Data Sheet

Self regulating process heating tapes

RS stock numbers 379-889, 379-974

The information contained within this sheet regarding applications and installation of RS Autotrace® heating tape is for guidance only. The user must satisfy himself that the tape is suitable for the intended application and does not contravene any safety requirements. If in doubt consult BS6351 or other appropriate specification.

General

RS Autotrace® heating tapes (RS stock no. 379-889) and 379-974) are intended to provide process heating for metal and plastic pipes. The heating tape (RS stock no. 379-889) may also be used for freeze protection. Unlike conventional heating tapes they are self regulating and do not always need a thermostat control. However, for freeze protection, to keep power consumption to a minimum, the use of a suitable thermostat is recommended. A 30mA residual current circuit breaker (RCCB) is recommended for all hazardous area applications or where the tape may be exposed to physical abuse, wet or corrosive atmospheres.

The principle of operation is that the tape senses any change in temperature and automatically varies its heat input. The polymeric heating element senses the temperature at every point along its length and can vary the heat output accordingly, thereby providing localised heat precisely where required. As it is self regulating, overheating, or the production of hot spots which can cause conventional heating tape to burn out, will not occur. It can be cut to any length without affecting its operation.

Technical specification

Applications: Metal or plastic pipework.

Locations: Non-hazardous or hazardous areas (EExe ll CT6)

	5BTV2-CT Tape	12XTV2-CT Tape
Supply voltage	240Vac 50Hz	240Vac 50Hz
Nominal output	15W/m	40W/m
Maximum circuit temperature	+65°C	+120°C
Maximum circuit length	165m	185m

Typical applications

- Sprinkler systems
- Safety showers
- Fire hose mains
- Chilled waterlines for air conditioning units
- Water supplies
- Fuel lines
- Condensation prevention
- Chemical process lines.

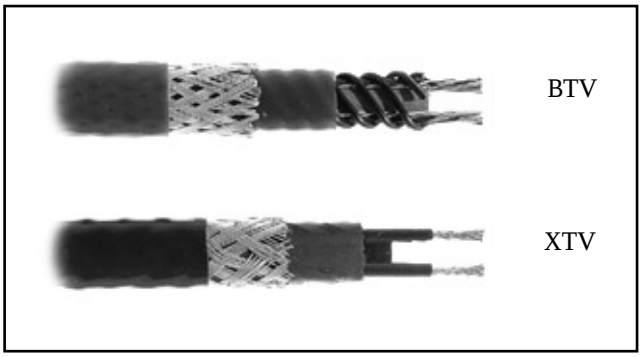


Table 1 **Maximum recommended heater lengths**

Autotrace heater		5BTV2-CT			12XTV2-CT		
Protection type	Protection rating A	L max. (m) +10°C start up	0°C start up	-10°C start up	L max. (m) +10°C start-up	0°C start-up	-10°C start-up
BS3871: Pt 1: 1965 (1984) Type 3 and Type 4 circuit breakers or equivalent	4	45	40	30	20	18	18
	5	60	50	40	25	25	20
	6	70	60	50	30	30	25
	10	115	95	80	50	45	45
	15	165	145	120	75	70	65
	16	–	155	130	80	75	70
	20	–	165	165	100	90	85
	25	–	–	–	120	115	110
	30	–	–	–	145	140	130
	32	–	–	–	160	145	140
	35	–	–	–	160	150	150
	40	–	–	–	–	150	150
BS3871: Pt 1: 1965 (1984) Type 2 circuit breakers or equivalent	4	40	35	30	25	25	18
	5	55	45	35	35	30	20
	6	65	50	45	40	35	25
	10	105	85	70	65	60	45
	15	160	130	110	100	95	65
	16	165	140	115	105	100	70
	20	165	165	145	130	125	85
	25	–	–	165	155	155	110
	30	–	–	–	185	185	130
	32	–	–	–	185	185	140
	35	–	–	–	–	-	150
	40	–	–	–	–	-	150
BS88: Pt 2: 1975 HRC fuses	4	25	20	16	20	18	18
	6	40	35	30	30	30	25
	10	70	60	50	50	45	45
	16	150	125	105	80	75	70
	20	165	165	145	100	90	85
	25	–	–	165	120	115	110
	32	–	–	–	150	145	140
	40	–	–	–	150	150	150
BS88: Pt 2: 1975 Motor fuses	20M25	165	165	165	100	90	85
	32M35	–	–	–	150	145	85

In most situations a single straight length of Autotrace® is sufficient to meet most requirements. When used on larger pipe diameters spiralling may be necessary. The Tracecalc software package will calculate the amount of spiralling required.

