

# INSTALLATION GUIDELINES

FOR

## DEKORON-UNITHERM ELECTRIC TRACED TUBING BUNDLES

This bulletin provides the Field Engineer and the craft people with information for the proper installation of Unitherm Electrically Traced products. These recommendations have been proven by years of actual experience. They are put forth as suggestions and do not preclude the use of other methods and good field construction practices

### Explanation of Symbols

The following symbols are used throughout this guide to show areas of special interest:



Caution - The user should be instructed in the proper procedure before continuing.



Caution - Surfaces may be hot



Warning - Improper action may cause severe damage to the product or injure personnel.



Caution - Dangerous voltages may be present.



Warning - Improper operation could result in a fire hazard.

This bulletin provides a general discussion on:

- Handling and Storage
- Planning and Preparation Metal
- Product Installation

Topics such as:

- Methods of Installation
- Methods of Bending and Straightening
- Hanging and Support Instructions
- Heater Connection and Termination
- Final Inspection and Commissioning

### **HANDLING AND STORAGE**

All Unitherm Traced products are shipped on non-returnable wooden reels. The standard reel for electric traced bundles has a 54" (1370 mm) bridge flange, is 36" (915 mm) wide, with a 40" (102 mm) drum, weighing 160 pounds (73 kg). Other reel sizes may be used, depending upon coil lengths.

Each length is sealed at the ends to prevent entry of moisture or foreign material. However, if reels are to be stored out of doors at the jobsite, a weatherproof covering (e.g., polyethylene film, canvas, etc.) should be used.



Bundle ends must be sealed to prevent component damage due to moisture.

## ***PLANNING AND PREPARATION***

The methods recommended for installing Unitherm Traced products are based upon accepted practices presently used by Instrument Engineers, Electricians and Pipe Fitters. Planning and preparation are essential to proper installation.

Initial planning and system layout is recommended to take total advantage of the installation cost savings. Preliminary planning should encompass such things as: determination of run lengths, position and angle of connection, accessible routing of the bundle, existing support structures and their location, entry into the instrument or analyzer and the possibility of external tracing requirements beyond the bundle. It is important to review the section on hanging and supports while planning the run to make the best use of existing supports.

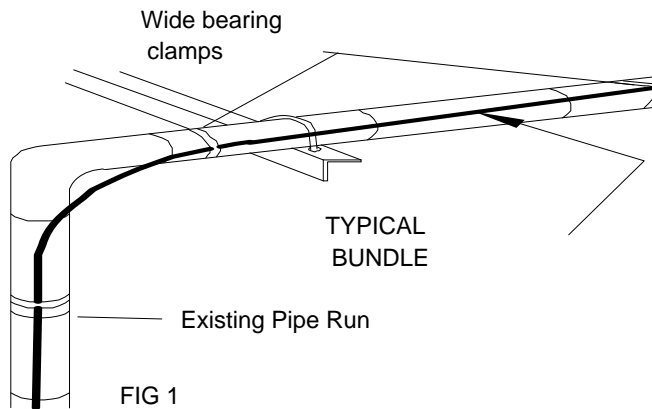
Check with Unitherm Customer Service for information on the size, weight, support distance, and minimum bend radius of the bundle being installed.

## ***LENGTH DETERMINATION***

Bundle length is determined by the routing distance between sample point and instrument. However, some allowance for extra length should be made. Minimum additional length requirement for each connection point, such as splice, termination and input power kit, should be 12 inches (300 mm). Allowances must also be made for routing inside probe enclosures and the analyzer housing. Special allowances must be made for bundles heated with CPD heating tapes to insure that the bundle is heated fully to each end. See the section on terminating heaters for additional information.

## ROUTING

The initial consideration in establishing the best route is to install instruments and adjacent supports which will allow the traced line to run straight for 12" to 18" (300 to 450 mm) before being connected to any instruments, sample points, orifice plates, etc. This will simplify the job of connecting after the bundle is secured.



Routing should be chosen to take advantage of existing cable trays, beams, columns, etc. Provide long radius sweeping bends whenever possible. Long radius bends allow the bundle to work at its maximum efficiency and also provide a place where the bundle can expand and contract due to ambient and tube temperature changes. Tighter bends can be made, as

explained below. Take care to insure that all bends are greater than the minimum bend radius. Support the bundle from 12 to 18 inches (300 to 450 mm) either side of the bend with wide bearing clamps (see fig. 1). The routing should not position the product in an area where the ambient will reach above 120°F (49 °C), such as near a boiler, reactor, heat exchanger, or against a hot chimney wall; unless the bundle is designed specifically to handle high ambient temperatures. If the bundle is routed within an enclosed cable tray or conduit, this maximum temperature may be reduced. Contact Unitherm Customer Service for information on the limitations of your bundle.

