MICC LTD

Trace Heating

Installation Guide

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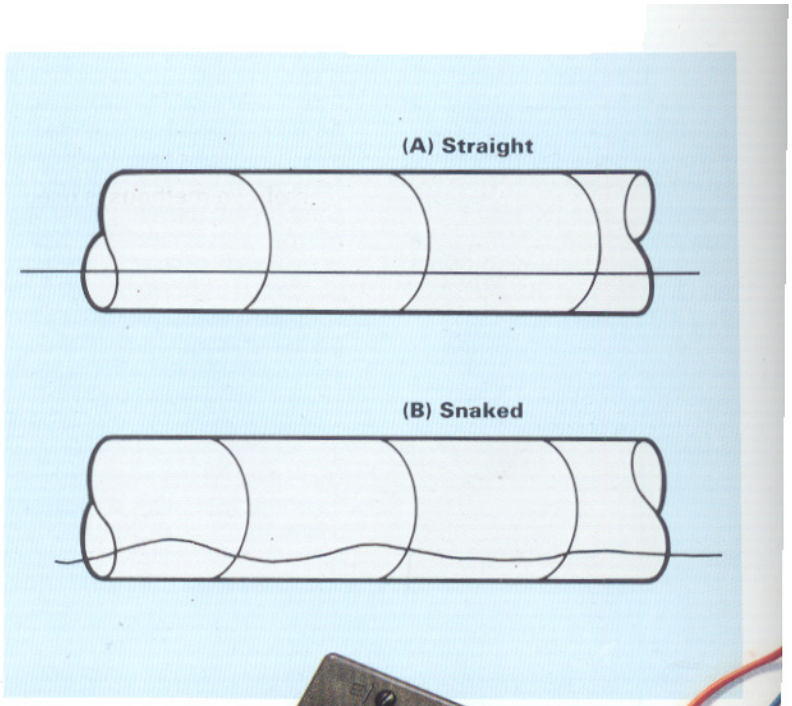
Installation Guidelines

Installation on Pipelines

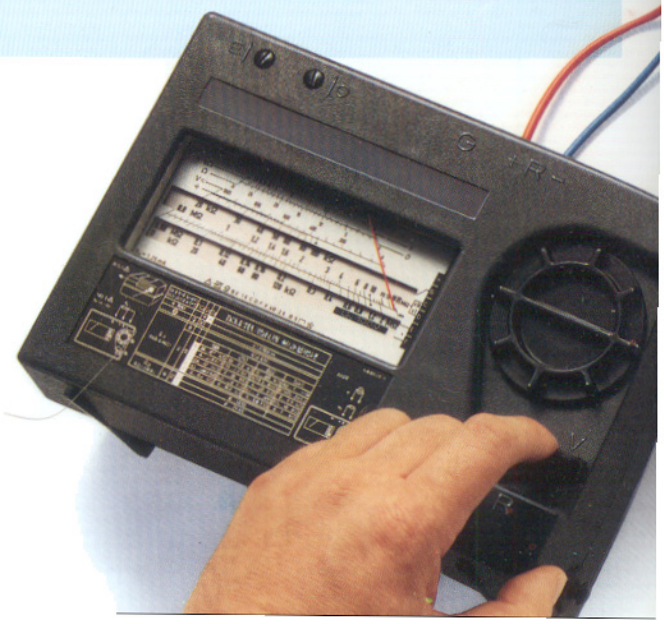
It is good practice to ensure that the surface to be heated is clean and free from rough areas, sharp edges, or burrs which could cause damage to the heating cables during installations.



Pipe Tracing

The most commonly used methods of applying heating units to a pipe are in straight lengths or snaked. See diagram right.

This method of installation makes for ease of removal of pipe sections, valves or joints" without a major disruption of the trace heating cables.



1. Where brackets are to be fixed to a pipe and used to mount ancillary equipment, these should be fitted first.

2. The tension in the fixing straps for mounting brackets is much greater than the tension required in the heating cable fixing straps, consequently a heating cable inadvertently located under the bracket mounting strap could become permanently damaged.

