Cable Services Group

Powering the World

Tricks of the Trade

TE connectivity

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The Tyco Electronics Brand Raychem is one of the world leading brands in the power cable accessories market. We pioneered heat-shrinkable terminations in the 1960's, joints in the 1970's and transitions and insulated separable connectors in the 1980's. Our aim is to make your job as a jointer as safe and comfortable as a tough job can possibly be. Every successful installation depends on you.

Because you are so important to us, we have prepared this booklet to share with you some of the best ideas we have received from jointers all over the world. We include information on modern tools and techniques available for the stripping of bonded semicon and easy strip cables as well as time-honoured practices for dealing with paper cable.

If you need additional assistance, don't hesitate to contact us.
http://energy.tycoelectronics.com

Tyco Electronics
Energy Division

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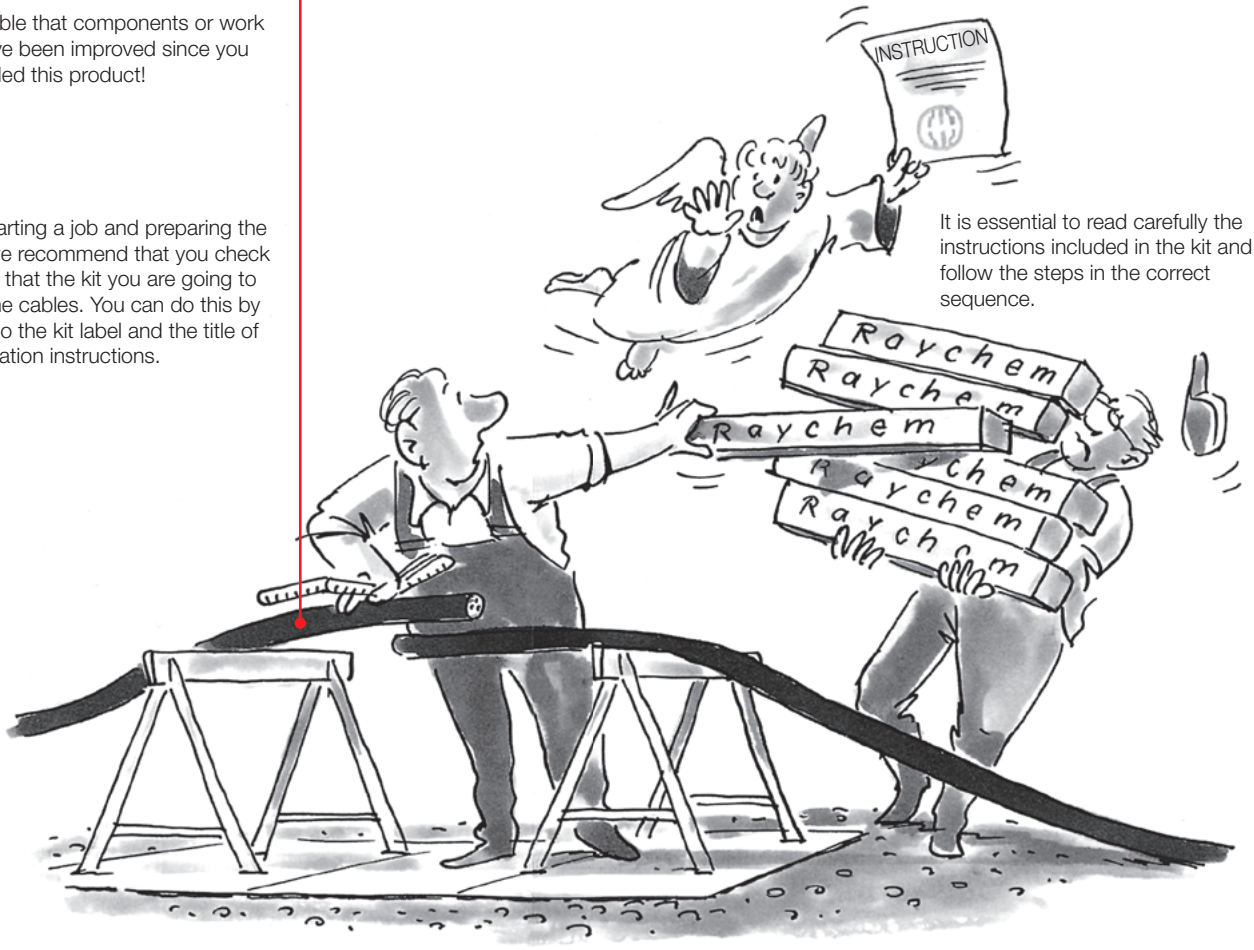
Note:
It is possible that components or work steps have been improved since you last installed this product!

