SOLCO.
Advanced Trace Heating Solutions

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FIRE SPRINKLER

Self-Regulating Trace Heating Cable System

Installation Manual

SPPM-0001 (Rev.0)

General

The SSR102-CP / Smart-GUARD system for Trace heating fire sprinkler pipework is in conformity with the following CPVC Fire Sprinkler Pipework:

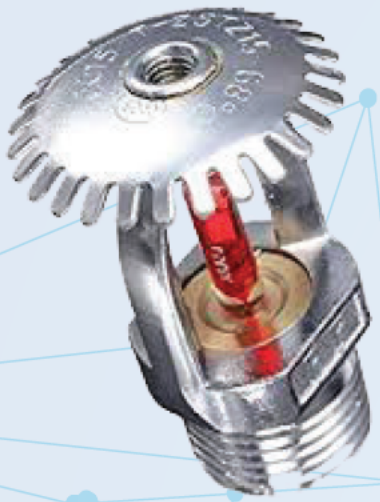
Lubrizol CPVC – FlowGuard Gold, BlazeMaster, and Corzan (FBC System Compatibility Program)

Spears Manufacturing CPVC – FlameGuard (Chemical Compatibility Evaluation Program)

Based on the following declaration:
The SSR102-CP outer jacket material is free of ester-functional plasticizers, including but not limited to phthalates, adipates, DINCH, dibenzoates, trimellitates, TXIB, etc.

The following have been involved in the assessment process:
1. The Lubrizol Corporation
Julie E. Schade
FBC System Compatible Program Manager

2. Spears Manufacturing Co.
Fernando De La Lastra
Technical Services Representative, Chemical Compatibility Evaluation Program



Self-Regulating Trace Heating Cable system

Installation, Operation and Maintenance Manual

This Installation Manual covers Trace Heating for fire sprinkler pipework in all industries including:

Architectural
Construction/Building Services
Agricultural
Utilities
Energy Sector
Chemicals
Manufacturing

The standard which is applicable is BS EN12845:2015 + A1:2019 – 'Fixed fire fighting systems – Automatic sprinkler systems – Design, installation and maintenance' – Outline recommendations for the purchase, design, installation, operation and maintenance of automatic fire sprinkler systems in commercial buildings and industrial plants. The specification calls for duty and stand-by trace heating tapes to be installed on the pipework and the temperature controller should automatically switch over to the standby trace heating tape. The temperature controller should provide a 24/7/365 monitoring and alarm system to alert via the Building Management System (BMS) that the following types of faults have occurred –

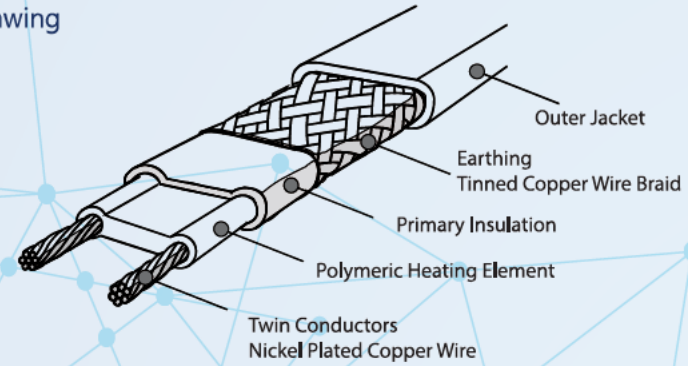
Duty trace heating tape has failed and the standby trace heating tape has been energised
There is a lack of voltage to the trace heating system
Failure of the ambient temperature sensing device
If pipe temperature monitoring activated then minimum / maximum limits can be monitored

Relevant Solco Pyroelec Trace Heating Tapes

Cat Ref:	Max Exp Power ON	Max Exp Power OFF	Max Circuit Length (m) /20A Type 'C' CB	Power Output W/m at +10°C
SSR102-CP	50	85	165*	10
SSR102-CP	50	85	248**	10

*Based on an assumed min. start-up temperature of +5°C
** Max. circuit length in conjunction with the soft-start function within the Smart-GUARD

Product Drawing



Principle of Self-Regulating (SR) Heating Tapes

The self-regulating heating core has a Positive Temperature Coefficient of resistance (aka PTC effect). This means that as temperatures drop the power output of the heating tape increases and similarly when the temperatures increase the power output of the heating tape decreases.
This means that SSR heating tapes can be overlapped at flanges and valves without any risk of creating hot-spots or burn-outs.

System Components required for a Typical Installation

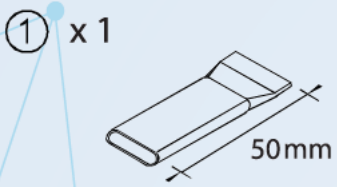
SSR heating tapes are parallel circuit and are used in conjunction with the following system components dependent upon the pipework layout - junction boxes, power connections, remote end seals, splice kits, tee connection kits, control thermostats, support brackets (for junction boxes, tee connections, in-line splice kits) plus fixing tapes and warning labels

Remote End Seal Kits

There are two options for the termination of our SzSR heating tapes at the non-powered end(s) of each circuit – the first is using heat shrink components and the second using cold applied components.

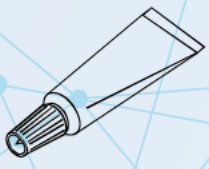
PYEX-ETK-S - a remote end seal kit using heat shrink components