Horizontal runs should be sloped to assist drainage of any condensate or particulate matter that may collect in the tube. Unitherm suggests a slope of 3/4 inch per foot of horizontal run. In systems where there is high gas velocity, this slope could be decreased.

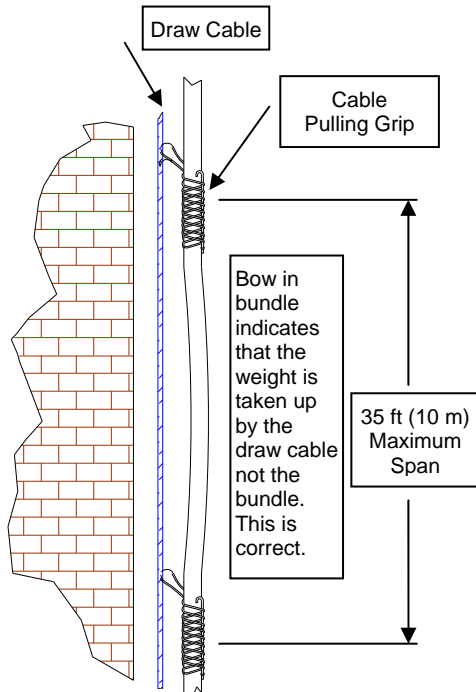
Multiple bundle routing, where more than one bundle is run in parallel, should allow at least 1" (25 mm) space between bundles. Bundles may be stacked if insulating spacers, no less than 1" (25 mm) thick, are used. Unitherm Customer Service has information on acceptable stacking hardware.



Proper spacing is critical to the long-term life of this product.

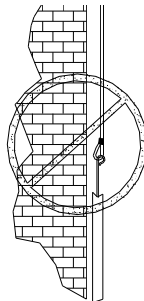
## METHODS OF INSTALLATION

The Unitherm products range from semi-rigid Traced bundles to extremely flexible Heated Hoses. These products cannot be treated like power cables. The maximum pulling tension on most Unitherm analyzer bundles is less than 50 pounds (22 Kg), so they cannot be simply attached to a draw cable and pulled into place.



Installation generally begins at the probe end. If the probe is elevated, position the reel at the base of the stack, if possible directly below the line where the bundle will be secured. A draw cable can be fitted with split cable pulling grips. These grips are attached to the bundle at intervals of 35 feet (10 m) maximum. The cable and bundle are then pulled up to the level of the probe. **NOTE: the cable grip is not a recommended method for securing the bundle to the stack. Other methods must be employed.** If the vertical run is offset around the stack from the probe location, the installer should pull sufficient bundle up the stack to make the offset. The bundle is secured on the vertical run before routing the bundle around the stack. Do not attach pulling blocks at the top of the vertical run and

pull the bundle from the probe location. The force applied at the pulling block is sufficient to damage the internal components even though there may be no apparent damage to the jacket. Route the bundle from the vertical run to the probe. Again, allow extra bundle for routing into and connecting to the probe.



Do not connect draw cable to the tubes or heater in the bundle and attempt to pull the bundle up. This will damage the internal components.

Begin securing the bundle within 18 inches (450 mm) of the inlet, using clamps and installation accessories detailed the following sections. Never use wire or thin cable ties to secure Unitherm bundles. Follow the bundle back from the probe, securing the bundle at the recommended support locations. Unitherm bundles are generally supported every 6 feet (2 m) on a horizontal run and every 15 feet (4,5 m) on a vertical run.



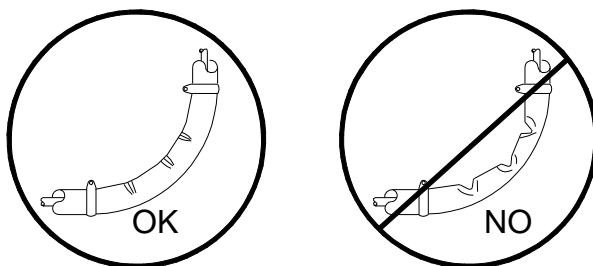
Plastic cable ties used for supporting and securing bundles must be wide bearing, UV and weather resistant, and designed for the maximum jacket temperature of the bundle. Failure of the ties can allow the bundle to fall from the supports. Cable ties should not be used unless the bundle is being secured to cable tray. The distance between tie points should be no more than 6 feet (2 m) for a horizontal run and 3 feet (1 m) for a vertical run.