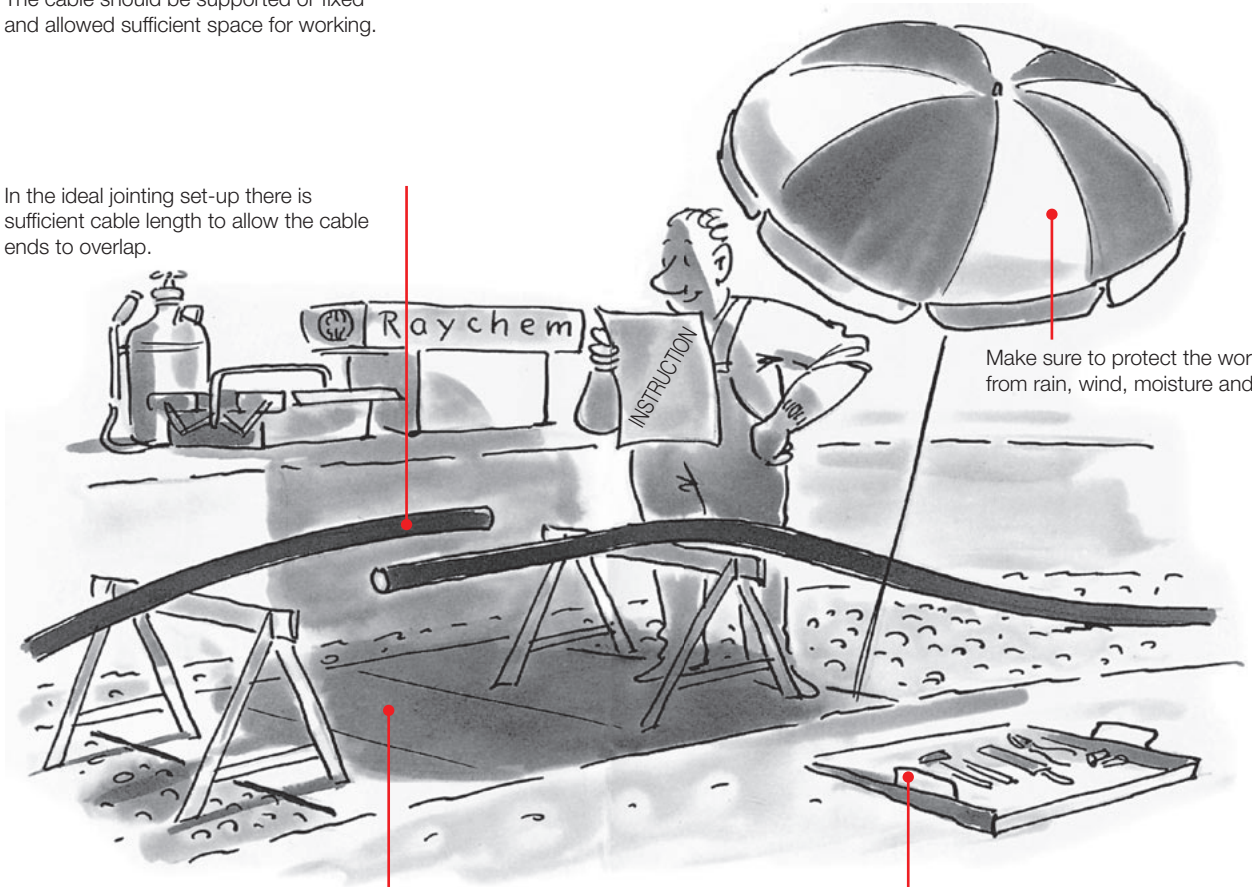
Before starting a job and preparing the cables, we recommend that you check to ensure that the kit you are going to use fits the cables. You can do this by referring to the kit label and the title of the installation instructions.



It is essential to read carefully the instructions included in the kit and to follow the steps in the correct sequence.

The cable should be supported or fixed and allowed sufficient space for working.

In the ideal jointing set-up there is sufficient cable length to allow the cable ends to overlap.

