

Freeze Protection of Pipework

Prevent Burst or Blocked Pipes

The Problem

Thermal insulation alone will not prevent freezing of pipes. For example, a 25mm diameter water pipe at +5°C, fitted with 25mm thick thermal insulation, will freeze within one hour in an ambient temperature of just -10°C!

Frozen water pipes can burst, causing loss of supply, flooding and damage. Wax can form in heating fuel oil lines causing a blockage and subsequent boiler shutdown. Freezstop Micro from Heat Trace Limited eliminates these problems safely and efficiently.



The Problem



The Solution

The Solution

The Freezstop Micro system was developed for use on almost all pipes - metallic or plastic. However plastic pipes must be foiled under and over the heating cable to help to dissipate heat into the pipe. Heating cables prevent hot and cold water pipes from freezing, fuel oil lines and pipes containing other fluids, or chemicals from clogging or crystallising.

Safe, Efficient, Reliable

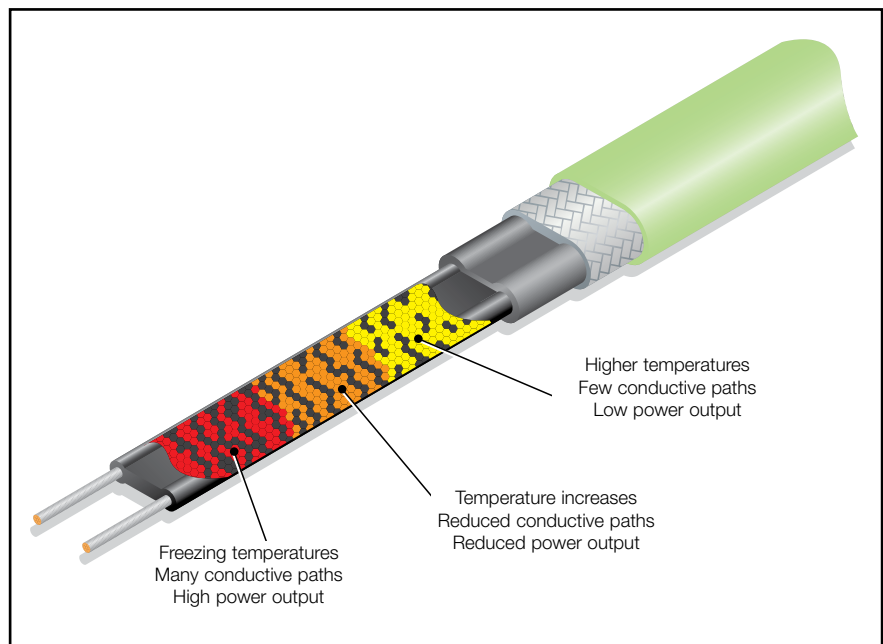
Freezstop Micro is a self-regulating heating cable especially developed for this application. The self-regulating effect causes the cable to generate progressively more heat as the pipe cools down and less heat as the temperature rises. Thus, it is energy efficient and can never overheat or burnout - even when overlapped.

Freezstop Micro is Inherently Temperature Safe, energy efficient and reliable. It operates automatically and requires virtually no maintenance.

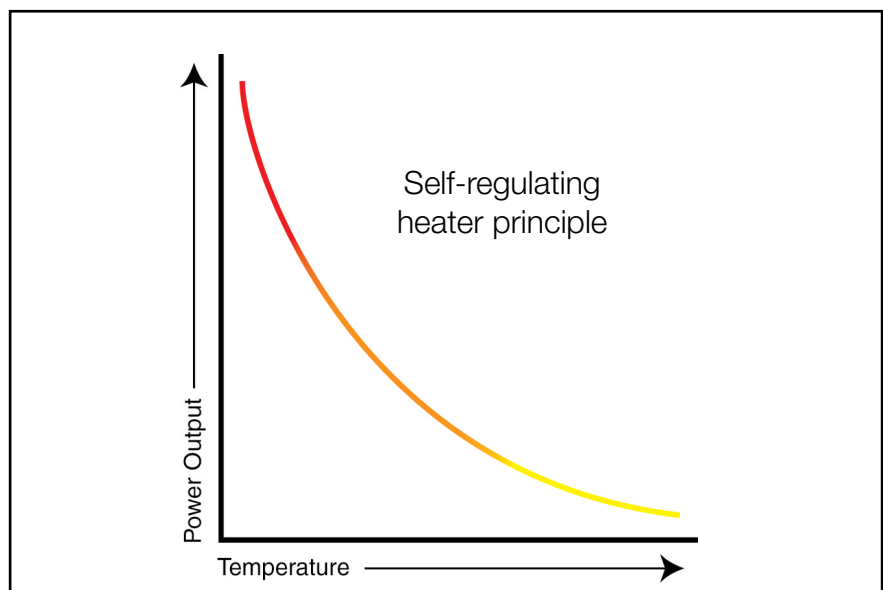
Inherently Temperature Safe - means that, "the cable's ability to self-regulate at a temperature level below the maximum product rating and withstand temperature of the insulating materials, without the need for temperature control"