Once the bundle is secured at the base of the stack, it can then be routed along exiting structures or in cable trays to the instrument. At this point, the draw cable and cable grips can be removed and used on another bundle. Again, the bundle should be laid in, not pulled.

On reaching the instrument, sufficient bundle should be pulled off the reel to route into the instrument enclosure or cabinet. Contact Unitherm Customer Service for recommendations on bulkhead fittings and entry seals for this application.

### ***METHODS OF BENDING***

Bending the Unitherm traced products can be accomplished by various means, depending upon the product type and size. In any case, no bend should exceed the minimum bend radius. Exceeding the bend radius can result in damage to the bundle jacket, core tubes, and heater (see Figure 4). Most bundles can be bent by hand. If the metal tubes or a number of messenger wires in the core, other methods may be needed. A thin wall conduit or MCM cable bender can be used with the smaller O.D. tube bundles. Other types of benders can also be used for all products if care is taken to prevent flattening of the tube(s) or damaging or misplacing the heating element. (A small amount of wrinkling in the jacket is normal and does not indicate bundle failure or loss of bundle properties.



(FIG 4)

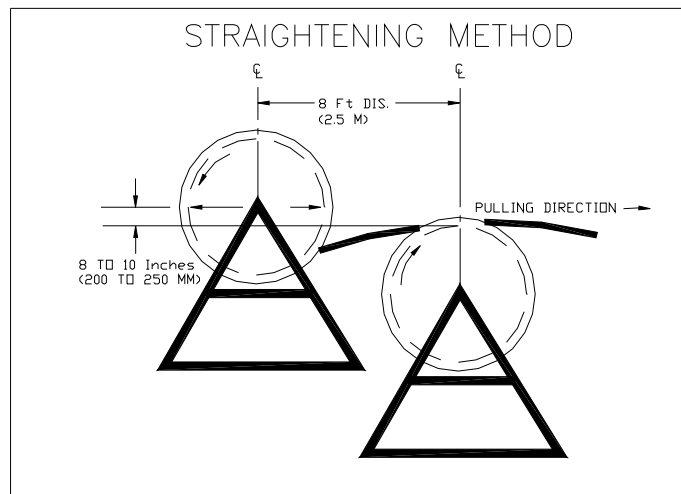
A stationary mandrel may also be used for bending. The mandrel, such as a cable reel flange, should have a diameter of twice the minimum bend radius of the particular product. If the mandrel is smaller than twice the

minimum bend radius, the complete bend cannot be made in one operation. Several large curvature bends must be made throughout the entire bend area so as not to exceed the minimum bend radius. The installer should also use this procedure when hand bending.

### **UNCOILING METHODS**

A free-wheeling payoff stand should always be used when uncoiling bundles. Tension should always be minimal, just enough to keep the reel from overrunning the pull.

Most bundles will exhibit a slight curve or bow when de-reeled. This bow can be removed by hand, or by drawing the bundle over a second reel as shown below. Again, care must be taken not to exceed the minimum bending radius.

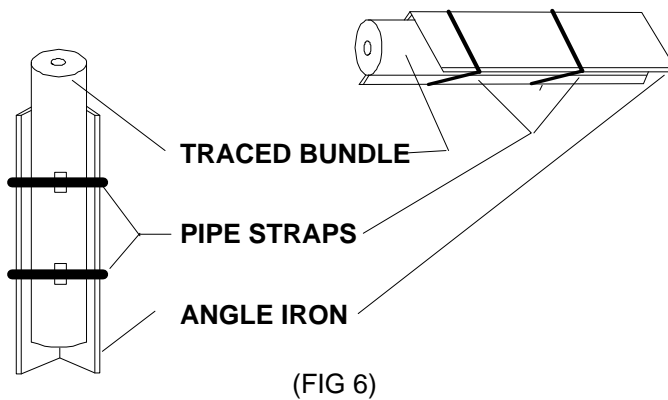


## HANGING AND SUPPORTS

Unitherm traced products should be supported securely according to the support center dimensions shown in the Unitherm catalog. Standard support distance for most bundles is 15 feet between vertical supports and 6 feet between horizontal supports. In addition to these dimensions, the product should be securely supported within 18 to 24 inches (450 to 600 mm) of any connection kit. Suggested support methods are listed below.