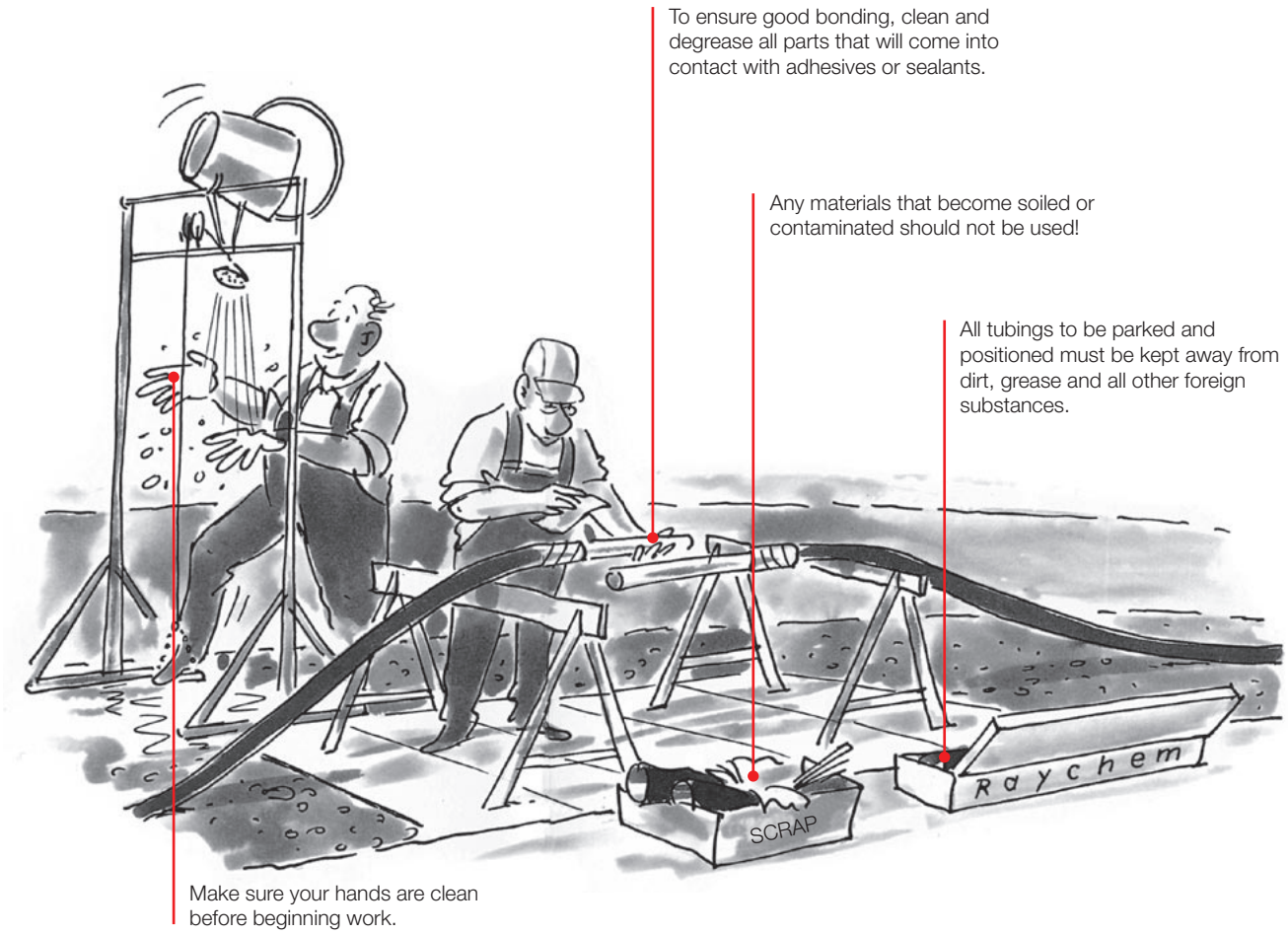


Make sure to protect the working area from rain, wind, moisture and dust.

Place a protective cover over loose dirt or sand, especially under the working area.