SP-ETK-M - a remote end seal kit using cold applied components



Moulded Silicone Rubber End Boot

SP-RTV-ST – a tube of RTV silicone sealant required for cold systems



Silicone Rubber RTV sealant 20g

Junction Boxes, Tee-Boxes or In-line Splices

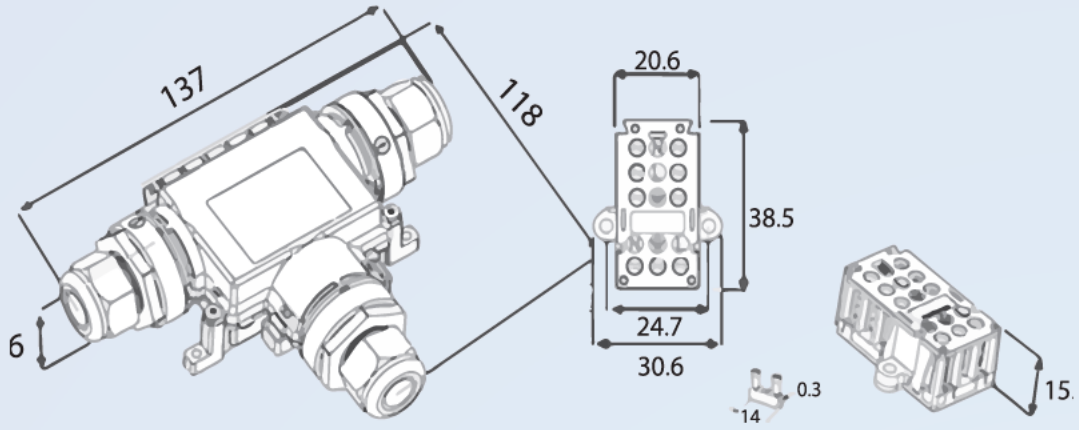
Junction boxes are typically used at the power supply entry point to each trace heating circuit and can also be used as a tee-connection box or in-line splice box. Solco's standard solution is our **SP-JBL** junction box which is 125mm x 125mm x 75mm consisting of a fibreglass reinforced polycarbonate base and polycarbonate cover with polyurethane gasket.

SP-JBL

Junction Boxes, Tee-Boxes or In-line Splices

Alternative Tee Box = **SP-3JB** which consists of a 3-entry connection box including terminal block, 3 black & 3 red grommets (depending on heating tape) plus 3 glands. You will also need to purchase either 3 No. PYEX-PTK-S kits (heat shrink components) or 3 No. **SP-PTK-M** kits (cold applied components) plus 3 No. **SP-RTV-ST** (RTV sealant tubes).

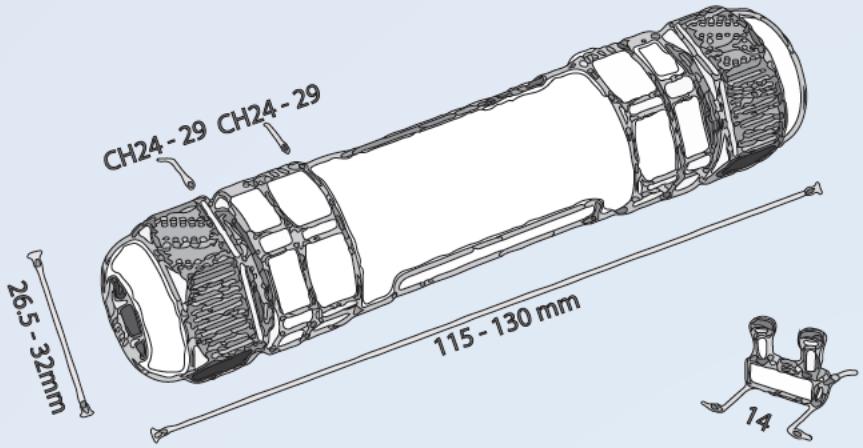
SP-3JB

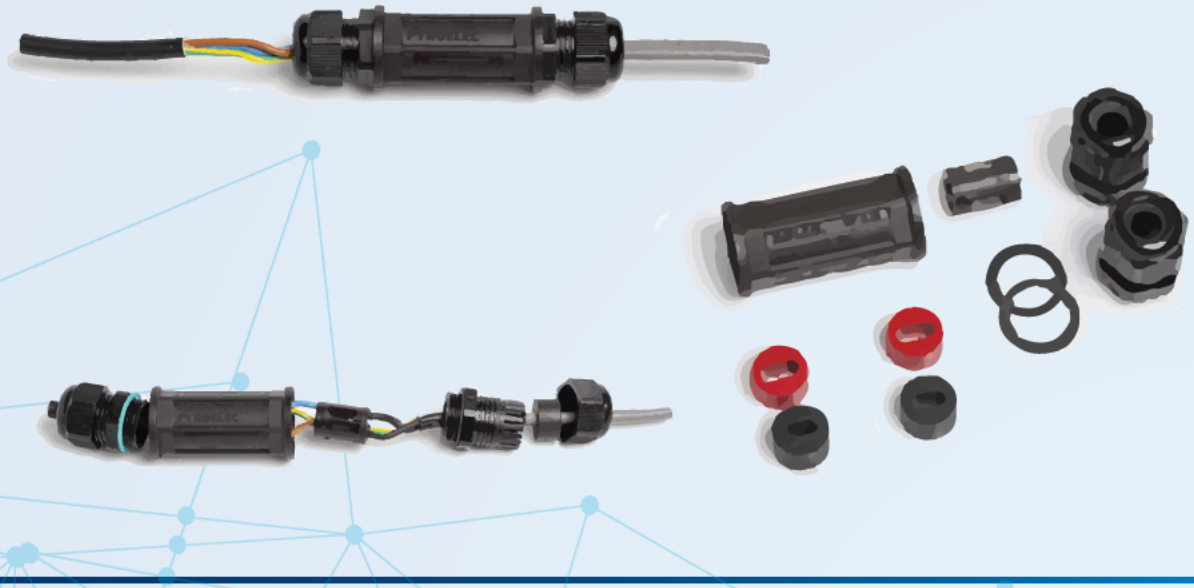


Junction Boxes, Tee-Boxes or In-line Splices

Alternative In-line Splice Box = **SP-2JB** which can be used to splice two heating tapes together or to splice a power cable to a heating tape. It consists of a cylindrical enclosure, terminal block, 2 black & 2 red grommets plus 2 glands. You will need to purchase either 2 No. **PYEX-PTK-S** kits (heat shrink components) or 2 No. **SP-PTK-M** kits (cold applied components) plus 2 No. **SP-RTV-ST** sealant tubes.

SP-2JB

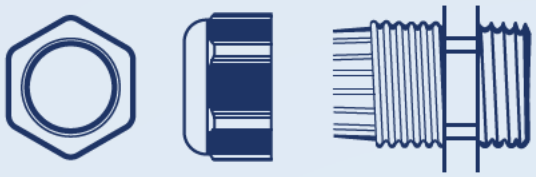




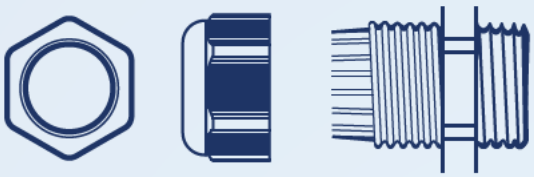
Power Connection & Remote End Seal Kit Options

Solco can also provide component kits which consist of 1 No. power connection kit and 1 No. remote seal kit with part ref nos: **SP-HPEK** (using heat shrink components) or **SP-CPEK** (using cold applied components) plus 1 No. **SP-RTV-ST** silicone sealant tubes.