### 1. ANGLE IRON

Angle Iron, sized to the closest 1/2" (12 mm) to the nominal bundle O.D., can be used effectively to support long vertical or horizontal single bundle runs.



The Unitherm traced product is secured to the angle iron with either plastic or metal strap ties (Figure 6). As always, strap ties should have wide bearing area and should not be so tight that they deform the jacket of the bundle more than 1/8 inch (3 mm). Horizontal

runs should have the angle iron over the Unitherm traced product to prevent containment of water, ice and snow.

### 2. CHANNEL IRON

Channel Iron can be used in the same manner as angle iron, but can accept multiple bundles if sizing is made to allow bundle separation. Strap ties may also be used here.

### 3. CABLE TRAY

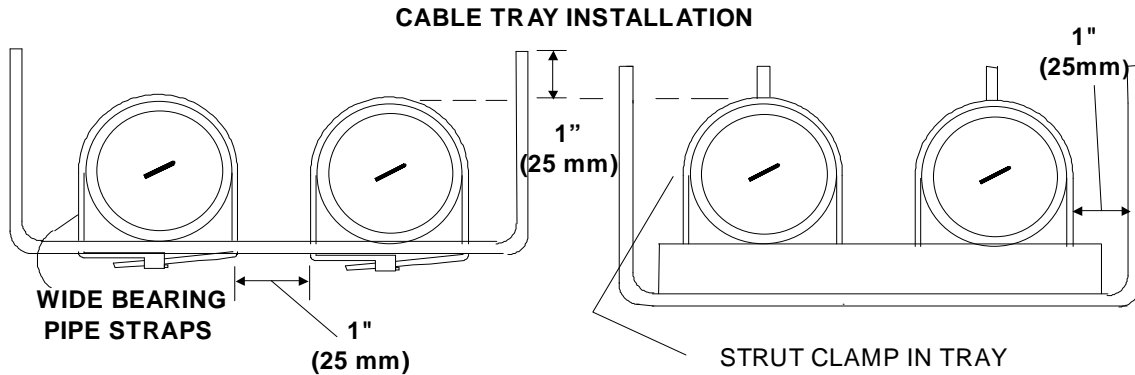


Figure 7

Standard industrial grade cable trays are best suited for multiple product runs. The product should be anchored to the tray to maintain clearance between the bundles. Securing each bundle to the tray within 18" to 24" (450 to 600 mm) of either side of a bend is recommended. The minimum spacing rule of 1 inch (25 mm) should apply on straight runs and bends (see Figure 7). Cable tray bends should be sized to the next standard size above the minimum bending radius of the bundle.

### 4. PIPE OR TUBE SUPPORTS

Unitherm recommends individual supporting hardware that has large supporting surface areas and cannot be over-tightened to the point where the support can crush the product and damage the core tube or heating element (see Figure 8).

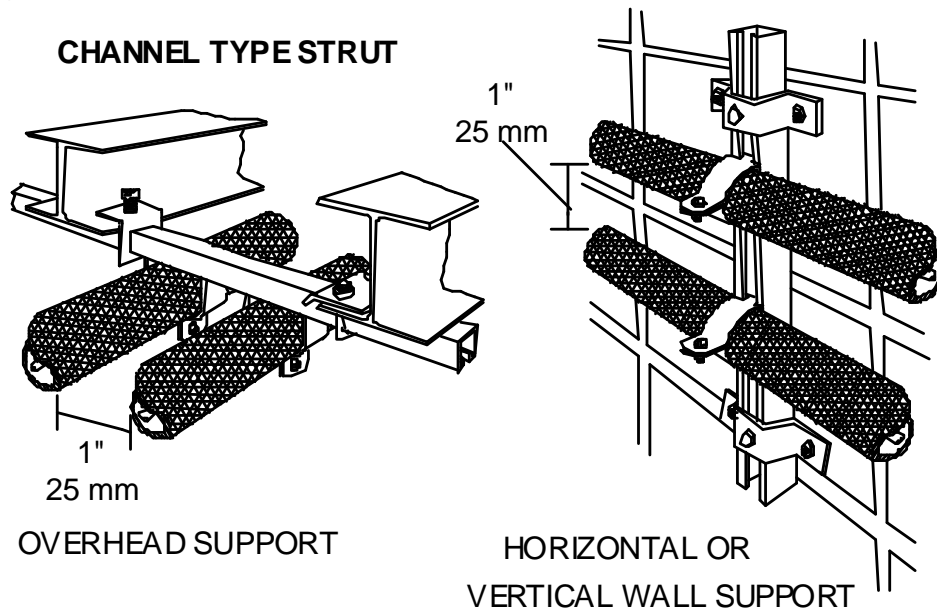


Figure 8.



