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Size Selection & Installation of Dual Wall Heat Shrink Tubing



NB: The recommendations presented here are based on general industry information.

Since TE Connectivity does not have knowledge of the specific application and the end use conditions of all users, each user should determine the correct size of tubing together with the installation conditions for their own application and evaluate against their individual requirements.

Note: The size and colour of the product may be different from the images in this document. The images mentioned in this document are for representation purpose only.

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1. SCOPE

This document outlines the general guidelines for selection and installation of general-purpose dual wall heat shrink tubing from TE Connectivity.

2. REVISION HISTORY / REASON FOR CHANGE / RELATED DOCUMENTS

Rev	Date	Prepared By	Approved By	Remarks
A	June 2023	Kamalaravanan	Richard Kewell	New document

2.1. Applicable product family

ATUM, DWFR, DWHF, DWP-125, DWTC, HTAT, RBK-105-KIT, RBK-85-KIT, SAS, SCL, TAT-125, TSAS

2.2. Customer Assistance

Reference Product Base Part Number and Product Code are representative. Use of these numbers will identify the product line and help you to obtain product and tooling information when visiting www.te.com or calling the number at the bottom of page 1.

2.3. Drawings

Customer drawings for product part numbers are available from www.te.com. The information contained in Customer Drawings takes priority if there is a conflict with this specification.

2.4. Specifications

Product Specification for product part numbers available from www.te.com provides product performance and test results.

2.5. Shelf Life

Refer document Global Dimensional Life for Heat Shrink Tubing Standard Size Products 408-32191 for details regarding the shelf life.

2.6. Safety

Appropriate Personal Protective Equipment (PPE) should be worn, and installation should take place with fume extraction or in a well-ventilated area.

3. TUBING SIZE SELECTION AND INSTALLATION GUIDELINES

3.1. Tube Size Selection

Dual wall tubing is a heat shrink tube that usually has a meltable inner liner used to bond and form a seal. Dual wall tubes are generally available in larger shrink ratio than single wall tubing. The tubing is installed in the same way as single wall tubing, same techniques and same equipment can be used. Assuming the correct size of the tubing is selected, the tube should easily fit over the article on which it is being installed. The tube should be at least 10% bigger than the article before installation. The tube must be cut to the required length considering some provision for longitudinal shrinkage.

- a. Always select the largest size of the tube that will snugly fit onto the substrate. This will maximise the installed wall thickness and provide better protection. Ensure not to force fit the size for the application.

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- b. Carefully cut the tubing to the required length using sharp knife or other suitable cutting equipment ensuring that it is a clear cut having the cut edges clean and free from burrs. An improper cut may result in a possibility of a split at the tubing end.
- c. Longitudinal shrink depends on the amount of radial shrink happened while shrinkage. Within the specification limits the longitudinal change will be different depending on the amount of recovery.

3.2. Installation Guidelines

It is recommended that local safety regulations are adhered too, and that installations are carried out in a well-ventilated area with adequate fume extraction. It is further recommended that operators wear heat resistant gloves when installing and handling hot heat shrink products, and that contact with molten material be avoided. Wash hands before eating, drinking, or contacting the face with the hands.

Installation of the dual wall product can be achieved via a heated air circulating oven, heat gun, or belt heater, dependent on specific application circumstances. In general, the length of time and the precise temperature required to fully shrink the product will be dependent on the associated thermal masses, thermodynamics and on tubing family. A piece of tubing will require more heating to achieve full recovery if it is associated with a large thermal mass, such as a large metal conductor. Depending on the shape and material of the article, correct installation equipment and process should be determined.

- a. Slide the heat shrink tube over the article that must be covered. Based on the shape of the article, position of the tubing, possibility of air trap, the place to start the heating should be determined. Avoid using open flame. Ensure not to stretch the tube while placement.
- b. In case of starting to heat the tubing from one end, it is important to ensure that the tube is placed in correct position. The end of the tubing will shrink holding the tube in place. See figure 1.

Figure 1.


- c. The heat should be applied in a controlled way by directing the air flow onto the tube for the whole length of the tube. This can be achieved by either rotating the assembly or the heat gun. See figure 2.

Figure 2.