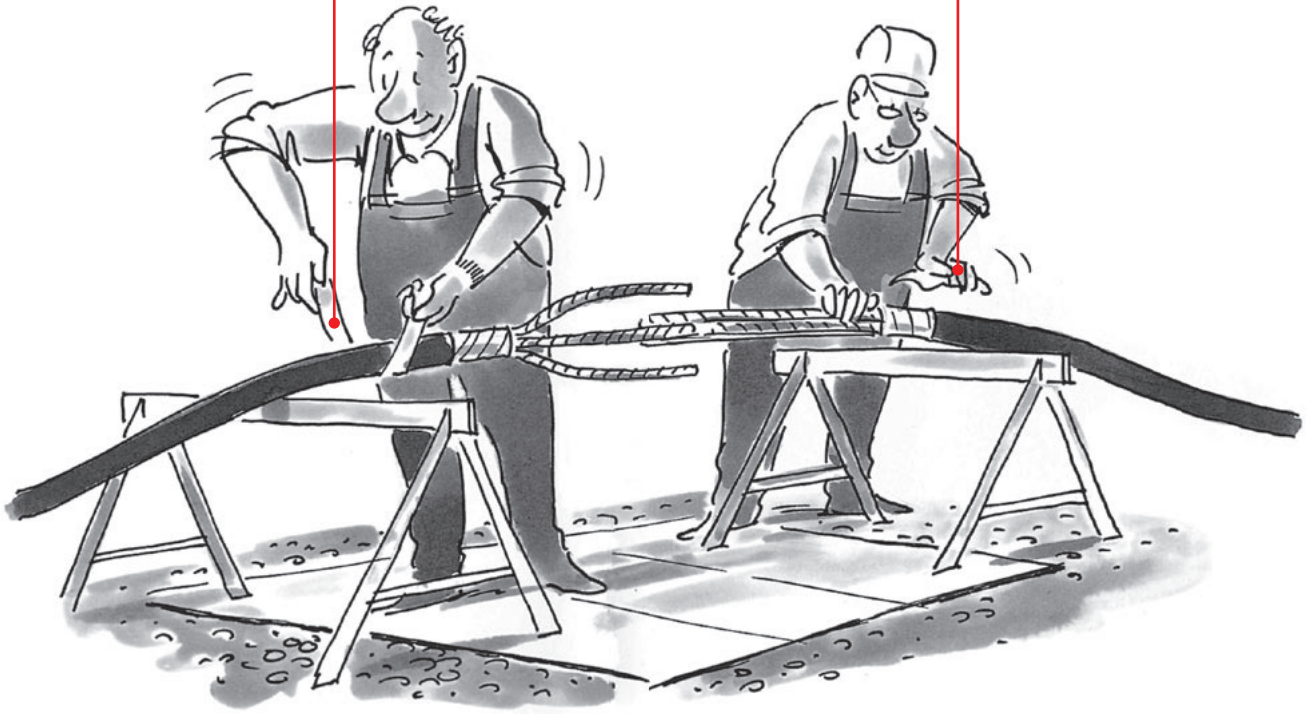
Use the recommended tool set, and lay out the tools on a tray so that they are kept clean and easy to reach.

The bags in which the tubings are supplied are well suited for use as protective covering over the cable jacket. This prevents the parked tubing from becoming soiled.

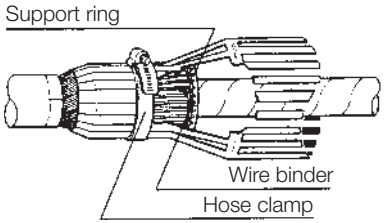


To ensure good bonding, after the cable ends have been stripped and cleaned the polymeric jackets must be abraded for about 250 mm from the cutback.

Use abrasive paper, a suitable file or a hacksaw blade to do the abrading. Be certain to clean off the cable jacket again when you finish abrading!

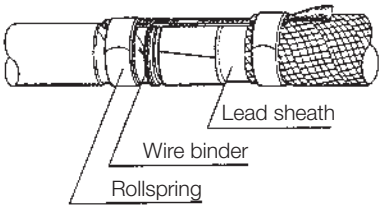


Steel Wire Armour (SWA)



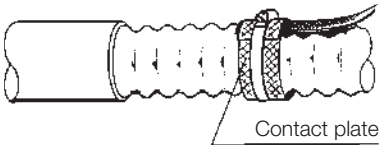
For SWA cables a support ring is required to maintain a constant pressure from the hose clamp on the armour and on the joint case.

Steel Tape Armour (STA)



For STA cables, copper mesh is required on top of the lead sheath underneath the rollspring. Tighten the rollsprings on the lead sheath and the STA with a twisting action.

Corrugated Sheath (CS)