3. The positioning of the fixing tapes or tags must correspond to the spacings of the heating cable layout.

4. Spacing should be specified in the heating system as designed.

5. Ensure that an adequate supply of temporary ties is available. These can take the form of binding wire for MI Heating Cables and Glass Cloth Adhesive Tape for served MI Heating Cables.

6. From the schedule and from plant layout drawings identify and select, from the reference number or code, the heating units to be installed on the particular section.

Check before Installation

Length

Check that the length of the heating unit specified on the label agrees with the length specified on the schedule, If in doubt measure the resistance of the unit and check this against the schedule and heating unit label. The length of the unit can be estimated by measuring the diameter of the coil and multiplying by 3.142 and then multiplying by the number of turns.

Loop Resistance

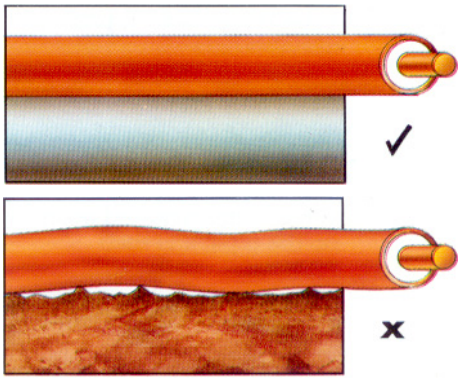
Check the loop resistance of the heating unit using a multimeter and confirm the value is consistent with installation checksheets or label information.

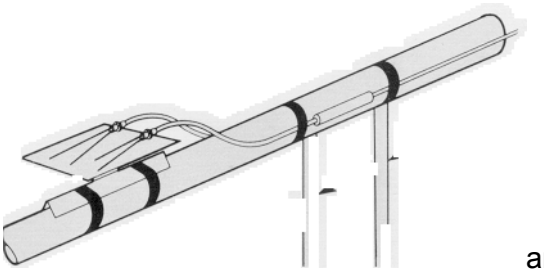
Insulation Resistance

Check the insulation resistance of the heating unit using a 500 volts insulation tester connected across the conductor(s) and the metallic sheath. It should not be less than 500 Mohms. However site conditions may reduce this and a value of 20 MΩ is considered to be acceptable even in dry conditions. Wet conditions may reduce this even further but in any case a value of <5 MΩ should be considered evidence of a problem to be investigated.
See hazardous area installation instructions for specific guidelines, also the unit should be tested in the safe area.

Installation

When preparing the heating unit for application to the pipe carefully unroll the coil. DO NOT pullout into a spiral. Avoid twists or kinks in the cable and take care not to flex the heating cable element within 150mm of the lead-in joints. This can be done by re- tying the first loop containing the joint. Wherever possible avoid installing heating cable over rough surfaces – see drawings right - and take precautions over flanges, valve cases or sharp edges to prevent damage to the heating cable. In general one of two methods is used to lay the heating units to the pipe. The choice usually hinges around accessibility of the pipe along its length. (a) If the pipe is wholly supported from below, or wholly from above, then the heating unit can be unrolled, looped recoiled and the 'lead' and 'return' applied to the pipe simultaneously. (b) If the pipe is supported from above and ~ below then it is usually necessary to 'lead' out the cable on one side of the pipe and 'return' down the other side of the pipe by carefully unrolling the heating unit from the coil as supplied. Locate and fix to the pipe the 'start' of the heating unit. The position of the start and finish of the heating unit is usually near to the electrical supply point or connecting box. Where a bracket is fitted to the pipe –see picture below



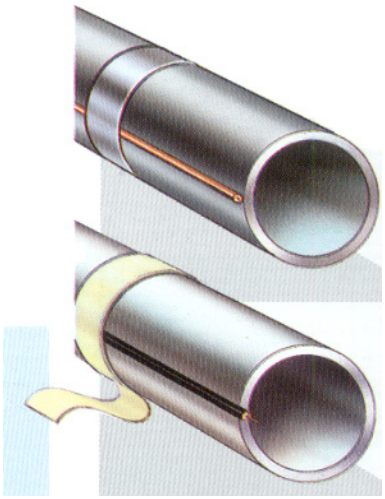


and is to be used to mount a connecting box then this is usually the 'start' and finish position. If a heating cable u~ comprising a heating cable jointed to a cold lead is being installed, a fixing strap should be fitted at a distance of about 150mm on either side of the joint.