Strut clamps are sized according to the bundle diameter and the location of the clamp. Clamps used on horizontal runs are sized to the nearest standard size greater than the bundle diameter. This allows the bundle to expand and contract through the clamp. Clamps used on vertical runs are sized to the nearest standard size less than the bundle diameter. This provides a secure anchor for the vertical run. Smooth radius bends at each end of the vertical run are recommended.

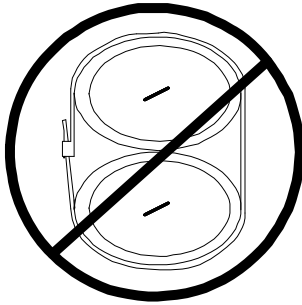


Figure 9.

Do not use wires or thin ties to tie bundles together or to attach bundles to hangers. These deform the jacket and insulation, reducing bundle efficiency and life.

**SUGGESTED HANGER TYPES ARE:**

- Double Bolt Hangers
- Band Hangers
- Split Steel Hanger
- F & M Hanger
- Short Clip Hanger
- Sliding Guide Support
- Refrigeration Clevis Hanger
- Auto Grip Insul-Speed Hanger
- Copper Tubing Adjustable Ring Hanger

**TYPES OF USE**

- Support and anchor
- Support
- Support and anchor
- Support and anchor
- Support and anchor
- Support and anchor
- Support
- Support
- Support

***THERMAL EXPANSION***

The construction of the Unitherm traced products inherently allow for movement caused by thermal expansion and contraction. Using smooth radius bends generally provide enough freedom to absorb tube movement due to thermal expansion. If there are no bends in a long run using a single metal process tube product, some method, such as an expansion loop, should be used to take up the movement.



Extra care should be taken to allow space for thermal expansion in bundles operating at temperatures above 400°F (204°C).

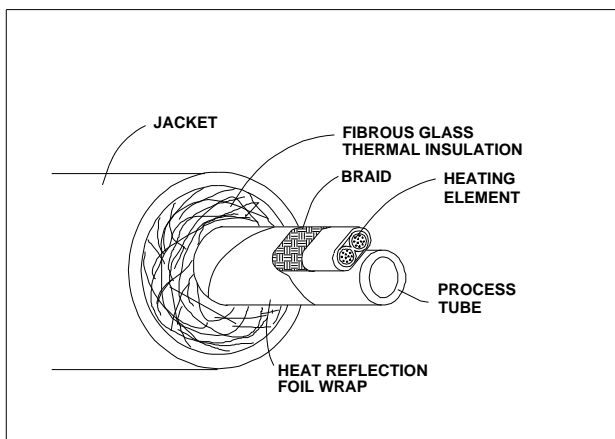
## ***ELECTRICAL CONNECTIONS***

The following section deals with terminating and connecting Unitherm electrically heated bundles to electrical power. If the bundle is factory sealed and terminated (common with Unitherm Heated Hose products), follow the instructions on the label attached to the power lead wires. The color code identifying the power leads is shown on the label.



These guidelines do not absolve the installer from meeting all national and local electric and safety codes when connecting Unitherm electric traced bundles.

The 2252, 2256, 2262, 2266, 2F52 and 2F56 products use a parallel resistance heating element with bus wires. These wires can be connected directly to the power supply wires after separation. These bus wires **must not** be connected together on the termination end and must be electrically isolated from one another and from the overall braid shield.



**Figure 10 - TYPICAL ELECTRIC TRACED BUNDLE**

## ***CONNECTION KITS***

Electrical connection kits are offered for each product, which provide an electrical enclosure and weather tight connection. Dekoron/Unitherm SR and CPD heaters can be connected and terminated using a Unitherm P/N 1548-1200J Electrical Connection Kit. This kit contains all the components necessary to make: 1- input power connection; -or- 1- input power splice connection; -or- 1- splice connection; -and- 2- termination connections. Bundles using Raychem or other heaters must be terminated using the manufacturer's recommended kits.