SP-HPEK
Termination Kit



SP-CPEK
Termination Kit



Power Connection & Remote End Seal Kit Options

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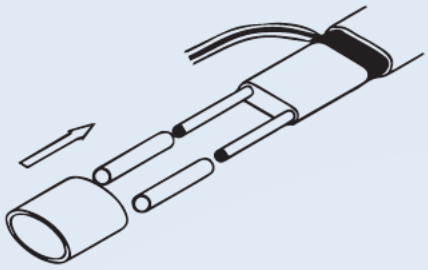
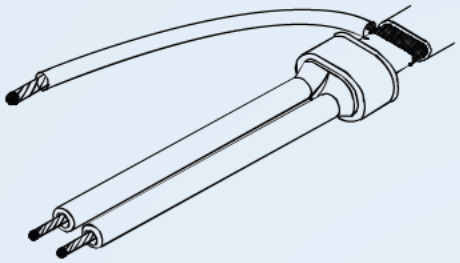
PYEX-PTK-S
Termination Kit

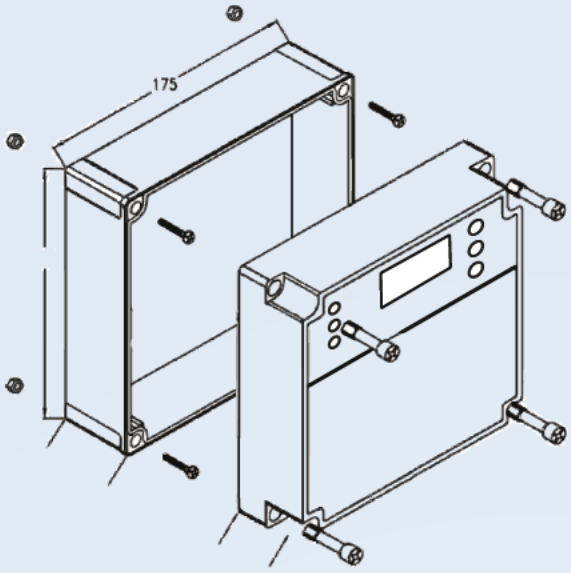


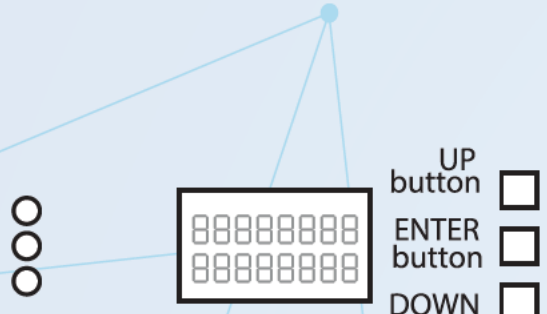
SP-PTK-M
Termination Kit

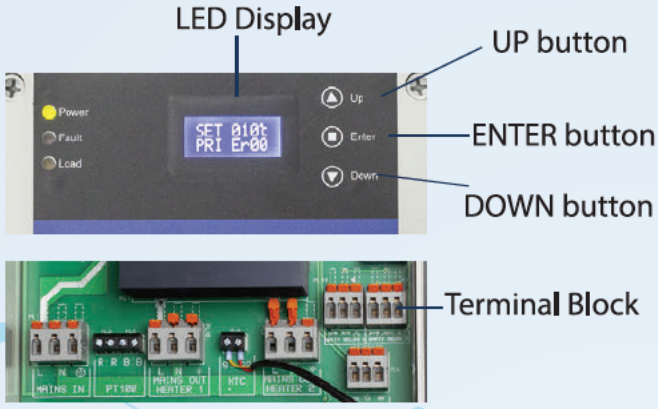


Smart Guard

Smart-GUARD Digital temperature controller – 175mm x 175mm x 75mm. Air/surface sensing programmable temperature control device with innovative Soft-Start, Fault Monitoring, BMS fault alarm relay and Auto Switchover features. For electronic temperature control of Fire Sprinkler trace heating systems in commercial, residential and non-residential applications.



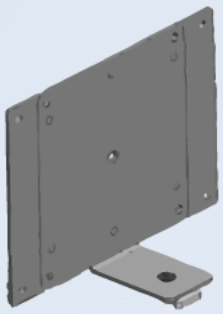




Pipe Mount Bracket Kits

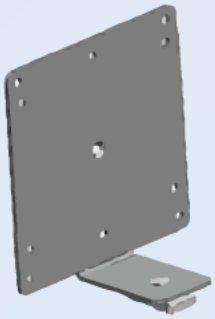
Stainless steel bracket kit used to fix to a pipe using a quick release band. The kit includes a steel bolt and T nut to screw both parts (plate and leg upstand) together. The bracket is to be used to mount Solco Pyroelec controllers and accessories onto a horizontal or vertical pipe. Additional nuts and bolts for the mounted products are provided in the kit also.