As the heating cable is being rolled along the pipe, it can be loosely held in position by temporary ties in the form of binding wire. If the heating cable is being lead out singularly then ties should be applied on the outward journey and repeated on the return journey.

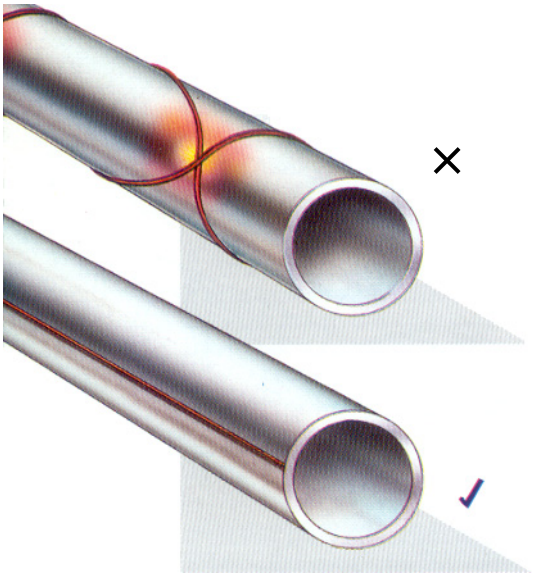
When the cable runs have been completed ensure that the slackness due to excess length is evenly distributed along the whole length of the pipe.

Fixing Straps



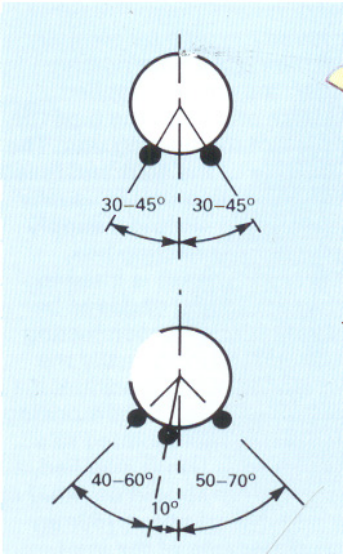
Permanent fixings should be applied at a maximum spacing of 300mm. Typically steel or stainless steel straps are used for attaching and securing the trace heating to the pipes.Use stainless steel straps for attaching single core and two core elements to pipes. For oversheathed elements use glass cloth adhesive tape. Pre-punched metal fixing tape should be used to attach elements to tanks or other vessels

Fit permanent fixing straps to the installation taking care not to overtighten. During the fitting of fixing straps correctly locate the heating cable in the required position on the pipe. It is BAD PRACTICE to create localised 'hot spots' by allowing touch contact between either loops of the same heating unit or between runs of adjacent heating units. Such a situation could cause permanent damage to the units due to overheating. (see drawings right)



Positioning of Heating Cables on Pipe

When two heating runs are involved on the same pipe each run should be positioned between 30° and 45° either side of bottom dead centre. Valves and joints in pipelines are prone to leakage and in many cases the substances being transported through the pipe can be corrosive to any metallic covering on the heating cable. Any leakage gravitates to the bottom dead centre of the valve or joint, consequently it is a wise 'PRECAUTION' to avoid locating 'runs' of heating cable at bottom dead centre. When three heating cables are involved (as in a three phase installation) the bottom cable should be located about 10° to one side of bottom dead centre. On a vertical pipe the heating cables should be proportionally spaced around the circumference of the pipe.