Tracecalc software

The Tracecalc software (**RS** stock no. 397-968), which runs on IBM PC and compatible computers, is a complete design package. From basic information such as pipe dia-meter, pipe length, insulation thickness and required maintained temperature etc the programme will calculate the type and quantities of products required. The information can be presented in one of three ways:

a) Design summary
b) Line list
c) Bill of materials

Installation

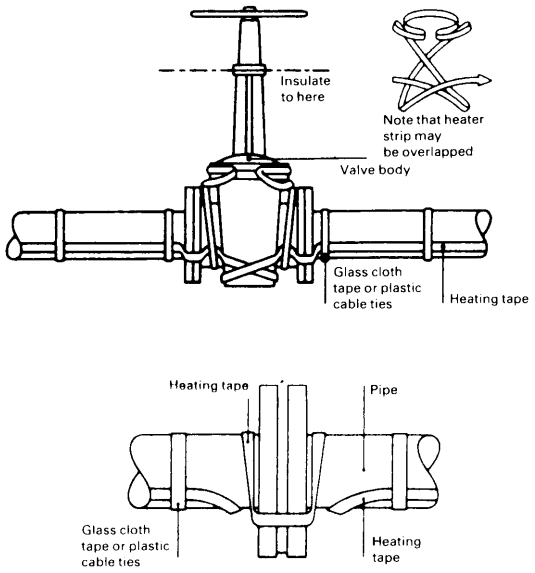
Generally a single length of Autotrace® tape, run horizontally along the lower section of a pipe is sufficient. When two tapes are required they should be positioned approximately 90° apart. Should spiralling of the tape be necessary, care must be taken to ensure Table 2 will indicate the required pitch. Before fitting it is suggested that the pitch is marked on the pipework (eg. with chalk).

Table 2 **Pitch length (mm)-240V types**

Pipe (mm)	Metres of Autotrace® per metre of pipe 1.1	1.2	1.3	1.4	1.5
100	800	560	440	370	330
150	1180	810	650	550	480
200	1520	1050	840	710	620

Autotrace® may be fixed in position using glass cloth tape (**RS** stock no. 512-395) at intervals of 300mm and where necessary when on, or near, valves, flanges, elbows, bends, supports etc. When fitting the heating tape to a removable valve body, leave a loop in the tape to allow the valve to be removed without cutting the tape, (Figure 1).

Figure 1 Applying the heating tape around valves



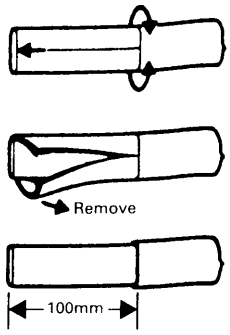
Connection

Preparation of tape end

Prepare each connection end which requires connecting to another tape, mains supply, etc. as detailed below:

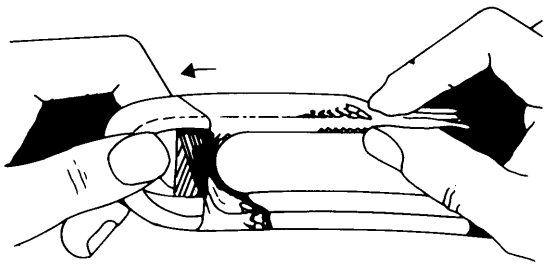
1. Remove the outer sheath for a length of 100mm by carefully cutting round the tape, and centrally between the conductors, with a sharp knife. Peel outer sheath away and remove to expose the black inner sheath. The braid will now be exposed and the inner sheath must be removed from within the braid as detailed in step 2.