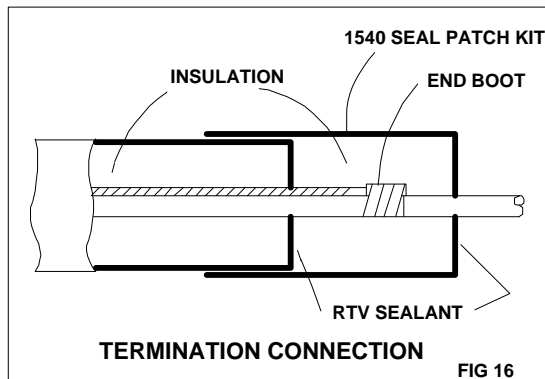
Follow the instructions for power connection and termination procedures found with the specific kit used.

## SEALING TERMINATION END OF BUNDLE

The termination end of the bundle can be sealed from moisture using the RTV sealant supplied in the kit.

1. Push thermal insulation inside the bundle end about 1/4 inch.
2. Fill void with RTV sealant.

If the end of the bundle is in a "wash-down" area or any place where additional



protection is necessary, a double seal can be provided using a Unitherm 1540-10000 Seal Patch kit. (See Figure 16)

1. Seal the end of the bundle as outlined above.
2. Wrap thermal insulation supplied in Seal Patch kit around core, building to the diameter of the bundle.
3. Form Seal Patch over insulation and bundle jacket and seal together.
4. Press back thermal insulation and seal with RTV as outlined above.

## INSTALLATION WITHOUT CONNECTION KITS

Use of the Unitherm 1548-12000 connection kit is a convenient way to insure a safe power connection and termination in all applications, and is required if the installer is terminating in a area classified as hazardous under the National Electric Code. If the installer does not choose to use these connection kits, certain procedures must be followed:

1. The heating wires must be connected to the cold lead wire or spliced together with an approved crimp connector which will withstand the temperatures generated.
2. The connections should be insulated in an approved method that is rated for the area and temperature of the installation.
3. The ends of the product must be sealed to prevent the entry of water. Sealing can be done by using a sealing grommet type bulkhead connector for entrance into an instrument enclosure, analyzer cabinet or a power supply cabinet. A high temperature sealant or cement, such as Part No. 1535-02080 End Sealant can be used to encapsulate the end. Whichever method is used, all national and local electrical and safety codes must be followed.

**FINAL CHECKS**

1. Check that all hangers and supports are secure to bundle, but not overly tight.
2. Check for extreme jacket kinking and for bends less than the minimum radius.
3. Check that all electrical connections are tight and properly insulated.
4. Check that heating element is not in contact with the temperature sensor.
5. Check that all connection kit covers have gaskets and are fastened tightly.
6. Check that all connections and components meet NEC and all Local Codes.

In addition to the above tests, the installer may elect to run a series of pre-commissioning tests. These tests check the electrical and pneumatic integrity of the analyzer bundle. Unitherm has developed a series of pressure / vacuum / electrical tests for this purpose.

***Pre-Commissioning Test Program for Unitherm Analyzer Bundles*****1. Scope**

This procedure covers pressure and vacuum tests run on sample line tubing and electrical tests run on electric heating elements prior to commissioning Unitherm electrically heated analyzer bundles.

**2. Equipment Required**

- a. pressure gauge capable of reading 0-30 psig (0 –2 Bar)
- b. vacuum pump with gauge and flowmeter (typically analyzer sample pump)
- c. portable volt-ohm meter
- d. portable megger

### 3. Procedure

#### 3.1 Pressure Test

The purpose of the pressure test is to determine if there are any leaks or pinholes in the sample tubing.

1. Cap the tubing at the probe end of the bundle.
2. Pressurize the sample tube to 30psig (2 Bar) and close off the supply.
3. Watch the pressure gauge for any drop.  
Typically, the tube pressure could drop up to 5 psig (0,3 Bar) over 10 minutes due to cooling of the air, any further drop could indicate a leak.
4. If the gauge pressure drops more than 5 psig (0,3 Bar) in 10 minutes, check all connections to insure that there are no leaks at the connection points, and repressurize the tube.
5. If the gauge pressure again drops, and there are no detectable leaks at the fittings, check for mechanical damage at the ends of the bundle, where the tubing is unprotected.
6. Continued pressure drop with no observable leaks indicates a pinhole within the bundle.