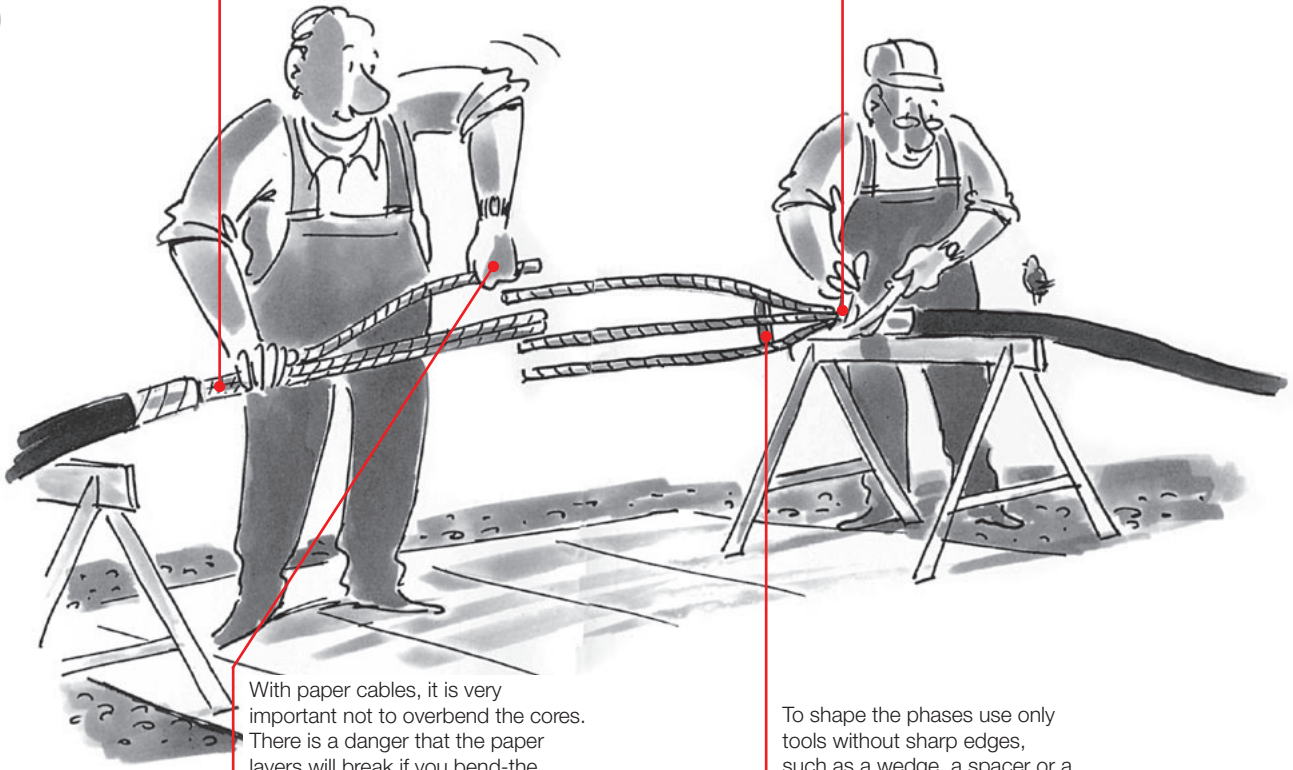
For corrugated-sheath cables, contact plates on top of and underneath the earth lead are also required.

Good electrical contact is needed in the event of a short circuit. For this reason, armouring needs to be abraded with a wire brush, a file or the blade of a hacksaw and afterwards cleaned with solvent in order to remove the oxide layer.

Please observe local regulations for handling paper cables at low temperatures.

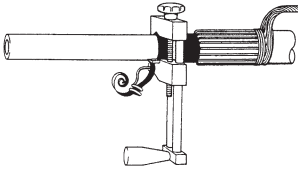
On plastic cables, make sure the sharp edge of the armour cut does not damage or cut into the core screen.

To support the sensitive crotch area, it is necessary to apply a temporary nylon tape on top of the belt papers or the fabric tape at the sheath cut.

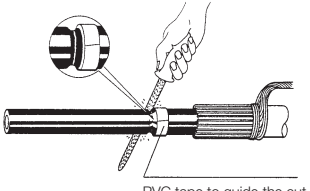


With paper cables, it is very important not to overbend the cores. There is a danger that the paper layers will break if you bend-the cable too far.

To shape the phases use only tools without sharp edges, such as a wedge, a spacer or a length of core!

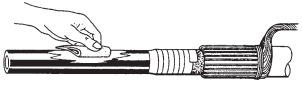


For round triple-extruded cables, use stripping tools as recommended by the cable manufacturer. If necessary, remove any remaining conductive particles with abrasive paper.

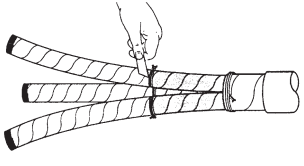


PVC tape to guide the cut

For “easy strip” cables, use a round file to cut radially through the core screen until the dielectric just becomes visible. Use a scoring tool as recommended in the tool list to do longitudinal stripping. To prevent cuts in the cable dielectric, **never use a knife.**



On graphite screened cables, protect the remaining screen with PVC tape (sticky side on the outside!) and wash off the unwanted graphite screen with a cable cleaner or solvent recommended by the cable manufacturer following any handling precautions given by the cleaner or solvent manufacturer.

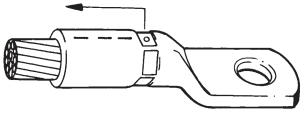


For paper cables, tear off the screen or belt papers against a twine binder, leaving an even straight edge. For screened cables also remove the first two paper layers exposed after removal of the screen. Always secure the core papers at the end with PVC tape.