Complete System

Freezstop Micro comprises the Freezstop Micro heating cable, together with a range of easily installed termination kits and ancillary items. A simple frost thermostat can be used to ensure that the system energises only during winter temperatures. The power supply can be fed from a local distribution board, or consumer unit, fitted with suitably rated circuit breakers. System design and installation is easy even for inexperienced electricians.



How self-regulating heaters work



Design Guide

A Freezstop Micro system can be designed in 4 steps.

STEP 1 - Determine heating cable type and thermal insulation thickness

STEP 2 - Calculate heating cable length required.

STEP 3 - Determine the number of heating circuits / distribution board requirements

STEP 4 - Define the number of system components needed.

STEP 1

Selection of Heating Cable Type and Thermal Insulation Thickness

The Freezstop Micro system has two(2) heater cable outputs - 11W/m and 17W/m.

The following Tables match the right power output heating cable with the thermal insulation thickness required to maintain pipes at +5°C for different minimum ambient temperatures and pipe sizes. [Figure for plastic pipes are shown in blue](#)

Calculation Basis for Tables:

Decimal numbers indicate heating cable spiralled to pipe (spiral ratio)

e.g. 1.3 = 1.3m of heater per metre of pipe. Whole numbers mean straight-traced cables.

e.g. 2 means 2 cables straight traced.

11 = Heating Cable Cat Ref 11FSM2-CT

17 = Heating Cable Cat Ref 17FSM2-CT

Supply voltage 230V (other voltages also available)

Insulation k-factor is based on 0.037W/mK, an average to include various materials such as, glass fibre, mineral wool, 'Armaflex' nitrile rubber, etc., are all suitable.

For conditions other than as stated, consult your local Heat Trace Ltd representative.

Cable length needed is pipe length multiplied by the number of cables, or the spiral ratio.

FOR MINIMUM AMBIENT TEMPERATURES DOWN TO -15°C

NOTE When installing heating cable onto plastic pipes additional power is required, In addition, to help heat transfer into the pipe, it is recommended that aluminium foil should be placed around the pipe to aid heat transfer into the pipe.

Key - Steel Pipes
Plastic Pipes

Pipe Size	Insulation Thickness (mm)				
	9	20	25	40	50
½"	1 x 11 <i>1 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
¾"	1 x 11 <i>1.1 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
1"	1 x 17 <i>1.2 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
1¼"	1 x 17 <i>1.2 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
1½"	1 x 17 <i>1.3 x 17</i>	1 x 11 <i>1 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
2"	1.2 x 17 <i>2 x 17</i>	1 x 11 <i>1 x 17</i>	1 x 11 <i>1 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
2½"	1.4 x 17 -	1 x 17 <i>1 x 17</i>	1 x 11 <i>1 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
3"	2 x 17 -	1 x 17 <i>1.2 x 17</i>	1 x 17 <i>1 x 17</i>	1 x 11 <i>1 x 17</i>	1 x 11 <i>1 x 11</i>
4"	-	1.1 x 17 <i>1.4 x 17</i>	1 x 17 <i>1.2 x 17</i>	1 x 11 <i>1 x 17</i>	1 x 11 <i>1 x 17</i>
6"	-	1.5 x 17 <i>2 x 17</i>	1.3 x 17 <i>2 x 17</i>	1 x 17 <i>1.1 x 17</i>	1 x 17 <i>1 x 17</i>

Examples from above table:

2" metal pipe with 25mm insulation = 1m x 11FSM2-CT for each metre of pipe.

4" plastic pipe with 20mm insulation = 1.4m x 17FSM2-CT heater for each metre of pipe.