Figure 2 Outer sheath stripping



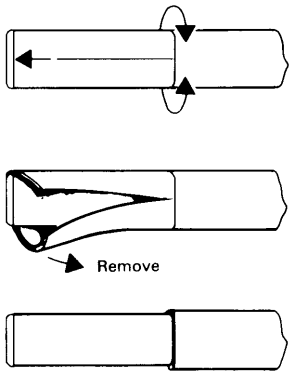
2. Open the braid on one flat face adjacent to the sheath with a small screwdriver, or similar. Bend the end of the heater into a 'U' with the braid opening on the outside of the bend. Withdraw the insulated heater through the opening as shown. Do not damage the braid. Twist the free braid.

Figure 3 Removing the inner sheath from braid



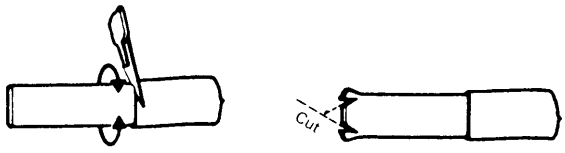
3. Using a trimming knife, score the periphery of the inner sheath at position required. Additionally score the sheath longitudinally. Remove the sheath by prising open the end.

Figure 4



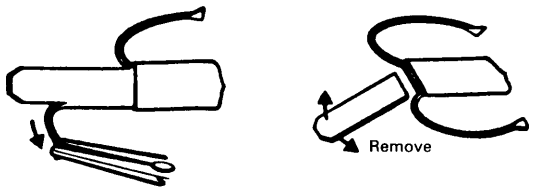
4. Carefully score completely round the inner sheath with a knife taking care damage is not caused to the conductors. Make a small cut diagonally for a length of 5mm towards each conductor using a pair of wire cutters, (Figure 5).

Figure 5 Inner sheath preparation



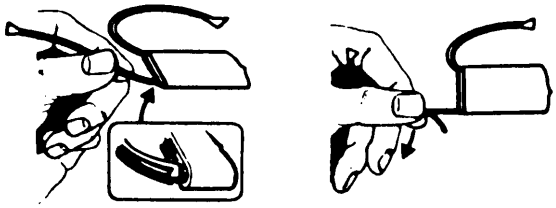
5. Hold one of the conductors with a pair of pliers and pull the conductor sideways away from the central section. Repeat for the other conductor. Remove all the remaining central section back to the outer sheath.

Figure 6



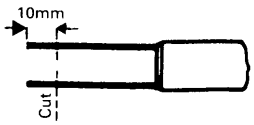
6. Bend the conductors towards each other and separate the remaining inner sheath material.

Figure 7



7. Check that the conductors are free of all remaining black inner sheath, then trim the conductors 10mm from the free ends and if necessary gather together the conductor strands and straighten.

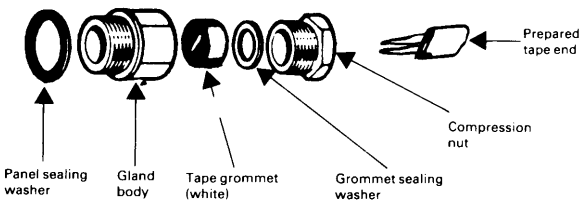
Figure 8



Making the joints

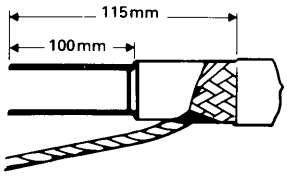
1. Two termination kits are available depending on the type of heating tape being used. For BTV tape use termination kit **RS** stock no. 379-895 and for XTV tape use **RS** stock no. 379-980. Separate the components of the supplied cable gland, remove and discard the black circular sealing grommets. Fit these items following the sequence shown in Figure 9 onto the prepared tape end. Replace the discarded grommet with the white tape grommet.

Figure 9



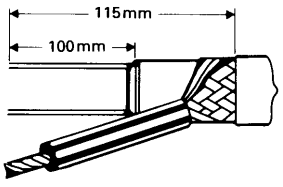
2. Prepare the end of the tape as described in the preparation instructions (steps 1 to 7 described previously) to the dimensions shown.

Figure 10



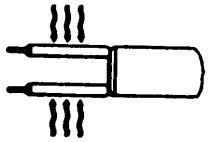
3. Slip the green/yellow heat-shrinkable sleeve over the twisted braid and slide up to the heater strip. Heat the sleeve until it shrinks tightly around the braid.