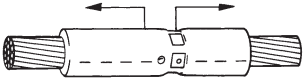
For screen removal, it is very important to make certain that no conductive material is left on the exposed cable dielectric, and that the remaining screen cut (including conductive paint) is straight with no jagged edges.

Note:
When crimping connections it is absolutely necessary to use only those dies, crimping tools and the corresponding lugs and ferrules recommended by the crimp manufacturer.

Crimping sequence for **lugs**



Crimping sequence for **ferrules**

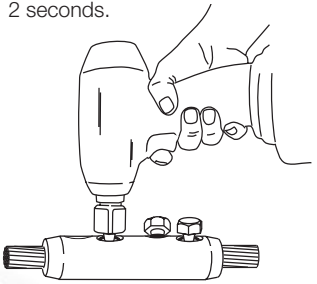


The same procedure is required for ferrules: here you start in the middle and work on alternate sides towards the ends. To ensure uniform length on 3-core cables, complete the first indents on each core before finishing each ferrule. Use a file to remove any rough edges which may result from the crimping.

Shear-off sequence for **mechanical connectors**

For connectors using more than one shear bolt per entry side, tighten them alternately and shear them off starting with outer bolts.

Note:
When a cordless impact wrench is in use the tightning intervalls should be in the range of 2 seconds.



On cable lugs the insulation cutback should be the internal length of the tubing plus 5 mm to allow for expansion. Start crimping at the top and proceed down the tube towards the bottom end of the lug.

Make sure to park the tubing before crimping!

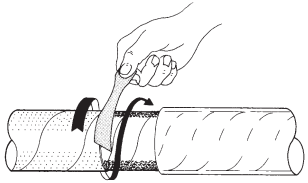
Do not remove grease from inside of ferrules or lugs before installing.

On paper cables and tape screens, the yellow void filler should be applied in the same direction (turn) as the last paper layer or metal foil.

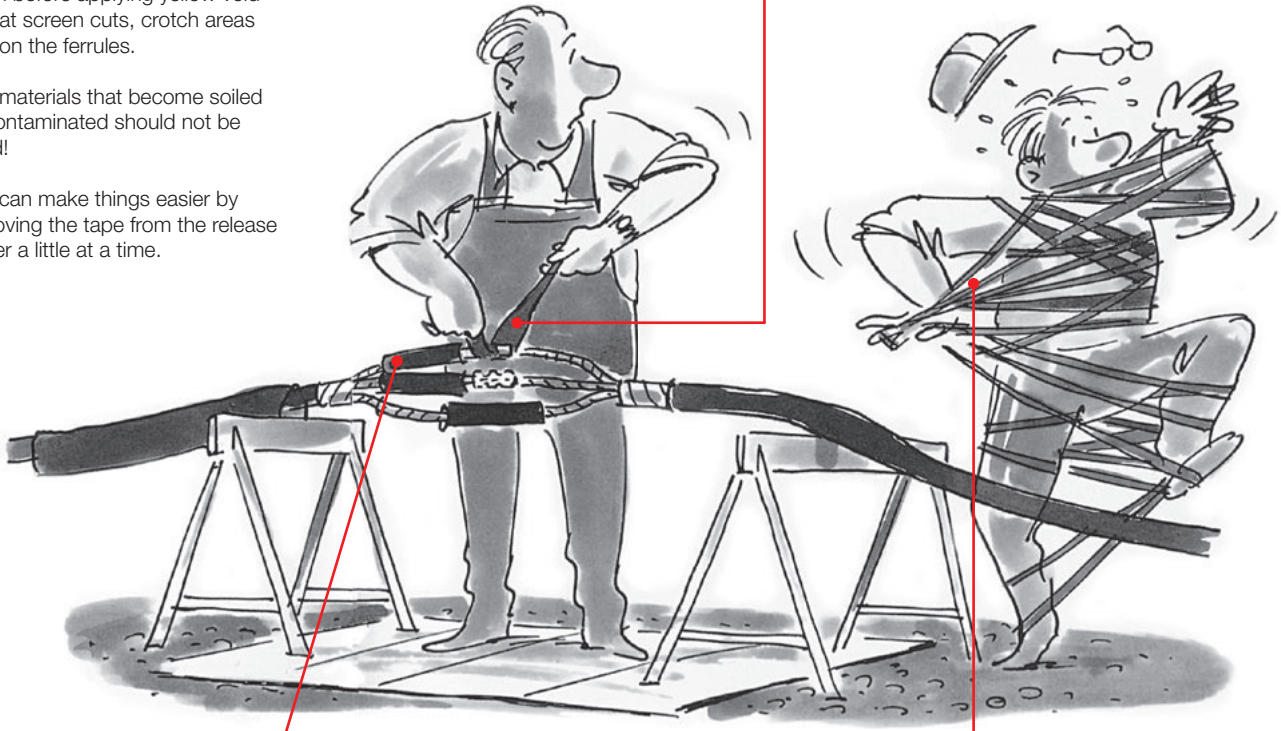
Special tip:
Always make sure your hands are clean before applying yellow void filler at screen cuts, crotch areas and on the ferrules.