FOR MINIMUM AMBIENT TEMPERATURES DOWN TO -30°C

NOTE When installing heating cable onto plastic pipes it is recommended that aluminium foil should be placed around the pipe to aid heat transfer into the pipe.

Key - Steel Pipes
Plastic Pipes

Pipe Size	Insulation Thickness (mm)				
	9	20	25	40	50
½"	1 x 17 <i>1.2 x 17</i>	1 x 11 <i>1.1 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
¾"	1.1 x 17 <i>1.5 x 17</i>	1 x 11 <i>1.3 x 17</i>	1 x 11 <i>1.1 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
1"	1.3 x 17 -	1 x 17 <i>1.5 x 17</i>	1 x 11 <i>1.3 x 17</i>	1 x 11 <i>1 x 11</i>	1 x 11 <i>1 x 11</i>
1¼"	2 x 17 -	1 x 17 <i>2 x 17</i>	1 x 17 <i>1.5 x 17</i>	1 x 11 <i>1.2 x 17</i>	1 x 11 <i>1 x 11</i>
1½"	2 x 17 -	1 x 17 <i>1.3 x 17</i>	1 x 17 <i>1.1 x 17</i>	1 x 11 <i>1.3 x 17</i>	1 x 11 <i>1.1 x 17</i>
2"	-	1 x 17 <i>1.5 x 17</i>	1 x 17 <i>1.3 x 17</i>	1 x 17 <i>1.5 x 17</i>	1 x 11 <i>1.2 x 17</i>
2½"	-	1.3 x 17 -	1.1 x 17 <i>1.5 x 17</i>	1 x 17 <i>1.1 x 17</i>	1 x 17 <i>1.4 x 17</i>
3"	-	2 x 17 -	1.3 x 17 -	1 x 17 <i>1.2 x 17</i>	1 x 17 <i>1.1 x 17</i>
4"	-	2 x 17 -	2 x 17 -	1.1 x 17 <i>1.5 x 17</i>	1 x 17 <i>1.3 x 17</i>
6"	-	-	-	1.5 x 17 -	1.3 x 17 <i>2 x 17</i>

Design Guide

STEP 2

Calculation of Heating Cable Length

Total length required = heater length in metres (m) - from STEP 1
 + 0.3m per power connection
 + 1.0m per T splice or T power connector
 + 1.0m per valve
 + 1.0m per un-insulated pipe support
 + 0.3m per pipe flange
 + double traced allowance *

* When a T branch line is less than 2m long, it is usually more economical to double trace the short branch in a loop down and back. Therefore, add the length of each such branch in calculating total heating cable length. **(See typical pipe layout image.)**

STEP 3

Determine the number of heating circuits / local distribution panel (LDP) requirements.

(LDP not supplied)

All heating circuits must be provided with adequate over-current earth leakage protection.

- i) LDP's are recommended with 230V, 16A Type C circuit breakers to BS EN 60 898 and should be fitted with a suitably rated residual current device. (Not supplied)
- ii) More than one heater circuit may be connected to a circuit breaker provided that the maximum heater length does not exceed the breaker capacity. **(See table below.)**
- iii) The number of circuits will normally be determined by the piping layout.

$$\text{Minimum number of heating circuits} = \frac{\text{Total heating cable length}}{\text{Maximum heater circuit length}}$$

Circuit breaker vs. Maximum Cable Length (230V)

		Heating Cable Maximum Length (m)			
		11FSM2		17FSM2	
Startup Temp		0°C	-20°C	0°C	-20°C
16A		128	124	102	88

Note. In addition to over current protection, all heating circuits must be provided with a 30mA residual current device (rcd). A 30mA, 30ms rcd should be fitted to each LDP. Suitable distribution panels should be selected with the correct circuit capacity. Select a panel having circuit capacity equal to or larger than the number of circuits.

System Components

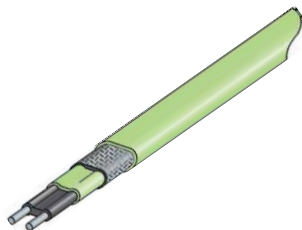
STEP 4

Determination of System Components

Heating Cable Product Data

See FSM Technical Data Sheet for more detailed information on heating cable

Maximum pipe temperature	Catalogue Reference	Nominal W/m Output @ 5°C	
		Metal Pipe	Plastic Pipe
65°C	11FSM2-CT	11	8.2
	17FSM2-CT	17	12.5



Freezstop Micro xxFSM2-CT self-regulating heating cable is designed for freeze protection of metal and plastic pipes. Heat Trace recommend braided and overjacketed heaters for all applications. It is recommended plastic pipes are foiled over and under the heater run to aid heat transfer, using adhesive aluminium foil tape.

