



# DREXAN™ HeatTracer



## Heating Cable Application Bulletin: Power Plants.

Application Bulletin Power Plants



[www.drexanheattracer.com](http://www.drexanheattracer.com)

Tech Line:  
1-800-663-6873

Right Product, Right Place, Right Price™

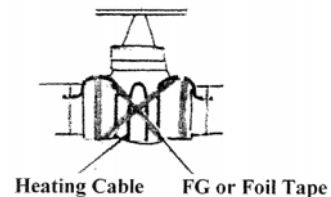
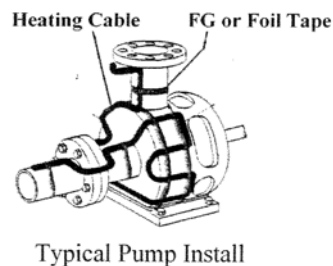
Power plants require heat tracing on process water lines, fuel oil lines, and steam condensate lines.

Process water lines require freeze protection. Since the lines are not exposed to high temperatures or organic/inorganic fluids, an ordinary freeze protection self regulating cable with polyolefin jacket suffices.

For cables installed on fuel oil lines, exposure of the cable to hydrocarbons at valves, flanges and pumps requires the use of Fluoropolymer jackets. Polyolefin jackets degrade and lose mechanical and dielectric properties over time with exposure to hydrocarbons.

Steam condensate lines are heat traced to prevent freeze ups during downtime in winter months. The cables must be selected to withstand the high operating temperatures of steam. Very often, self regulating heaters with low maximum exposure temperatures are misapplied on steam condensate lines. When exposed to excessive temperatures, the conductive polymeric heating matrix breaks down and the power output of the cable decreases over time. Two heater options are recommended on steam condensate lines: high temperature self regulating cables, or inorganic, metallic-sheathed constant-wattage cables. Series-circuit Mineral insulated cables used in high temperature applications are custom-manufactured and installed on the exact pipe for which they are designed. They are very good for long lines. Alternatively, PipeGuard CMH provides an alternative to series-circuit MI cables. PipeGuard CMH is a parallel construction, constant wattage cable with great flexibility and ruggedness that can be cut in the field, and repaired in the field with standard tools.

- Requirements for process water. The cable should have a polyolefin jacket unless there is potential for exposure to hydrocarbons, in which case the jacket should be specified as Fluoropolymer.
- Requirements for fuel oil. The cable should have a Fluoropolymer jacket. The cable must be specified for the maximum exposure temperature of the pipe, not the fluid (e.g. if the line is steamed out).
- Requirements for steam condensate lines. The cable must be specified for the maximum exposure temperature of steam. This will require Fluoropolymer jackets for both the inner and outer jacket as well as a fibre construction for self regulating heaters, or the specification of MI Cable or PipeGuard™CMH with a maximum temperature withstand of 350C.
- Requirement for monitoring and control. Most power plants are highly automated and have streamlined work forces. Reliability is critical since outages can result in a plant being taken offline with denial of service to power subscribers and added load on the rest of the power distribution network. The heat tracing system should have appropriate monitoring and control to function automatically, while providing immediate warnings and alarms to provide adequate time for the appropriate response by the maintenance work force. Stand-alone controllers with integral ground fault and alarm outputs should be specified throughout.
- Installation for ease of removal and replacement of valves and pumps. In power generation, pumps and valves must be maintained. Cables should be installed to simplify maintenance. Incorrectly installed cable can not only increase the time to remove and replace components from piping systems, but may result in cable damage that extends down-time and increases maintenance costs.



## Generic Specification for Power Plants

### General:

Furnish, install and commission a complete Approvals-Agency certified heat tracing system comprising self-regulating heating cables, connection components, and monitoring and control panels for the purposes of

- a. **Freeze protection** for any pipes containing water (or water mixture); or
- b. **Fuel temperature maintenance** for fuel lines , tanks or accessory requiring a safe, easily installed heat source; or
- c. **Freeze protection** of steam condensate lines where the cables are exposed to elevated operating temperatures.