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- d. Rotate the heat around the tube and evenly to ensure even installed wall thickness of the tube. Whilst the tube is recovering to its position, the hot air can be directed along the longitude to continue the shrinking process. Considering the temperature profile of hot air from the heat gun, maintain appropriate distance between hot gun and the tubing
- e. Ensure to work down the tube to ensure the air is not trapped inside the tube. Direct the heat evenly around the width and length of the tube such that it shrinks evenly and fits snugly over the article.
- f. Avoid overheating the product after shrinkage has occurred. Stop heating immediately if the product blisters, chars or shows other signs of degradation. As a warning, tubing will start to turn glossier or matt on overheating. Avoid inhaling fumes which may be released and ventilate the area thoroughly before resuming work.
- g. In dual wall tubing, it is important to provide enough heat to melt the liner and allow the adhesive liner to adhere to the substrate surface. If sufficient heat is applied on the tube, it is usually possible to see a small quantity of the liner flowing from the end of the tube. During this process, ensure not to overheat the product as that will make it charred or brittle.
- h. The completed assembly should be free from cold spots and wrinkles and conform to the shape of the substrate. See figure 3.

Figure 3.**Note:**



- Nature of the substrate dictates the installation time. For example, metal substrate will take away a part of heat supplied due to their thermal conductivity and hence will take longer time compared to a plastic substrate.
- Similar philosophies should be used when using ovens or belt heaters.
- For air circulating ovens the heating is more uniform and should not require mechanical manipulation of the product. Ensure that the product is appropriately positioned within the oven, which should be pre-heated. The temperature and time required within the oven will be dependent on the characteristics of the substrate, as is the case for operation within a belt heater.
- TSAS is an adhesive tube and not a heat shrink tube
- RBK-85 and RBK-105 tubing must be used in combination with a separate heat shrink tube
- For installations with other types of equipment, please consult your TE Connectivity representative.

4. GENERAL GUIDELINES AND TROUBLE SHOOTING

4.1. General Guidelines






- a. For coloured tubes, supplied tubes will be of a pale shade of recovered colour. Please note that the colour of the tubing concentrates during shrinking.
- b. For clear tubes, note that the tubing will become clear on recovery. Clarity will be at the highest when heating and reduces when cools down. Please contact your TE Connectivity representative for the requirement of clear tubing with highest levels of clarity.
- c. Ensure that the substrate is clean before application of the tubing. Usage of wires after long storage time in substrate may cause split in the tubing during longitudinal shrinkage.

4.2. Troubleshooting

Fault	Possible Cause	Solution
<p>Tube not fully shrunk onto substrate / Under installed</p> 	<p>Insufficient heat Insufficient time Wrong tube size</p>	<p>Increase heat Increase heating time Consult Tube Selection</p>
<p>Tube mislocated after installation</p> 	<p>Incorrect location prior to installation Tube unbalanced</p>	<p>Locate correctly (offset) Consult local TE Connectivity rep</p>




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<p>Tube partially recovered at one end</p> 	<p>Tube did not align centrally in application equipment</p>	<p>Use guidelines on machine for centralisation Check calibration</p>
<p>Tubing or wire overheated</p> 	<p>Excessive heat Excessive time</p>	<p>Reduce heat Reduce heating time</p>
<p>Tubing scorched on one side</p> 	<p>Excessive wire curvature Tube located incorrectly in machine</p>	<p>Use straightened wire Reposition tubing</p>
<p>Tubing splits</p> 	<p>Wire strand loose Tube overheated Wrong tube size selected</p>	<p>Check tooling Reduce heat/time Reassess</p>
<p>Wire strand pokes through tube</p> 	<p>Wire strand loose from wires</p>	<p>Check tooling Check wire construction</p>

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<p>Cannot cover</p> 	<p>Incorrect size of tube Inadequate heat Too many wires Contamination on wires Inadequate covering zone</p>	<p>Refer to sizing guide Increase heat Reconstruct tubing Clean substrate Check process</p>
<p>Wire damage at tubing edge but tubing visually OK</p> 	<p>Overheat Excessive time Tube not centred in machine Mismatch of tube/wire Temperature rating</p>	<p>Reduce heat Reduce time Use guides on machine Reduce heat/time</p>
<p>Adhesive dripping / ooze out / overflow</p> 	<p>Excessive heat Excessive time</p>	<p>Reduce heat Reduce heating time</p>

4.3. General Do's and Don'ts

Do's	Don'ts
<p>Always select higher size then application</p> 	<p>Don't get gun too close – Possibility of overheating</p> 
<p>Start heating from one end and finish through another end</p> 	<p>Don't finish both ends and come to middle – Possibility of air entrapment</p> 
<p>Cut using a sharp knife</p> 	<p>Don't use scissors – Possibility of nick leading to split</p> 

In some cases, the Adhesive can act as a lubricant and allow the heated tube to slide from the larger diameter as it shrinks to the recovered diameter. This is called 'Milking off', it is more likely to happen to higher shrink ratio tubes.



To minimize this affect, shrink the tube onto the larger dimension and allow to cool before returning to shrink the tube on to the smaller dimension.