Operating Voltage	230V (Nominal)	
Power output multiplier factor	11FSM	17FSM
220V	0.94	0.95
230V	1.00	1.00
240V	1.06	1.05
Nominal dimensions	5.6 x 7.9 mm	
Minimum bending radius (20°C)	20mm	

System Components cont'd

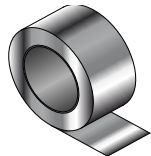
STEP 4 continued

Ancillary Components



FT-HTP - Adhesive black fixing tape
(12mm wide x 30m)

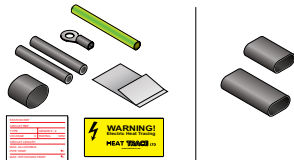
A self-extinguishing conformable PVC adhesive tape. Used for low temperature applications only.
Dimensions: 12mm wide x 33m roll
Max Withstand Temp: 80°C
Min Application Temp: 0°C
Adhesive: Rubber resin



FT-ALUM - Adhesive aluminium foil tape
(75mm wide x 50m) (recommended for use with plastic pipes.)

A 30 micron aluminium foil, coated one side with an acrylic, pressure sensitive adhesive. The tape is backed with a strong polythene coated release paper. Flame retardent and water resistant.
Dimensions: 75mm wide x 45m roll
Max Withstand Temp: 110°C
Min Application Temp: 0°C
Adhesive: Acrylic

Heat Shrink Termination Kit

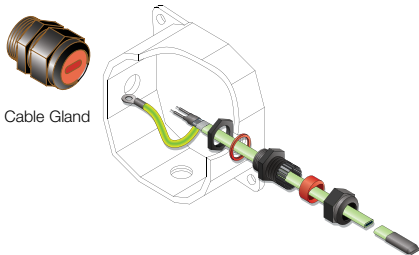


Power Connection Kit (HPS)

End Seal Kit (HES)

HTK1 - Universal Heat Shrink Termination Kit for power end termination and remote end termination.

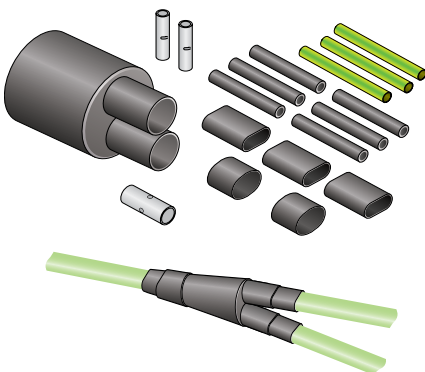
Universal heat shrink termination kit, c/w all components necessary to terminate the power connection end and the remote end of the heating cable. Kit is complete with M20 x 1.5 plastic gland with slotted bush for heating cable. (Junction box not supplied.)



Cable Gland

Completed Heat Shrink Terminated Cable (JB not included)