Figure 11



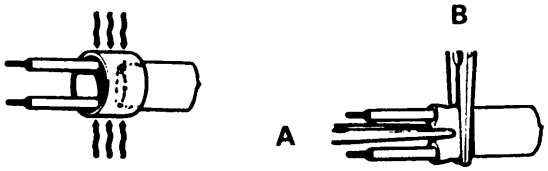
4. Place one piece of the smaller diameter heat shrink sleeving onto each prepared conductor. Heat with a suitable heat source (eg. hot air gun or gas torch) to shrink the sleeving onto the conductors, this will leave 10mm of bare conductor on each prepared end.

Figure 12



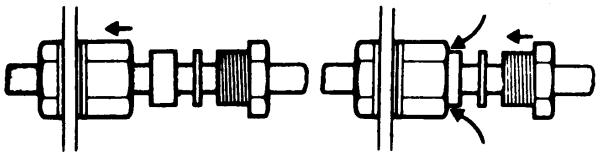
5. Place the larger diameter sleeving equally over the tape and conductors and shrink into place. Squeeze the heated sleeving in positions 'A' and 'B' with a pair of pliers to ensure a good joint. A good seal is indicated by a bead of adhesive appearing around the sleeving edges. If this is not evident reheat and repeat the above procedure.

Figure 13



6. Feed the prepared tape end through an M20 clearance hole in the required control/junction box and insert threaded portion of gland body through the hole, ensuring that the sealing washer is between the box outer face and the gland shoulder. Fit the gland nut and tighten to retain the seal. Position tape grommet and grommet sealing washer into gland body. Tighten compression nut to retain tape and seal joint.

Figure 14

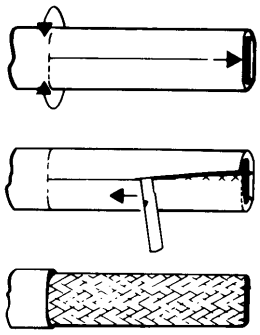


7. Test tape to ensure electrical insulation resistance is satisfactory, see Testing.
   Make electrical connections as necessary.

End sealing braided heating tape

1. Cut the tape 40mm beyond the required length. Score the periphery of the sheath 80mm from the end. Additionally, score the sheath longitudinally. Do not cut the braid. Carefully prise open the end of the sheath. Remove. This will expose the braid.

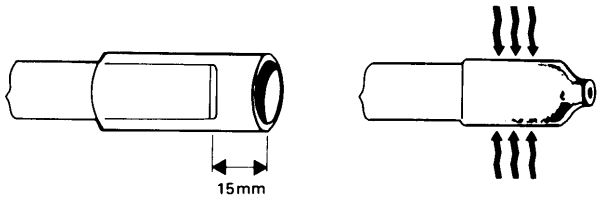
Figure 15



Push back the braid and cut off 40mm of the exposed heater.

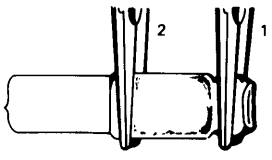
2. Slip the short sleeve over the tape so that about 15mm projects beyond the cut end. Heat the sleeve until it shrinks tightly around the tape.

Figure 16



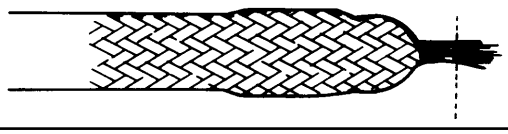
3. Using a pair of pliers, squeeze the warm sleeve at positions 1 and 2 in that order, for 5-10 seconds so that adhesive appears at the edges. Check that seals have been made. If not, reheat and repeat operation.

Figure 17



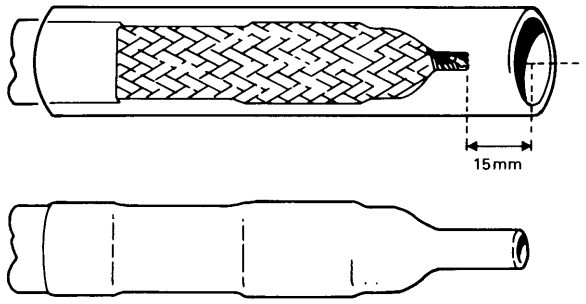
4. Bring the braid back over the capped end and twist the strands together. Trim the end of the braid so that a length of 5mm of braid remains twisted.

