

Class 1 – Public

Size Selection & Installation of TFE, TFER & AT053 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.

Contents	Page
1. Scope	3
2. Revision history / Reason for change / Related documents	3
2.1. Applicable product family	3
2.2. Customer assistance.....	3
2.3. Drawings.....	3
2.4. Specifications	3
2.5. Shelf life.....	3
2.6. Safety.....	3
3. Tubing size selection and installation guidelines.....	3
3.1. Tube size selection.....	3
3.2. Installation guidelines	4
4. Trouble shooting.....	6

Class 1 – Public

REV A

1. SCOPE

This document outlines the general guidelines for selection and installation of TFE, TFER and AT053 heat shrink tubing from TE Connectivity.

2. REVISION HISTORY / REASON FOR CHANGE / RELATED DOCUMENTS

Rev	Date	Prepared By	Approved By	Remarks
A	Feb 2024	Kamalaravanan	Richard Kewell	New document

2.1. Applicable product family

TFE, TFER and AT053

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

- 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.
- 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.
- 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.

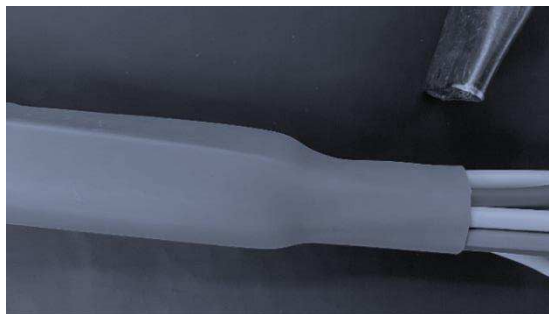
3.2. Installation Guidelines

It is recommended that local safety regulations are adhered to, 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. Wash hands before eating, drinking, or contacting the face with the hands.

Installation of the 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.

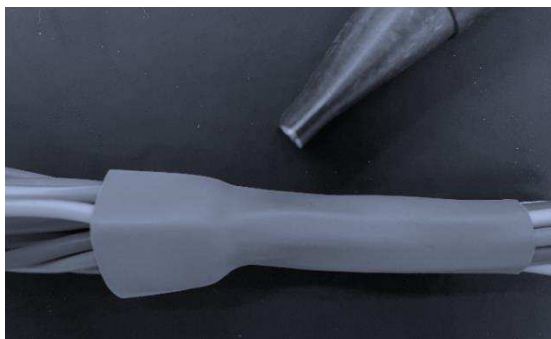
- a. Locate the tubing into place on the substrate e.g., hoses, coupling. Ensure not to stretch the tube while placement.
- b. Start to shrink the tubing starting from one end of the assembly. See figure 1. *Since these products are designed to provide insulation and mechanical protection in severe thermal environments, shrink temperatures during installation should be set accordingly. **Minimum shrink temperature: 330°C [625°F]***

Figure 1.



- c. Work progressively to the end of the tubing ensuring uniform heat application. This can be achieved by either rotating the assembly or the heat gun. See figure 2. Ensure there is no air entrapment inside. **Minimum full recovery temperature: 340°C [644°F]**

Figure 2.



- d. Ensure that the end of the heat gun does not touch the exterior of the tubing otherwise splitting may occur. Considering the temperature profile of hot air from the heat gun, maintain appropriate distance between hot gun and the tubing.






Class 1 – Public**REV A**

- e. 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.
- f. 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:**



- AT053 is a dual wall product with TFE as the outer layer combined with meltable clear inner layer. The installation procedure and temperature remain the same as mentioned above except that 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.
- 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.
- For installations with other types of equipment, please consult your TE Connectivity representative.
- 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.
- 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. TROUBLE SHOOTING

Fault	Possible Cause	Solution
<p>Tube not fully shrunk onto substrate</p> 	<p>Insufficient heat</p> <p>Insufficient time</p> <p>Wrong tube size</p>	<p>Increase heat</p> <p>Increase heating time</p> <p>Consult Tube Selection</p>
<p>Tube mislocated after installation</p> 	<p>Incorrect location prior to installation</p> <p>Tube unbalanced</p>	<p>Locate correctly (offset)</p> <p>Consult local TE Connectivity rep</p>
<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</p> <p>Check calibration</p>
<p>Tubing or wire overheated</p> 	<p>Excessive heat</p> <p>Excessive time</p>	<p>Reduce heat</p> <p>Reduce heating time</p>
<p>Tubing scorched on one side</p> 	<p>Excessive wire curvature</p> <p>Tube located incorrectly in machine</p>	<p>Use straightened wire.</p> <p>Reposition tubing</p>

Class 1 – Public

REV A

<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>
<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>