SP-BRP-001



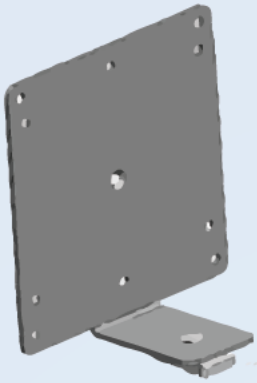
For : SP-JBL

SP-BRP-002



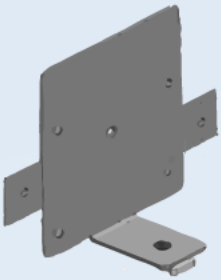
For : SP-JBL

SP-BRP-003



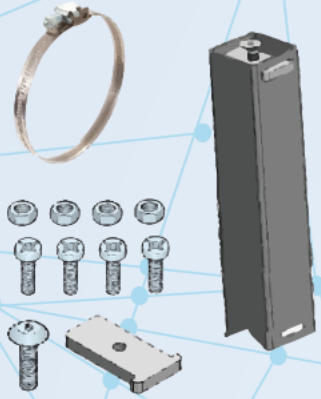
For : Smart-GUARD

SP-BRP-004

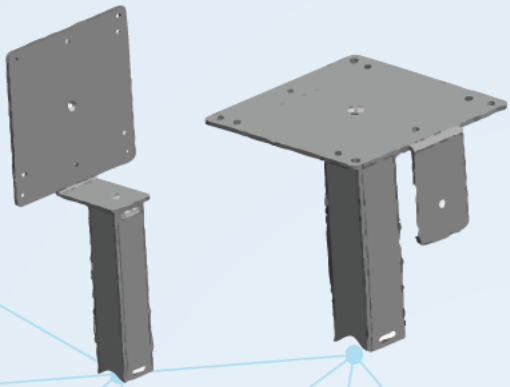


For : SP-3JB
SP-2JB

SP-BRP- Kit Fixings



Assembled Examples



Methods of Attachment of SR Heating Tape

The most common method of fixing heating tapes to metallic pipework is using a double circumferential wrap of adhesive backed glass fibre cloth fixing tape every 300mm spacing. Solco do not recommend the use of metallic cable ties (could be overtightened) . Our standard glass cloth fixing tape is **SP-GCT-50** which is supplied in 50m rolls and 12mm wide. Alternatively any electrical fixing tape is acceptable.

For plastic and stainless steel pipework, we would recommend the application of adhesive backed aluminium foil tape along the full length of the SR heating tape. This will enhance the efficiency of heat transfer from the SR heating tape into the pipe wall of plastic and stainless steel pipework. Our standard adhesive backed aluminium foil tape is **SP-AFT-45** which is supplied in 45m rolls and 48mm wide.

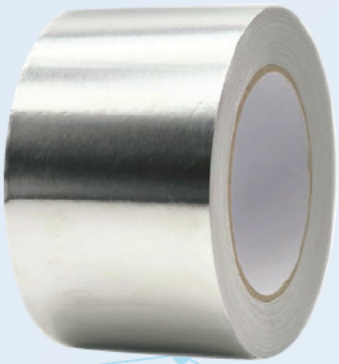
SP-GCT- F50 / H50

Glass Fibre Cloth Tape

or

Insulation/ Electrical Tape

SP-AFT- 45 - 45m Aluminium Foil Tape.



Mechanical Protection with External Metal Cladding

It is typical in the Building Services / Commercial market sector that many insulated pipes have a simple aluminium foil faced finish or non-metallic cladding to protect against moisture ingress. This is a judgement made by the designers / consultants that the insulated pipework will not be subject to mechanical damage. However, in situations where a metallic cladding such as aluminium, Aluzinc or stainless steel is required, then the trace heating tape MUST be mechanically protected using an insulation entry kit – Solco Ref: **SP-IEK**

Warning Labels – "Electrical Trace Heating under Insulation"

As a key requirement for health and safety of site operatives and maintenance personnel, it is important that relevant warning labels are fixed to the outside of the thermal insulation or metallic or non-metallic depending on the installation type. The specification calls for these labels to be fixed in place every 3 to 5m along the length of a pipe run and at all changes of direction to ensure wherever possible, any operatives have a visual indication that there is an electrical trace heating cable installed underneath the thermal insulation on any given pipe. The Solco warning labels are – **SP-WLAB-01**

Receiving Materials

1. Upon receipt of trace heating tapes, components and controls please make sure product type, model, electrical rating and power output are all as per the design details.

2. Visually inspect the trace heating tape for any damage incurred during transportation. The electrical integrity should be checked with at least a 500 Vdc megger tester between the twin conductors and the metallic braid. Connect the positive lead to the two conductors and the negative lead to the metallic braid. The measured minimum resistances should be no less than 20 Megohms.

3. Store all materials within a clean and dry location.

4. Do NOT install damaged trace heating tapes and / or components. The heating tape ends should be kept dry before and during installation to avoid fire and shock hazard.

- Cutting the cable insulation with sharp tool.

- Twisting the cable in short pitch.

- Folding the cable sharply.

- Bending the cable in flat plane.

- Bending the cable less than the specified minimum bending radius.

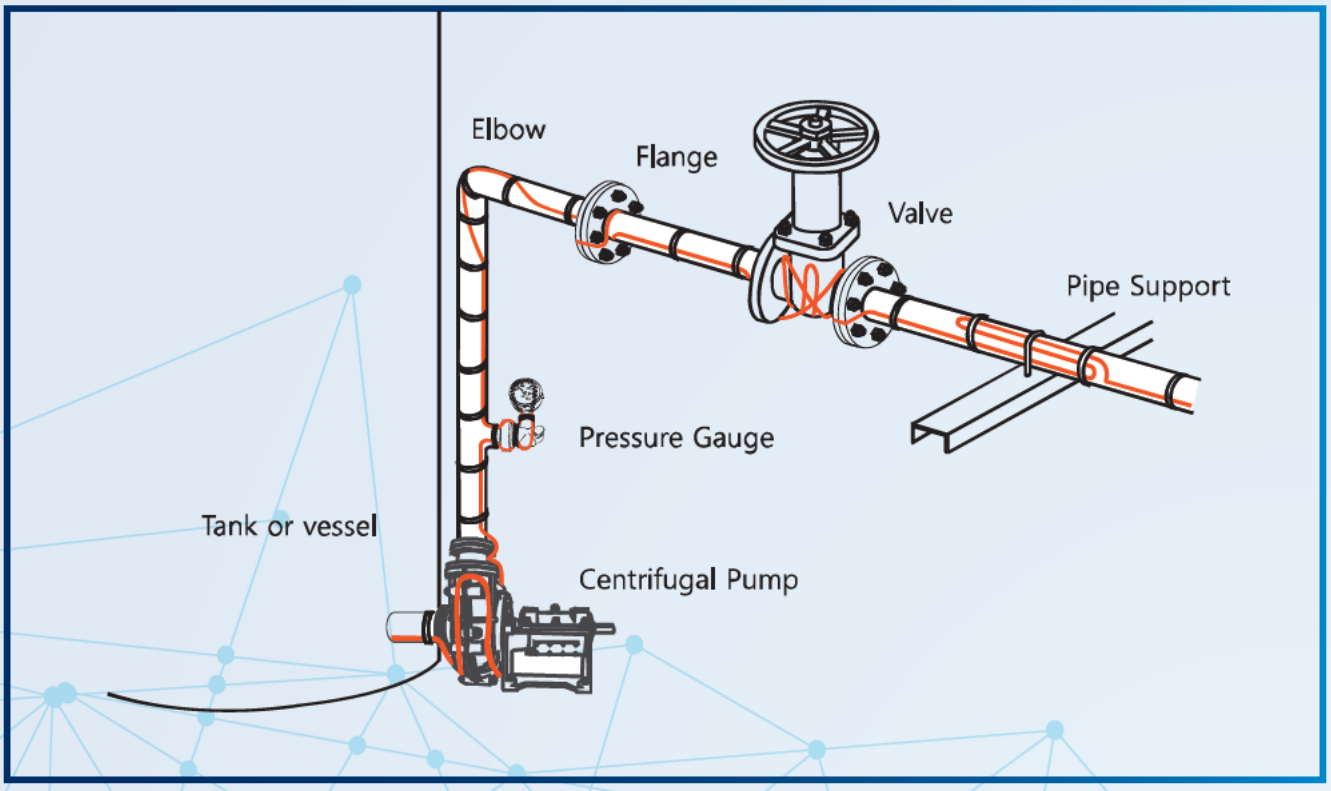
- Stamping or walking on the cable.