Branch Pipes

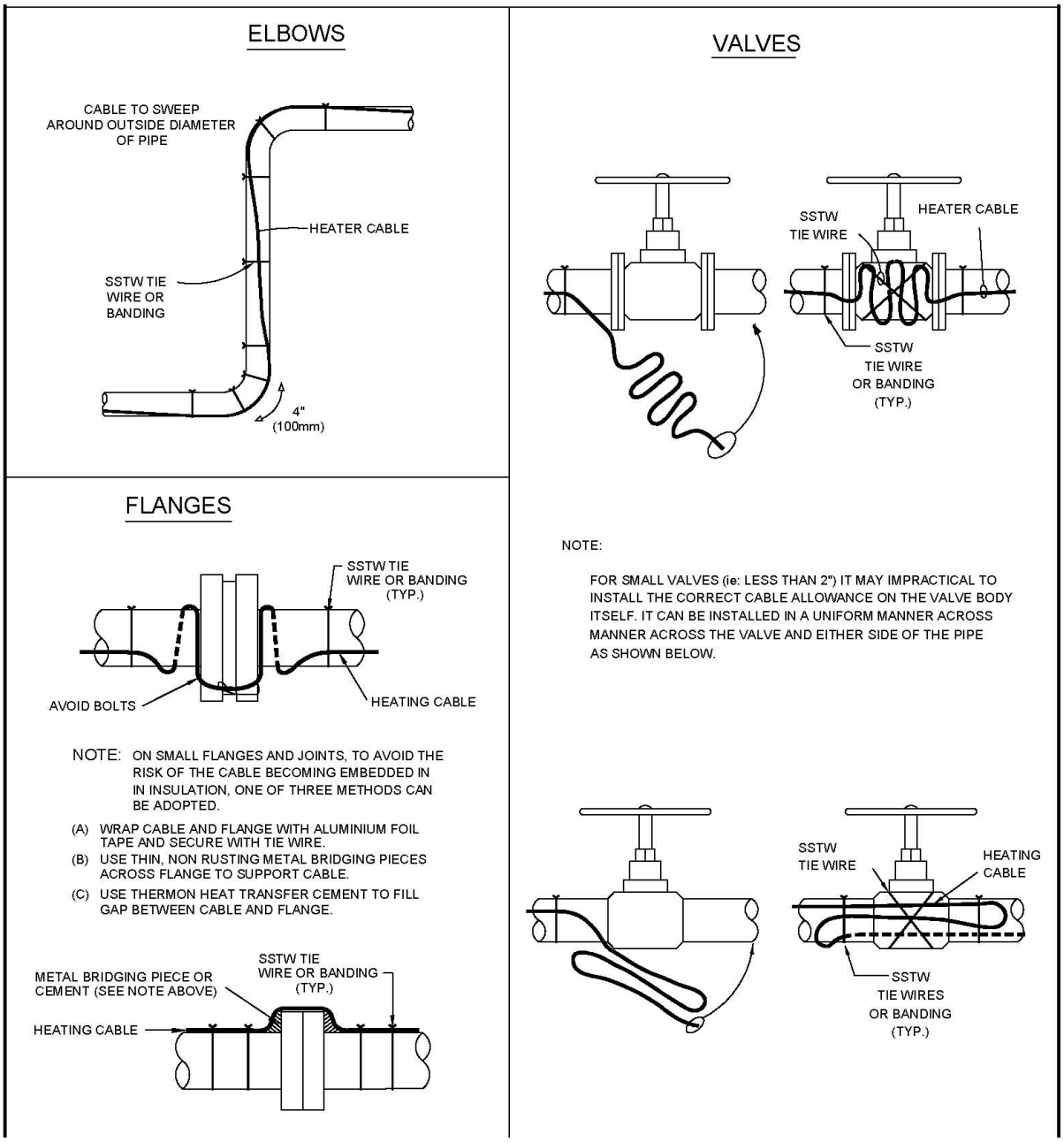
At a tee branch in a pipe line, particularly if the branch pipe is of smaller diameter than the main diameter ‘looping in’ with the main heating unit may produce unbalanced heat loading. BE CAREFUL, check from the schedules that this is permissible.