Heat Shrink T-Splice Kit



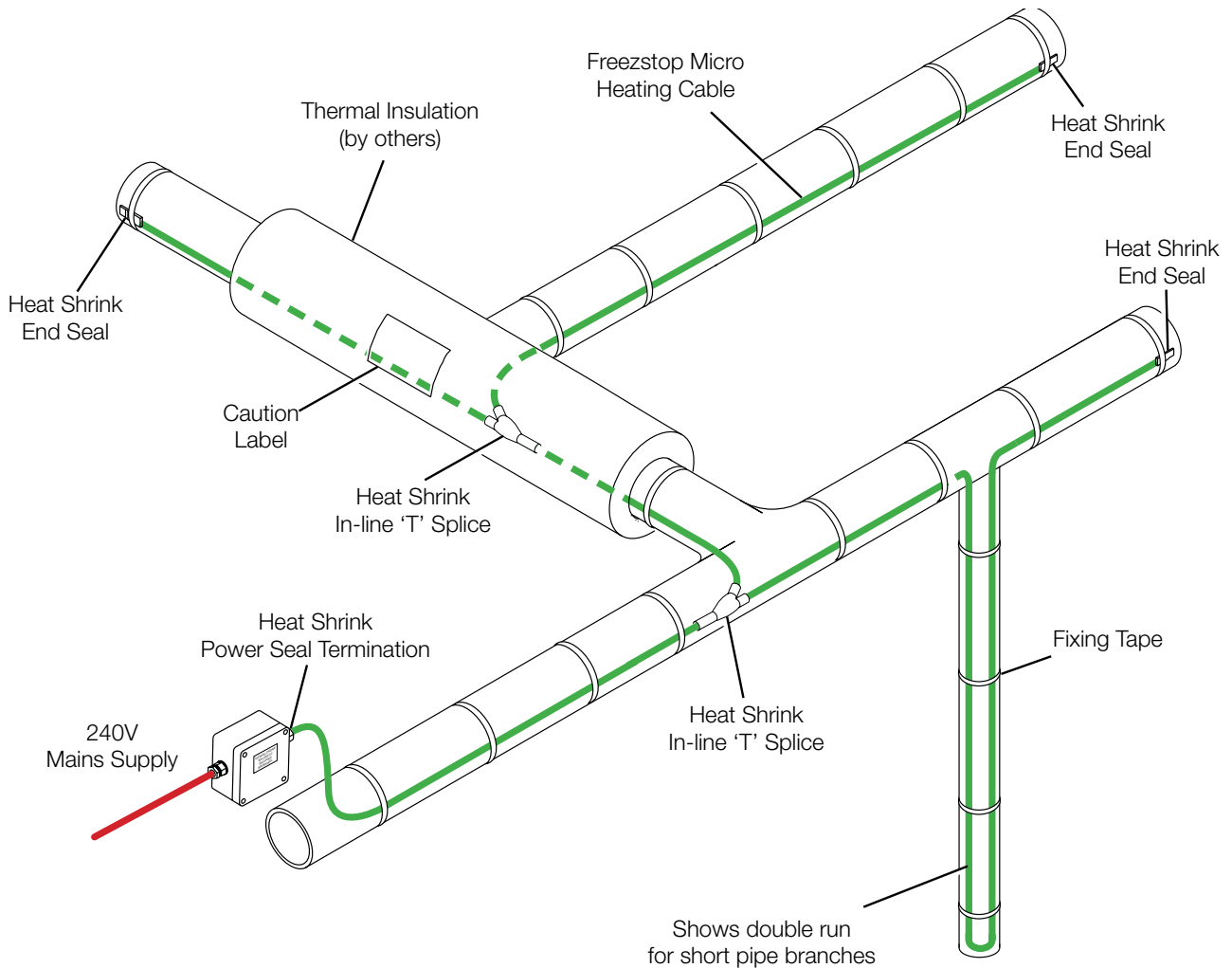
Completed Heat Shrink 3-Way T Splice

HSK-T Heat Shrink T Splice Kit for 3-way heating cable joint.

A 3-way T splice kit for joining 3 cables together at a pipe branch. Complete with all the necessary adhesive-lined heat shrink items: earth/braid sleeves and conductor bullet crimps.

Installation

Typical Freezestop Micro System Installation - showing various components



General Information

The above illustration shows a typical pipe system layout, demonstrating the possible positions of components, terminations and splices. Where there are short branch pipes, of around 1 metre or less, it is usually more economical to double run the heater in a "hairpin" loop, as shown in the above illustration, rather than carry out an inline splice at the pipe T junction.