- Keeping the cable outside the operating temperature range in time.

Typical Trace Heating System Components

a) SP-JBL Junction box with stainless steel pipe mounting bracket kit
b) SP-2JB Heating tape to heating tape splice or power cable to heating tape connection
c) SP-3JB Heating tape tee connection
d) PYEX-ETK-S Remote end seal (heat shrink)
e) SP-ETK-M Remote end seal (cold applied)
f) SP-IEK Insulation entry kit (metallic cladding only)
g) SP-GCT-50 Circumferential wraps of glass fibre cloth tape , alternatively electrical fixing tape
h) SP-AFT-45 Longitudinal fixing of aluminium tape
i) SP-WLAB-01 Warning label
j) Smart-GUARD Electronic temperature controller (enhanced comms)
k) SP-BRP-ST/SJ Pipe mount bracket kits

Typical Pipe and Components



Typical Installations

FIG. 1: Installation using standard junction box for Tee's

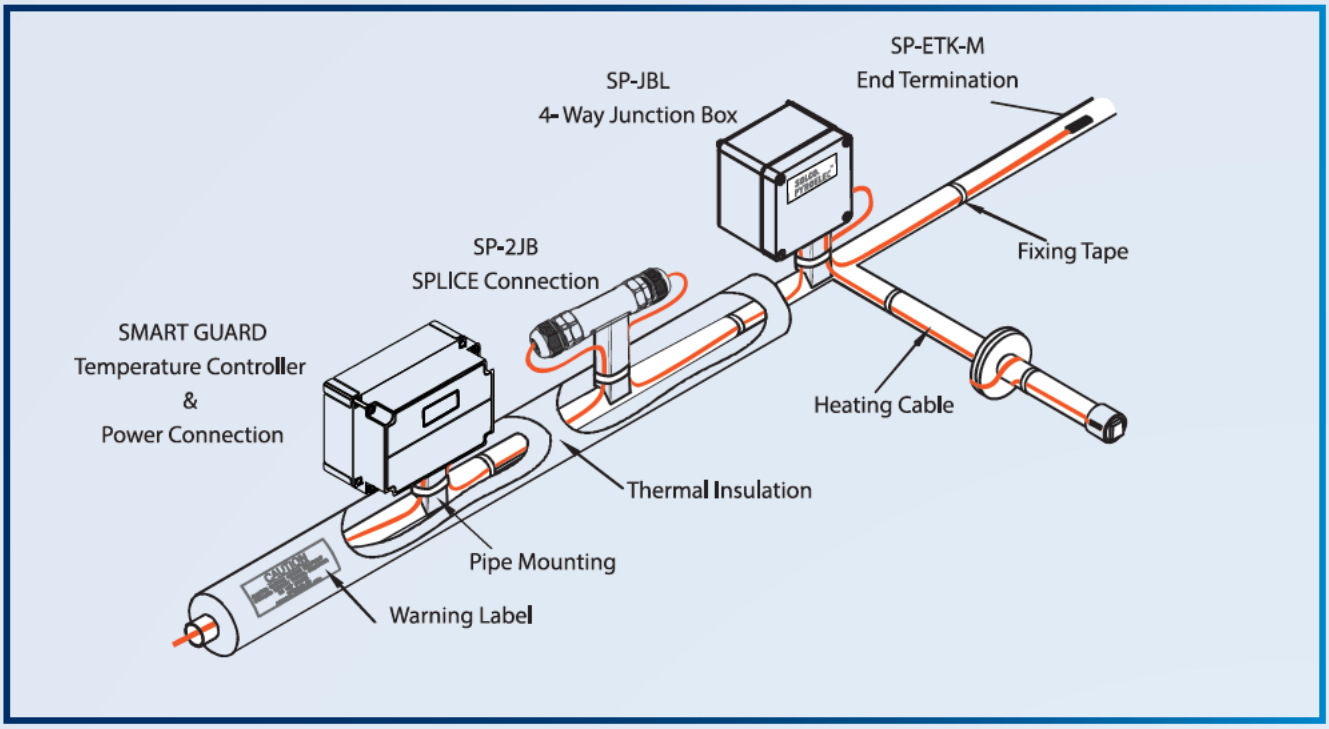
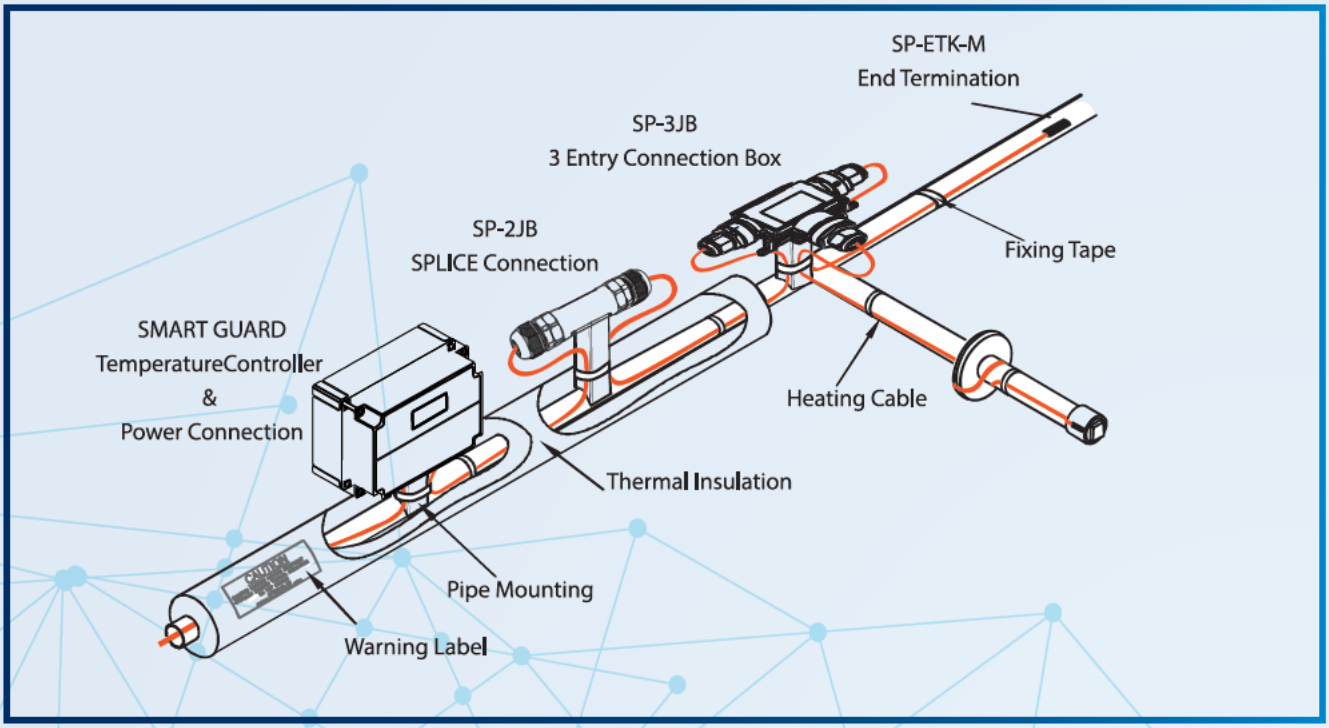