Joints, Flanges and Valves

Care must be taken at joints, flanges, valves or any obstructions on the pipeline to prevent damage to the heating cables during installation. To ensure maximum heat transfer it is important to maintain close contact between the heating cable and the surface to be heated. On valves, and over flanges or joints, careful attention is required.

Flanges

Over large flanges double bending of the heating cables give the best results. Minimum bending radius 6 x diameter. On small flanges and joints where it is impractical to bend the cables so tightly, heat transfer cement, aluminium foil or metal bridging pieces can be used to fill any gaps between the heating cable and the surface to be heated. Alternatively aluminium foil can be wrapped over the heating cables and flange or joint.

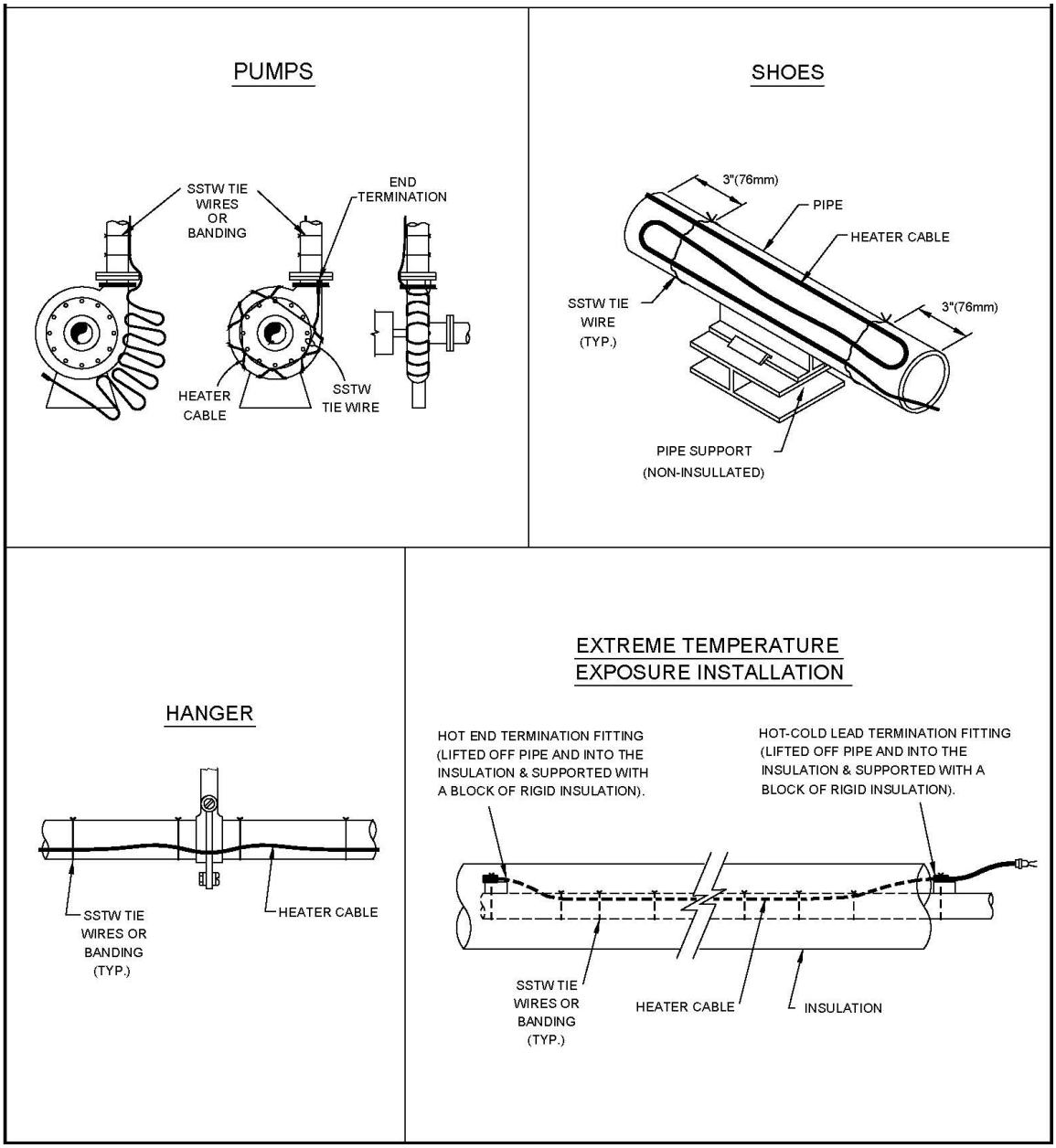


Valves

Work sufficient length of loop of heating cable into valve case snaked, taking care to avoid the valve head fixing bolts. Additional straps are usually required on valves. The cross over technique is particularly useful.

Thermal Lagging

The heating element must be kept in intimate contact with the surface to be heated. Cables must not be embedded or encapsulated in the thermal insulation.



Check after Installation

Insulation Resistance

Check the insulation resistance of the heating unit using a 500 volts insulation tester connected across the conductor(s) and the metallic sheath. It should not be less than 500 Mohms. However site conditions may reduce this and a value of 20 MΩ is considered to be acceptable even in dry conditions. Wet conditions may reduce this even further but in any case a value of <5 MΩ should be considered evidence of a problem to be investigated.
See hazardous area installation instructions for specific guidelines, also the unit should be tested in the safe area.

Loop Resistance

Check the loop resistance of the heating unit using a multimeter and confirm the value is consistent with installation checksheets or label information.

Installation Guidelines for Hazardous Areas

Below is the documentation which TRM provides with units it manufactures for use in hazardous areas.

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Compiled by:
Authorized by:

Introduction

These instructions provide contain information for the safe use and installation of completed TRM heating elements in hazardous areas.
Use of the checklist below will provide the necessary assurance that the element(s) can be installed safely for use in a hazardous area

Limitations

- The maximum withstand temperature of elements with a nickel alloy sheath is 450 ºC
- The minimum installation temperature is –20 ºC
- The power for the element(s) shall be terminated in a suitably protected enclosure
- The maximum supply voltage between heating element conductor and sheath is 350 V and 500 V depending on resistance cable employed.