#### 3.2 Vacuum Test

The purpose of the vacuum test is to determine if the tubing is plugged or kinked within the bundle.

1. Attach the probe end of the bundle to a filter to prevent dust and dirt from being drawn into the sample tube.
2. Attach the analyzer end to the analyzer pump or auxiliary vacuum pump.
3. Energize the pump and record the air flow rate and vacuum level.
4. The values recorded above must be within the analyzer manufacturer's specification to insure that the proper sample volume is pulled into the analyzer.
5. A high vacuum level with very little flow could indicate a kink or plug in the sample line.
6. A moderate to high vacuum level with normal flow could indicate the sample line is undersized for the flow rate required and the length of the sample line.
7. A moderate to low vacuum level with normal flow indicates there are no plugs or kinks in the sample tubing.

### 3.3 Electrical Tests

The purpose of the electrical tests are to insure that the heater is continuous and has no faults in its electrical insulation.

1. Tie the two heater bus wires together at the analyzer end of the bundle.
2. Read the resistance across these bus wires from the probe end of the bundle. Typical bus wire resistance should be less than 10 ohms.  
A high bus wire resistance indicates a broken lead wire within the bundle.
3. Tie the two heater bus wires together at the probe end of the bundle and electrically insulate them to insure they do not short out against the braid or any ground point adjacent to the heater cable. Note, the bus wires are tied together only for this test. They must be separated for final installation and termination.
4. Attach a portable megger at the analyzer end of the bundle  
The positive lead of the megger should be connected to the two heater bus wires that were twisted together in the earlier test. The negative lead of the megger should be connected to the heater braid.
5. Megger the heater at 500 VDC.  
The megger reading should be greater than 10Meg Ohm.
6. If the megger reading is less than 10Meg Ohm, check for contact between the braid and the heater bus wires at both ends of the bundle.

### 4. Testing Complete

On completion of the above tests, the sample line is ready for final installation and commissioning. Record values obtained in testing. These can be used to troubleshoot any future problems. Install termination and input power kits to bundle per the instructions supplied with the kits.

**SUMMARY**

The following list summarizes some of the important items to remember when installing Unitherm bundles.

<u>INSTALLATION</u>	
Don'ts	Dos
DO NOT EXCEED MINIMUM BEND RADIUS.	DO PROVIDE LONG, SWEEPING BENDS WHERE POSSIBLE.
DO NOT EXCEED RECOMMENDED SUPPORT CENTERS.	DO SEAL ALL EXPOSED INSULATION WITH RTV END SEALANT.
DO NOT OVERTIGHTEN SUPPORT CLAMPS—JACKET SHOULD NOT BE PINCHED.	DO SEAL FITTINGS AND SPLICES WITH A SEAL PATCH
DO NOT TIE MULTIPLE RUNS TOGETHER TO FORM ONE BUNDLE—PROPER SPACING(1" (25 mm) MINIMUM) IS REQUIRED FOR HEAT DISSIPATION.	DO STRIP JACKET TO MAKE TIGHT 90 BENDS—USE A UNION ELBOW WHERE TIGHT BENDS ARE NECESSARY AND SEAL INSULATION.
DO NOT SEVERELY CRIMP JACKET AS THIS MAY AFFECT INSULATION PROPERTIES, SOME SLIGHT CRIMPING CAN BE EXPECTED WITH HAND—FORMED BENDS.	DO USE A MANDREL TO ASSURE CONSTANT RADIUS BENDS WHERE POSSIBLE.
DO NOT REMOVE EXCESSIVE AMOUNTS OF JACKET AND INSULATION AT FITTINGS.	DO SLOPE FOR CONDENSATE 1 IN (25 mm) PER FOOT.
DO NOT ALLOW THE HEATING ELEMENT TO BE IN CONTACT WITH THE SENSOR	DO CHECK THAT ALL ELECTRICAL CONNECTIONS ARE TIGHT AND SEALED.
DO NOT ROUTE ELECTRIC TRACE BUNDLES WHERE THE AMBIENT WILL BE ABOVE 110°F (49°C)	DO CHECK THAT ALL CONNECTION BOX COVERS HAVE GASKETS AND ARE FASTENED TIGHTLY.
	DO SECURE END KITS WHEN USING TEFLON TUBE TRACE PRODUCTS TO REDUCE STRAIN ON THE FITTINGS.