Figure 18



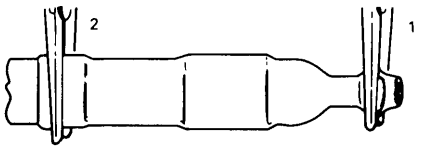
5. Slip the long heat-shrinkable sleeve over the heater so that about 15mm projects beyond the end. Starting at the end of the heater, heat the sleeve until it shrinks tightly round the heater, and adhesive appears at the edges.

Figure 19



6. Using a pair of pliers, squeeze the warm sleeve at the points 1 and 2 in that order for 5-10 seconds so that adhesive appears at the edges. Check that seals have been made. If not, reheat and repeat operation.

Figure 20



Fix the capped end of the heater to the pipe with glass cloth tape or a plastic cable tie. When the installation is complete the strip should be tested as detailed later.

Joining braided tape - non-hazardous areas

Should it be necessary to join the heating tape it may be done in the following manner, using the items listed below. The total combined length **must not exceed 150m.**

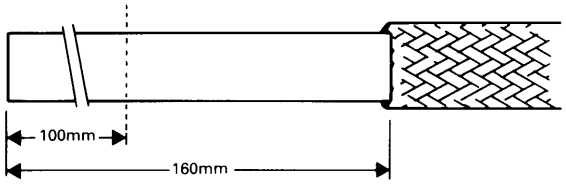
Items required per joint:

Adhesive lined heat shrinkable sleeving

4	16mm	lengths of 3mm diameter (RS stock no. 399-861)
2	16mm	lengths of 12mm diameter (RS stock no. 399-732)
1	120mm	length of 12mm diameter (RS stock no. 399-732)
1	180mm	length of 19mm diameter (RS stock no. 399-748)
2	1.5mm^2	red butt crimps (RS stock no. 532-771)
		or
2	18awg	red sealed splices (RS stock no. 533-673)
1	2.5mm^2	yellow butt crimp (RS stock no. 533-190)

1. Remove 160mm of outer sheath on one strip as described in step 1 of the preparation for connection. Push back the braid over the sheath and remove 100mm of heater. Do not cut the braid.

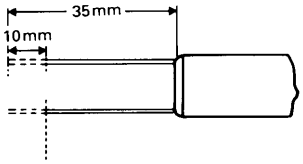
Figure 21



On the other strip remove 80mm of the outer sheath as described in step 1 of the preparation for connection. Cut off 45mm of the braid. Do not separate the braid from the heater.

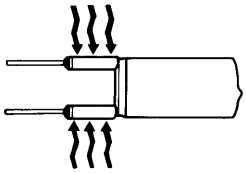
2. Prepare the ends of both strips as described in steps 4-7 of the preparation for connection to the dimensions shown. Do not separate the braid from the heater.

Figure 22



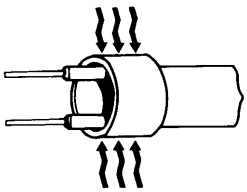
3. Slip the conductor insulation sleeve over the conductors of one strip. Heat the sleeves with a hot air gun until they shrink tightly around the conductors.

Figure 23



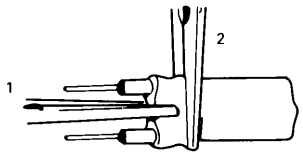
4. Position the core seal heat-shrinkable sleeve half over the tape as shown and shrink into place.

Figure 24



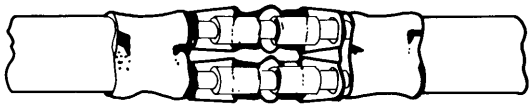
5. Using a pair of pliers, squeeze the warm sleeve at the positions 1 and 2 in that order for 5-10 seconds so that the adhesive appears at the edges. Check that a seal has been made. A bead of adhesive should be visible around the edges. If not, reheat and repeat the operation.

Figure 25



6. Repeat steps 3 to 5 for the other tape.
7. Slide a 120mm length of sleeving onto both prepared ends.
8. Position the crimp sleeves over the conductors and crimp the barrels firmly into place.