- The minimum cable spacing must not be less than 25 mm

Storage & handling

- Elements should be stored in a clean and dry environment
- Elements should be handled with care avoiding kinking, crushing or twisting.
- In preparation for installation on the surface to be heated, unroll the coil carefully, DO NOT pull out in a spiral.
- The hot to cold stainless steel junction should NOT be excessively manipulated, this can be avoided by tying the first loop to the joint

General Installation

- Do **NOT** bend the element within 75 mm of the hot to cold stainless steel junction
- Work hardening of the sheath will occur if repeatedly bent and straightened – this should be avoided
- As a rule the cable should not be bent below a minimum bend radius of six times the outer diameter – for a **one-off** bend this can be three times the outer diameter
- Do not allow heating cable to cross or touch as this can cause hotspots with a risk of element failure and invalidation of certification
- Ensure cables are spaced no closer than 25 mm
- Install the element in a manner which allows access or removal of serviceable equipment (valves, pumps, access ports, etc) with a minimum of disruption to the element installation.

- The fitting of insulation should be planned to follow the fitting of the heating element elements in order to avoid mechanical damage

Pre-installation checks (safe area) – see checklist

1. Ensure the correct drawings or schedules are available to determine where the elements are to be installed
2. If JBs and other ancillaries are also fixed to the surface to be heated ensure their fixing arrangements are installed prior to heating element installation to avoid interference
3. Compare heating element tag information with information in 1) and confirm length and type. Note the label attached to the element will specify the maximum pipe temperature, operating voltage and temperature class (T rating) – check this label carefully!
4. Inspect the heating element and accessories for damage
5. Check the insulation resistance of each heating element using a 500V insulation resistance tester (Megger). Minimum acceptable insulation resistance shall be 1000 Mohms
6. Measure and check the series resistance against the schedule and heating tag label of each heating element using a resistance meter.
7. **WARNING** – elements failing either of tests 4, 5 & 6 **MUST** be returned to TRM Ltd. for repair – please contact TRM Ltd. for advice
8. Ensure that all metal joining processes on the installation surface have been completed.
9. Check before installation that actual pipe lengths and actual heating element lengths are comparable
10. Ensure that installation surface is free from burrs, nicks and sharp edges. These could cause damage to element during installation and are also a hazard to the installers
11. Check that any surface treatments (paint, coatings, etc) have been considered during the design stage - checklist

