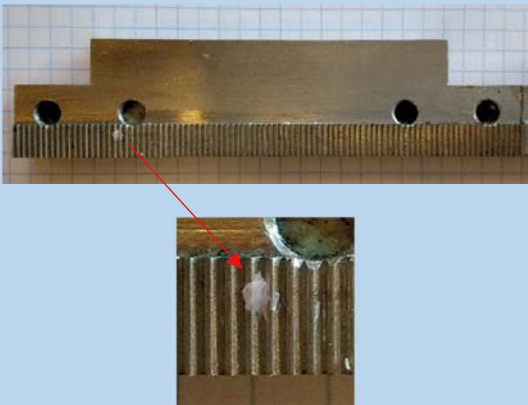
The defects of appearance that can happen and the actions to be performed to correct them, are defined in the following table:


ASPECTS DEFECTS	POSSIBLE CAUSES	CORRECTION FACTORS
<p style="text-align: center;"><b><u>EARS</u></b></p> 	<p><b>Excessive heating:</b> Temperature too high Hot Air pressure to high</p> <p><b>Excessive compression:</b> The jaws are too closed</p>	<p><b><u>Check sealing parameters:</u></b></p> <ul style="list-style-type: none"> <li>* Reduce Temperature</li> <li>* Reduce Air Pressure</li> </ul> <p>* Check jaws setting.</p>
<p style="text-align: center;"><b><u>PRINTING DETERIORATION SEALING AREA</u></b></p> 	<p><b>Excessive heating:</b> Temperature too high Hot Air pressure to high</p> <p><b>Excessive compression:</b> The jaws are too closed</p>	<p><b><u>Check sealing parameters:</u></b></p> <ul style="list-style-type: none"> <li>* Reduce Temperature</li> <li>* Reduce Air Pressure</li> </ul> <p>* Check jaws setting</p>
<p style="text-align: center;"><b><u>PRINTIND DETERIORATION SEALING SIDE</u></b></p> 	<p><b>Excessive heating:</b> Temperature too high Hot Air pressure to high</p> <p><b>Excessive compression:</b> The jaws are too closed</p> <p><b>Contact with an abrasive surface at the exit of the machine</b></p>	<p><b><u>Check sealing parameters:</u></b></p> <ul style="list-style-type: none"> <li>* Reduce Temperature</li> <li>* Reduce Air Pressure</li> </ul> <p>* Check jaws setting</p> <p><b><u>Check abrasive contact areas</u></b></p>

ASPECTS DEFECTS	POSSIBLE CAUSES	CORRECTION FACTORS
<p><b><u>WRONG TRIMMING</u></b></p> 	<p>Badly sharp blades. Incorrect alignment or incorrect turntable height.</p>	<ul style="list-style-type: none"> <li>* Clean the blades.</li> <li>* Sharpen the blades.</li> <li>* Align the trimming system.</li> <li>* Adjust the turntable.</li> </ul>
<p><b><u>NON UNIFORM SEALING OR WITH DEFORMATIONS</u></b></p> 	<p>Jaws are badly aligned.  Accompany jaws are badly aligned.  Unsuitable height adjustment of the hot air nozzle</p>	<p>Line up the jaws  Line up the accompany jaws.  Adjust the height of the hot air nozzle</p>

ASPECTS DEFECTS	POSSIBLE CAUSES	CORRECTION FACTORS
<p style="text-align: center;"><b><u>TUBE BROKEN (NOT SEALED TUBE)</u></b></p> 	<p>Excessive pressure feeding tube</p> <p>Inadequate feeding to the tube holder</p> <p>Tube holder not fit for this tube format</p>	<p>Check in step by step movements the tubes enter correctly into the tube holders.</p> <p>Adjust pressure / speed feed tube to tube holder</p> <p style="background-color: #FFF9C4;">Check tube holder suitable fit tube format and its outer diameter</p> <p><math>\varnothing_{ext\_ESTube} &gt; \varnothing_{ext\_Extruded\ Tube}</math></p> <p><i>(check outer diameter table)</i></p>
<p style="text-align: center;"><b><u>TUBE BROKEN (SEALED TUBE)</u></b></p> 	<p>The tube is not well centered and the overlap lines is too close to the edge of the tube.</p> <p>The overlap line was broken before the sealing. For example, in the feeding (according to previous point)</p> <p>Tube forced against some surface (at the exit of the machine?)</p>	<p>Check tube centering.</p> <p>Check the correct feeding of the tube in the tube holder (see previous point)</p> <p>Verify that the tube doesn't crash with any surface, for example when the tube is ejected from the machine.</p>



ASPECTS DEFECTS	POSSIBLE CAUSES	CORRECTION FACTORS
<p><b><u>HOT AIR NOZZLE SPOTTED WITH MOLTEN MATERIAL</u></b></p>  	<p><b><u>The nozzle touches in the tube, because:</u></b></p> <p>The tube is not well centered (axially) with respect to the HA nozzle.</p> <p>Outer ring is not used.</p> <p>The nozzle is too big for the diameter of the tube.</p> <p>It is an elliptical tube and the outer ring is not used.</p> <p>The outer ring doesn't round correctly the tube.</p>	<p>Check the alignment between the tube and the HA nozzle.</p> <p>Use the outer ring.</p> <p>Reduce the diameter of the HA nozzle, according to our recommendations (<a href="#">see chapter 4.2.2.3</a>)</p> <p>Use the outer ring to round off the elliptical tube.</p> <p>Check that the outer ring rounded elliptical tube correctly.</p>
<p><b><u>JAWS SPOTTED WITH MOLTEN MATERIAL</u></b></p> 	<p><b><u>Nozzle too large</u></b> The nozzle is too large and drag the molten material out of the tube</p> <p><b><u>Temperature too high</u></b> The molten PP material is too fluid due to excess temperature</p> <p><b><u>Crimping compression too large</u></b> The PP material is very fluid, excessive pressure can remove material residue and leave them in the jaw</p>	<p>Reduce the diameter of the HA nozzle, according to our recommendations (<a href="#">see chapter 4.2.2.3</a>)</p> <p>Reduce the temperature</p> <p>Check the crimping pressure</p> <p>Distance between jaws recommended = 0.2 ~ 0.25mm</p>

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## 6. ASPECTS TO CONSIDER

### 6.1. HEALTH AND SAFETY

Make proper use of the sealing machine to avoid entrapment, burns...

### 6.2. ENVIRONMENT

Comply with the Company waste management instruction.

### 6.3. SR

DOES NOT APPLY

## 7. ASSOCIATED DOCUMENTS

DENOMINATION	DOCUMENT CODE
IMS Glossary	X.00.00000
Technical specifications ESTube Plastic Tubes	E.00.00002