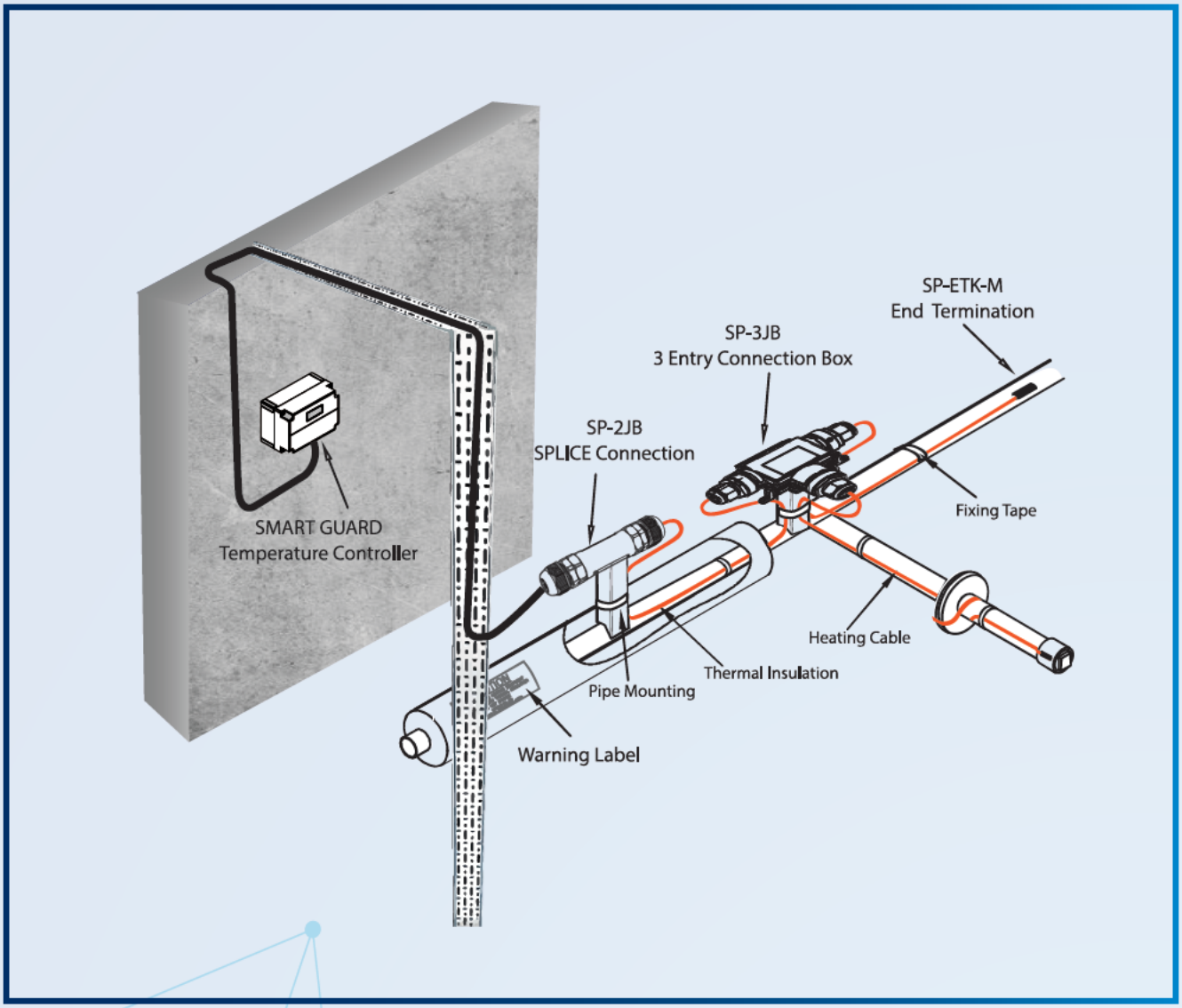


FIG. 2: Installation using SP-3JB 'Connectabox' for Tee's



Typical Installations

FIG 3: Installation when temperature controller is wall mounted not pipe mounted



Pre-Installation Checks

1. Walk the total pipework run to ensure that the installation is fully complete with flanged sets, valves, pipe supports and any other in-line ancillaries. As part of this initial visual check, ensure that there are no sharp edges or rough surfaces which could risk damaging the heating tape; if present, either smooth them off or protect with either glass cloth tape or aluminium tape as required. Finally, ensure pipework is formally released to you for the trace heating installation.
2. Compare the pipework layout with the design drawing in your possession to ensure that any variations are highlighted and clarified before commencing installation.