Any materials that become soiled or contaminated should not be used!

You can make things easier by removing the tape from the release paper a little at a time.



When applying mastic tape, always stretch it to about half its original width and apply each turn slightly overlapping the previous one.

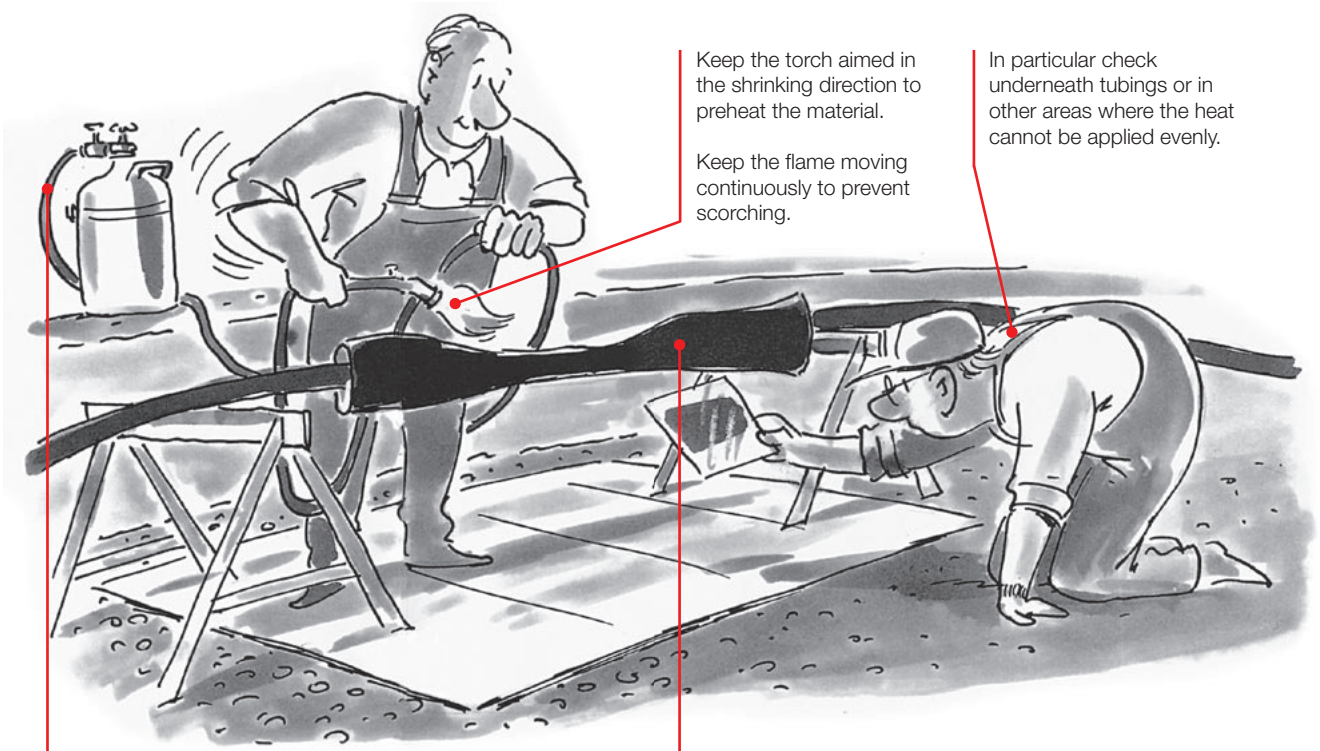


After the yellow void filler is applied to an individual ferrule, centrally position the stress control tubing over it. This prevents contact with other mastics.

A good way to avoid mastic sticking to your fingers is to coat your hands with a very thin film of silicone grease after you've cleaned them.

Lastly...
After the shrinking procedure is completed as shown in the kit instruction, allow the accessory to cool down before subjecting it to mechanical strain.

For terminations:
If readjusting the core position, it is necessary to postheat. Additional components, such as conductive paint or PVC tape, must not be used for identification marking of track resistant outer tubings. There should be no clamping or other materials on the termination itself.