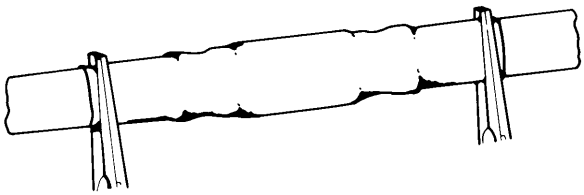
Figure 26



9. Position the splice sleeve centrally over the connection.

   Starting from the middle shrink firmly into place, until the adhesive appears at the edges. Squeeze the ends of the warm sleeve with a pair of pliers for 5-10 seconds. Check that a seal has been made. If not, reheat and repeat operation.

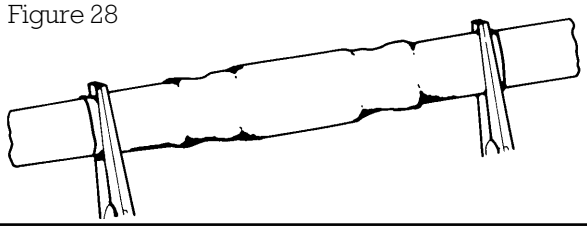
Figure 27



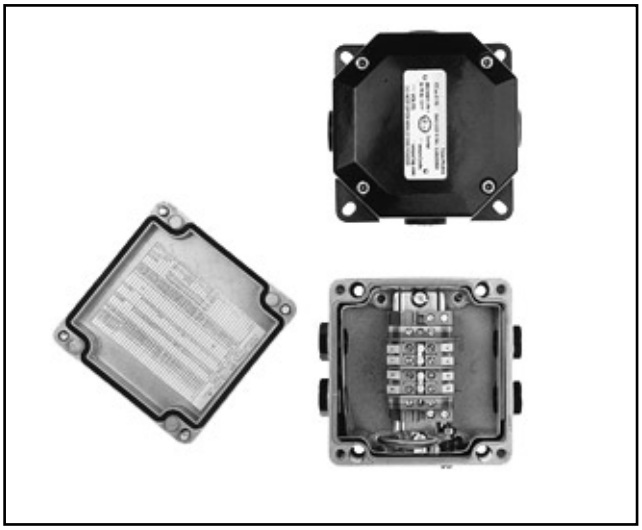
10. Pigtail the braids together and connect using the 2.5mm butt sleeves.
11. Position the 180mm long sleeve centrally over the splice connection.

    Starting from the middle shrink firmly into place, until the adhesive appears at the edges. Squeeze the ends of the warm sleeve with a pair of pliers for 5-10 seconds. Check that a seal has been made. If not, reheat and repeat operation. The connection is now complete. All unconnected ends must be sealed as described previously, and once complete the installation should be tested.

Figure 28



Joining braided tapes - hazardous areas



For joining heating tapes in hazardous areas two methods are possible.

a) splicing kit (not stocked by RS)

b) junction box.

Whichever system is used the components need to be BASEEFA approved. Junction boxes are the preferred option as they can be used to join up to 4 cables together.

Tape type	Junction box type	stock no.
5BTV2-CT	UKH-PL612-01	379-918
12XTV2-CT	JB - 48	379-924

The junction boxes can be directly mounted onto a panel, alternatively they can be mounted onto the support bracket (RS stock no. 379-930). This support bracket can then be fixed to a pipe with one or more pipe straps (RS stock no. 379-946). If a single strap 300mm long is insufficient to go round the pipework then straps can be joined together to form a longer strap.

Testing

Before final connection and application of thermal insulation each circuit should be electrically tested in the following manner. Using a 500-2500Vdc insulation tester eg. a Megger®. The minimum insulation resistance reading between either conductor and earth should be 10MΩ, regardless of length of run.

This figure should be recorded for future reference.

WARNINGS:

1. Do not twist the conductors of a heating tape together.
2. All unconnected ends must zbe sealed as described previously.
3. The length of any one circuit must not exceed the length specified in table 1.
4. When applying to painted surfaces ensure they are fully dry, some types of paint formulation can degrade the installation in their wet state.
5. Do not expose the tape to temperatures in excess of

6. Damaged sections of the tape must be replaced, not repaired.
7. Heating tape which may become damaged and wet should be protected by a 30mA sensitivity residual current device.