Trace Heating Installation Procedure

1. As a general rule, commence the installation of the trace heating tape from the remote end seal location and gradually work back towards the location of the power supply entry point via a junction box, connection box or Smart-ECO / PRO.

2. Ensure that the trace heating drum is supported in such a way as to eliminate any high tractive forces on the heating tape which could create excessive twisting, kinking or crushing that could well affect its long term performance.

3. Ensure that all Solco components are installed fully in accordance with the installation instructions which are supplied with each kit.

4. Ensure that the additional heating tape allowances are installed at all in-line pipework items such as flanged sets, valves, supports etc which represent additional "heat sinks" over and above the pipework diameter.

5. Plan the total length of heating tape to be installed on each circuit to ensure that the maximum circuit length of the relevant heating tape is not exceeded based upon the current rating of the Type 'C' circuit breaker to be used for electrical protection.

6. All of our heating tapes have "metre marks" at regular intervals along their entire length. This enables the installer to record the exact amount of heating tape installed in each circuit from any given drum of product.

7. Once the trace heating tape installation has been completed for each circuit and prior to the thermal insulation being installed, the pre-installation megger testing of the heating tape should be repeated using a minimum 500 Vdc megger tester with a 50 Megohm insulation resistance measurement a minimum threshold level to be achieved.

Thermal Insulation Installation Procedure

1. Once the trace heating tape has been IR tested and passed, the thermal insulation materials can then be commenced.

2. Check that the thermal insulation type and thickness supplied for the installation is in accordance with the relevant project specification.

3. Take care to ensure that the heating tape is not mechanically damaged during the installation and in particular if metallic cladding is to be installed, to minimise the length of drill bits if used to drill holes in the cladding sheets on site for either screws or rivets to be fitted.

4. Ensure that suitably sized insulation boxes or flexible insulation jackets provide a "snug fit" to the relevant flanged set, valve, pump body etc. In the case of metal insulation boxes, it is critical that all joints between the insulation boxes and related pipework are correctly sealed using a suitable silicone type sealant.

5. If metallic cladding is installed, then the SP-IEK insulation entry kits fitted to the heating tape, must be mechanically attached to the cladding and suitably sealed using a silicone type sealant.

6. It must be stressed that unless the thermal insulation is suitably sealed against the ingress of moisture, its thermal conductivity will dramatically increase resulting in excessive heat losses above the design calculations. Ultimately the resulting system will not be effective in either frost protecting or maintaining the pipework at the required levels.

7. Finally, it is very important that the SP-WLAB-01 warning labels must be installed at 3 to 5m intervals along the pipe run including at all changes of direction and these should be clearly visible to site operatives.

Annex A - Pre-installation checks (recommendations)

No.	Items to be checked	Remarks
1	Is the workpiece erected and tested and temporary supports removed ? Is the surface to be trace heated free from sharp edges, weld spatter and rough surfaces?	Any welding or pressure testing after the installation of a trace heater could damage the device.
2	Is the surface upon which the trace heater is to be applied normal steel or non-metallic?	If the surface is of polished stainless steel , very thin-walled pipe or non-metallic of any kind, special precautions may be necessary.
3	Do the items to be heated correspond in size, position etc., with the design?	It is sometimes difficult to be sure that the correct pipe is being heated. A suitable line numbering system may be of some assistance.
4	Has it been specified that metallic foil be installed before the application of the trace heater?	This may be used to aid heat distribution or protect stainless steel pipework from leaching chlorides from thermal insulation.
5	Has it been specified that metallic foil be installed after the application of the trace heater?	This may be used to aid heat distribution or protect stainless steel pipework from leaching chlorides from thermal insulation.
6	Can flow of product in the pipework to be trace heated, under normal or abnormal conditions, reach temperatures greater than those that the trace heater can withstand?	This would normally be covered in the design stage; however, further discussion with staff on site may show that incorrect or out of date information has been used.
7	Is the trace heating system documentation (working drawings, designs and instructions) available?	No change should be contemplated without reviewing the trace heating system documentation, as careful calculations are necessary to ensure safe operation.
8	Can pipes or surfaces expand and contract so as to cause stress on any part of the trace heating installation?	In this case, precautions are necessary to avoid damage.
9	Can sensors of temperature controllers be affected by external influences?	An adjacent heating circuit could affect the sensor.
10	Is the trace heater to be straight traced (typical on pipes), spiralled or zigzagged onto the workpiece, according to the design?	Check design loading per unit length of pipes (or surface area) to determine if spiral or zigzag application is necessary.
11	Are cold leads, when fitted, suitable for contact with the heated surface?	If the cold lead is to be buried under the insulation, it has to be able to withstand the maximum temperatures present.
12	Is the pipework hung from a pipe rack?	In this case, special precautions are required to ensure the weatherproofing of the insulation at points of suspension.
13	Does the pipework have its full complement of supports?	The addition of intermediate supports at a later stage could damage the heating system.
14	Are there sample / bleed lines etc installed on site but not shown on the drawings?	These could obstruct or prevent the fitting of the trace heater and a review of the trace heating system documentation may be necessary.
15	Are other parameters used in the design if the equipment as specified by the design documentation?	
16	Are the trace heaters, controllers, junction boxes, switches, cable glands etc suitable for the environmental conditions and are they protected as necessary against corrosion and the ingress of liquids and particulate matter?	