Keep the torch aimed in the shrinking direction to preheat the material.

Keep the flame moving continuously to prevent scorching.

In particular check underneath tubings or in other areas where the heat cannot be applied evenly.

Use a propane gas torch as recommended in the tool list for shrinking heat-shrinkable components. Adjust the torch to obtain a soft blue flame with a yellow tip. Pencil-like blue flames should be avoided.

After shrinking, each tubing and molded part should be smooth and free of wrinkles and “cold spots”.

Metric, British, US Conductor Conversion Chart

British Standards			Metric	American Wire Gauge	
C.S.A. of Conductor sq. inch	Number and Diameter of Strands inch	Equivalent Metric C.S.A. mm²	Cross-sectional Area mm²	Metric C.S.A. mm²	AWG or MCM
.001	3/.020 ó 1/.036	0.65	0.75	0.653	19 AWG
				0.823	18
.0015	1/.044	0.97		1.04	17
.0020	3/.029	1.29		1.31	16
			1.5	1.65	15
.003	3/.036 ó 1/.046	1.94		2.08	14
			2.5	2.62	13
.0045	7/.029	2.90		3.31	12
.0050	1/.083	3.23			
			4.0	4.17	11
.007	7/.036	4.52		5.26	10
.008	1/.103	5.16			
			6.0	6.63	9
.01	7/.044	6.45		8.37	8
.013	1/.128	8.39			
.0145	7/.052	9.35	10.0	10.55	7
				13.30	6
.20	1/.160	12.90			
.0225	7/.064	14.52	16.0	16.70	5
				21.15	4
.03	19/.044 ó 1/.192	19.35		26.67	3
.04		25.81	25.0	33.63	2
	19/.052				
.06	19/.064	38.71	35.0	42.41	1
				53.48	1/0
			50.0		
				67.43	2/0
.10	19/.083	64.52	70.0	85.03	3/0
			95.0		
.15	37/.072	96.77		107.20	4/0
			120.0	126.64	250 MCM
.2	37/.083	129.03	150.0	152.00	300
.25	37/.093	161.25			
			185.0	202.71	400
.3	37/.103	193.55			
			240.0	253.35	500
.4	61/.093	258.06	300.0	304.00	600
				354.71	700
.5	61/.103	322.58		405.35	800
.6	91/.103	387.00	400.0		
.75	91/.103	483.87	500.0	506.71	1000
			625.0		
1.0	127/.103	645.00			

IT 1000-005

IT 1000-006

IT 1000-007

IT 1000-008

IT 1000-009

IT 1000-010

IT 1000-011

IT 1000-019

FH-1630-S-TS 1

IT 1000-023

Recommended Tools for Cable Preparation

	Set Content	Product Description
1	1x Hammer 300 g	
2	1x Screwdriver 3.5 mm	
3	1x Screwdriver 6.5 mm	IT 1000-005
4	1x Hacksaw	
5	1x Hacksaw junior	
6	1x Pipe Wrench, size 250	
7	1x Side cutter, size 160	
8	1x Pincers, size 180	IT 1000-006
9	1x Combination Pliers, size 180	
10	1x Scissors, size 200	
11	1x Folding ruler, size 2	
12	1x Wirebrush, size 4	
13	1x Hook knife	IT 1000-007
14	1x Cable knife – B	
15	1x Sharpening stone, 125 x 50 mm	
16	1x File set, medium size	
17	1x Control mirror, 100 x 100 mm + Cover	
18	1x Spreader 3-way	
19	2x Core separator	IT 1000-008
20	54x Cleaning tissue	
21	1x Refillable Al-Container 0.41	
22	1x Stripping tool for bonded screens, round conductor	
23	1x Tool set with knife, allan key set packed in a tool box	IT 1000-009
24	1x Gas torch set	FH-1630-S-TS 1
25	1x Scoring tool for easy strip screens	IT 1000-011
26	1x Diameter tape	IT 1000-010
27	1x Leather tool case	IT 1000-012
28	1x Cordless impact wrench	IT 1000-023
29	1x Installation tool for mech. connectors	IT 1000-019

TE Energy – innovative and economical solutions for the electrical power industry: cable accessories, connectors & fittings, insulators & insulation, surge arresters, switching equipment, street lighting, power measurement and control.

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TE Connectivity is a global, $12.1 billion company that designs and manufactures over 500,000 products that connect and protect the flow of power and data inside the products that touch every aspect of our lives. Our nearly 100,000 employees partner with customers in virtually every industry – from consumer electronics, energy and healthcare, to automotive, aerospace and communication networks – enabling smarter, faster, better technologies to connect products to possibilities.

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