Installation

- If possible, uncoil the heating element and lay it next to the surface to be heated.
- Where the element is to be installed in the form of a return loop uncoil about half of the element, have someone hold the middle and then uncoil the rest of the element back to the starting point.
- Where this is not possible lay the cable against the surface to be heated securing with loose securing straps as the element is uncoiled.
- For either case temporarily secure the element using 1mm diameter stainless steel tie wire starting at the hot to cold joint.
- Heating elements should, ideally, be installed around the bottom of the surface to be heated avoiding the very bottom (where moisture/chemical spills collect). If this is not possible run the cable at a higher location but try to avoid areas where mechanical impact damage may occur.
- The hot to cold joint should be supported with stainless bands at 150 mm either side of the joint.
- The radii of any curves should be left as large as possible to allow for any subsequent adjustments.
- Any heat conduction to the glanding carried along the cold lead cable should not exceed 70 deg C. If it is in excess of this value, where the cable exits the insulation covering heat sinks should be affixed to dissipate the conducted heat.
- After the element has been installed it may be necessary to adjust for excess or shortage of element length by redistribution on the installed surface – usually allowances in length

are made for valves. Severe mismatch should have been checked before installation but, if necessary, the E&I engineer responsible should be informed so an appropriate decision can be taken.

- After adjustment, if necessary, the element should be secured at 300 mm intervals using stainless fixing strips and bands. Cable loops at process fittings should be finalised. DO NOT overtension straps – the element should be able to be repositioned but should not move under it's own weight. This 'tension' check allows thermal movement of the element during power application and is essential to avoid heat cycle fatigue failure.

Inspection

Please use the checklist below (Commissioning section) as guidance for the inspection procedure. Period of inspection should coincide with that applied to all field instrumentation in the plant but as a minimum should be tested annually.

This page may be photocopied as necessary to provide an adequate number of checklists

Project		**Area**			
Location/panel		**Contractor**			
Lead installer		**Installer**			
Pre-installation checks – general					
Metal joining processes complete		Smooth installation surface			
Surface treatment check		Pressure testing completed check			
JBs/ancillaries installed					
Pre-installation checks – heating elements					
Drawing number/schedule reference					
Tag reference		Element reference			
Actual lengths checked		Length		Type	
Pre-install Resistance value		Damage check		IR check	
Series resistance before thermal insulation					
Commissioning checks – heating elements					
Heating element area classification check		Surface T class check			
Cable glands fitted to JBs		Earthing check			
Electrical connections tight					
Electrical protection check		JBs area classification check			
Resistance value check		IR check			
Pre-installation checks – heating elements					
Drawing number/schedule reference					
Tag reference		Element reference			
Actual lengths checked		Length		Type	
Pre-install Resistance value		Damage check		IR check	
Series resistance before thermal insulation					
Commissioning checks – heating elements					
Heating element area classification check		Surface T class check			

Cable glands fitted to JBs		Earthing check			
Electrical connections tight					
Electrical protection check		JBs area classification check			
Resistance value check		IR check			
Pre-installation checks – heating elements					
Drawing number/schedule reference					
Tag reference		Element reference			
Actual lengths checked		Length		Type	
Pre-install Resistance value		Damage check		IR check	
Series resistance before thermal insulation					
Commissioning checks – heating elements					
Heating element area classification check		Surface T class check			
Cable glands fitted to JBs		Earthing check			
Electrical connections tight					
Electrical protection check		JBs area classification check			
Resistance value check		IR check			

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