Annex B - Trace heaters commissioning record
(recommendations)

Site name and location:		Project No.:	
		Area Classification: Hazardous / Safe:	
Design drawings ref.		Max Temperature exposure, deg C:	
		Ambient Temperature, deg C:	
Circuit / Line no.:		**Panel No.:**	Panel location:
Trace Heater Supplier:		**Trace Heater model, voltage, wattage per unit length:**	

TRACE HEATER TESTING:

NOTE: For the insulation resistance test, the minimum acceptable insulation resistance is 50 MegOhm. The minimum acceptable test voltage is 500 Vdc. However, 1000 Vdc is recommended for MI and 2,500 Vdc for polymeric (self-regualting) trace heaters. Records of the test meter manufacturer, model, calibration status are recommended to be kept for future notice if necessary.

1. Receipt of material, Trace Heater test on the reel:			
Continuity / ohms check, Ω:		Insulation resistance test, M Ω:	
2. Pipework completed and approved, Trace Heater test on the pipework:			
Continuity / ohms check, Ω:		Insulation resistance test, M Ω:	
Trace Heater correctly installed on pipe, vessel or equipment:		Date:	
		Initials:	
Trace Heater correctly installed on valves, pipe supports and other heatsinks:		Date:	
		Initials:	
Components correctly installed and terminated (JBs, power, tees, ends)		Date:	
		Initials:	
Installation agrees with suppliers instructions and design		Date:	
		Initials:	
3. Thermal Insulation completed and approved, Trace Heater test under lagging:			
Continuity / ohms check, Ω:		Insulation resistance test, M Ω:	

TRACE HEATING SYSTEM INSPECTION:

4. Marking, Tagging and identification complete (see BS EN62395-1 cl. 7)	Date:	
	Initials:	
5. Trace Heater effectively earthed	Date:	
	Initials:	
6. Temperature Controllers properly installed and set points verified	Date:	
	Initials:	
7. Junction Boxes properly marked and closed	Date:	
	Initials:	
8. Thermal Insulation weather tight (all penetrations sealed)	Date:	
	Initials:	
9. End seals, covered splices, labels marked on insulation / outer cladding	Date:	
	Initials:	
10. Drawings, documentation marked as built status	Date:	
	Initials:	

FINAL COMMISSIONING:

Circuit Volts, V:		Tested by:	
Pipe Temperature, deg C:			
Breaker No. & Size:		Witnessed by:	
Measured Amps at start-up (A):			
Measured Amps after 5 mins (A):		Date:	

Annex C - Maintenance schedule and log record (recommendations)

Location		System			Reference drawing(s)		
CIRCUIT INFORMATION:							
Trace heater number		Circuit length			Breaker panel number		
Power connection		Design voltage			Breaker pole(s) number		
Tee connection		Residual current protection (type)					
Splice connection		Residual current trip setting					
Heating controller							
VISUAL:							
Panel No:	Circuit No:						
	Date						
	Initial						
Thermal Insulation							
Damaged insulation / lagging							
Water seal acceptable							
Insulation / lagging missing							
Presence of moisture							
Heating system components							
Enclosures, boxes sealed							
Presence of moisture							
Signs of corrosion							
Trace heater lead discoloration							
Heating and / or high limit controller							
Operating property							
Controller set point							
ELECTRICAL:z							
Insulation resistance testing (bypass controller if applicable) - refer to clauses 4.7.5 and 4.8.6 in BS EN 62395 - 2:2013							
Test voltage							
Megger value (MegOhms)							
Trace heater supply voltage							
Value at power source							
Value at field connection							
Trace heater circuit current reading							
Amps reading at 2 to 5 min at pipe temperature							
Amps reading after 15 min at pipe temperature							
Earth-fault current							
Comments and actions							
Performed by:			Company:			Date:	
Approved by:			Company:			Date:	

Troubleshooting Guidelines

Symptom:	Potential causes:	Suggested actions:
No power output	Loss of power supply voltage caused by– ♦ overcurrent or rcd protection trip? ♦ loss of supply cable continuity? (eg open circuit resulting from damage) ♦ loose terminals in junction box?	Re-instate power supply ♦ rectify overcurrent or rcd protection. ♦ locate damage and repair. ♦ re-tighten terminals.
No power output	Temperature controller is connected in the normally OPEN position	Amend connections to normally CLOSED position.
No power output	High resistance connection at – ♦ junction box terminals? ♦ tees or splices?	Locate and rectify by – ♦ re-tighten. ♦ repair. Note: if excessive heating has occurred due to high resistance, then replace the terminals /crimps.
Circuit Breaker overcurrent protection trips or blows	Electrical fault at ♦ damaged heating cable? ♦ faulty tees or splices? ♦ end seal? ♦ connection?	Investigate all listed causes of an electrical fault and rectify as necessary.
Circuit Breaker overcurrent protection trips or blows	Circuit oversized - more heating tape installed on the circuit than the maximum allowed?	Check total installed heating tape length and if higher than protection rating either reduce circuit length or increase protection rating as required.
Circuit Breaker overcurrent protection trips or blows	The start-up temperature is below that assumed during the trace heating design?	Potential re-design based upon a more realistic minimum start-up temperature.
Circuit Breaker overcurrent protection trips or blows	Electrical protection is faulty?	Replace the electrical protection.
Residual Current Device (RCD) trips	Potential earth fault at ♦ damaged heating tape? ♦ connections? ♦ end seals? ♦ tees or splices?	Investigate these areas and rectify as required.
Residual Current Device (RCD) trips	Potential moisture ingress at ♦ junction boxes? ♦ end seals? ♦ tees and splice?	Dry out and re-seal or re-make as required. Then carry out a new Insulation Resistance (IR) test described earlier in this document. (minimum 20MegOhm with 500Vdc applied voltage)
Residual Current Device (RCD) trips	Potential high leakage currents caused by excessive power cable and/or heating tape lengths?	Re-design is necessary.
Residual Current Device (RCD) trips	Mains borne disturbances?	Re-design the power distribution system.
Residual Current Device (RCD) trips	Defective RCD?	Replace the RCD.
Low pipe temperature	Wet thermal insulation?	Remove and replace with dry thermal insulation compliant with the design specification and ensure all relevant joints are sealed.
Low pipe temperature	Design incorrect?	Review the overall design including heat losses, pipe size, thermal insulation type & thickness and modify as required.
Low pipe temperature	Temperature controller set points incorrect?	Review temperature controller settings and rectify if required.
Low pipe temperature	Trace heating tape has been exposed to temperatures beyond it's stated ratings due to steam cleaning or unforeseen operation / maintenance conditions?	Replace the heating tape that is capable of withstanding the relevant maximum exposure conditions.

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