Terminations

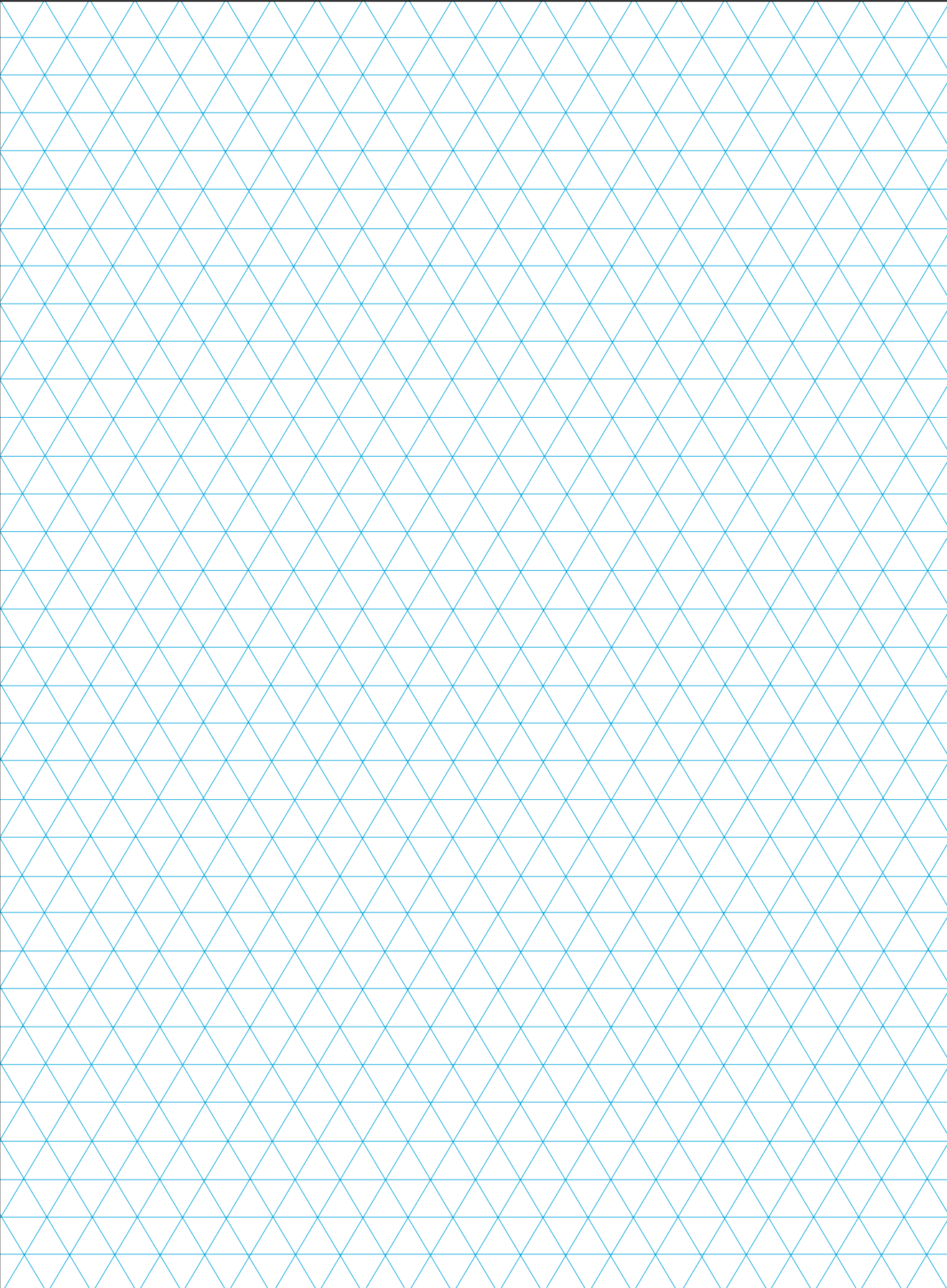
The standard power termination, remote end seal and the in-line splice kits all use adhesive lined heat shrink materials. There is an alternative available using silicone rubber sleeves, boots and silicone sealant, however, the sealant requires 24 hours for full cure.

Control Thermostat

Consideration may be given to controlling the system using a simple air-sensing thermostat for energy efficiency. However, the heater is safe to run without thermostatic control due to the fact that the FREEZSTOP MICRO cable is Inherently Temperature Safe and cannot overheat under its own power.

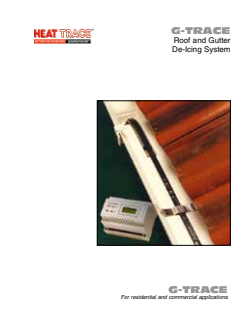
Design

Isometric Graph Sheet for Sketching Pipework Layout

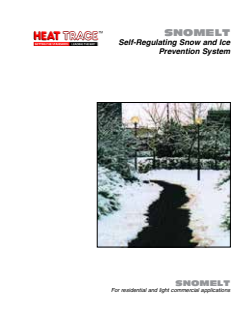


OTHER SYSTEMS AVAILABLE FROM HEAT TRACE

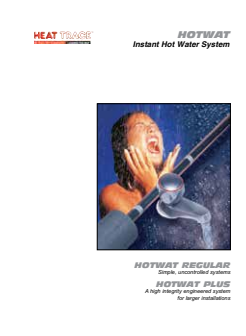
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