### Products:

#### 1. Self Regulating Heating Cable – Freeze Protection for Process Water.

##### a. Construction:

###### i. At a minimum self-regulating heating cable shall be:

1. A parallel circuit consisting of (or comprising) two (2) 16 AWG main bus wires nickel copper extruded within in a semi-conductive, self-regulating polymeric core.
2. The cable shall be capable of being cut to length and powered and terminated in the field by licensed qualified trades people.
3. The polymeric core shall be encased in a radiated cross-linked, modified polyolefin dielectric jacket. The dielectric jacket shall have a tinned copper wire shield (braided) encased in an outer jacket of polyolefin (SJP) which is specified for service where the cable jacket will not be exposed to organic or inorganic chemicals. Jacket specification is Drexan HeatTracer –SJP.

##### b. Performance:

- i. Wattage output of self regulating cables shall vary along the linear length of the cable in response to, and in direct proportion to the temperature in immediate proximity (or in contact with) the cable.
- ii. **Tolerances:** Rated output (as certified by CSA) shall be -0% to +10% of published rated output as stated in catalogue and so marked on cable.
- iii. The cable shall be capable of operating at 120, 208, 220, 240, or 277 volts without use of a transformer.
- iv. The wattage output of the cable shall be matched to the heat loss of the pipe at minimum design ambient temperature as calculated by manufacturer's **ProTrace** heat tracing design software.

##### c. Warranty:

- i. Self Regulating Cable shall be furnished with a standard 3 year warranty against defects in workmanship and product quality.

##### d. Acceptable Products: **Drexan™ HeatTracer PipeGuard SJP.**

#### 2. Self Regulating Heating Cable – Freeze Protection for Steam Condensate Lines and Temperature Maintenance for Fuel Oil Lines.

##### a. Construction:

###### i. At a minimum self-regulating heating cable shall be:

1. A parallel circuit consisting of (or comprising) two (2) 14 AWG main bus wires, nickel copper, separated by a dielectric insulating spacer; around which is wrapped one or more semi-conductive, self-regulating fiber heating elements.
2. The cable shall be capable of being cut to length and powered and terminated in the field by licensed qualified trades people.
3. The heater core shall be encased in a Fluoropolymer dielectric jacket. The dielectric jacket shall have a tinned copper wire shield (braided) encased in an outer jacket of Fluoropolymer.

##### b. Performance:

- i. Wattage output of self regulating cables shall vary along the linear length of the cable in response to, and in direct proportion to the temperature in immediate proximity (or in contact with) the cable.
- ii. **Tolerances:** Rated output (as certified by CSA) shall be -0% to +10% of published rated output as stated in catalogue and so marked on cable.
- iii. The cable shall be capable of operating at 120, 208, 220, 240, or 277 volts without use of a transformer.
- iv. The wattage output of the cable shall be matched to the heat loss of the pipe at minimum design ambient temperature as calculated by manufacturer's **ProTrace** heat tracing design software.

c. Warranty:

- i. Self Regulating Cable shall be furnished with a standard 3 year warranty against defects in workmanship and product quality.

Acceptable Products: **Drexan™ HeatTracer PipeGuard Hot.**

3. Components

Drexan™ HeatTracer power connections, splices and end seals must be used, as per installation instructions, with the Drexan HeatTracer Cables to ensure product performance criteria and to comply with requirements of warranty, codes and approvals.

The connections components shall be one of the following varieties:

- i. heat shrinkable
- ii. metallic assemblies
- iii. **PowerPod™** polymeric quick connections (for PipeGuard -SJ and PipeGuard -SJP only)

The connections shall be mounted on or above the insulation to allow access for inspection and troubleshooting.

A visible light indicator shall be provided at the end of the circuit to allow for visual confirmation of continuity when the heating cable is energized.

End seals shall be re-enterable for inspection and troubleshooting.

4. Monitoring and Control

a. Electronic Monitoring and Control Panel: **RECOMMENDED**

A programmable, solid-state Heat Tracing Monitoring and Control Panel shall be installed to provide the following System Fault Alarms:

- i. Breaker off or tripped.
- ii. Heater continuity or low current.
- iii. Ground fault trip.
- iv. Low temperature.
- v. High temperature.
- vi. Sensor fault.
- vii. The panel shall include
  1. DC or AC alarm output for PLC or remote alarm indication.
  2. A viewable LED Alarm indicator shall be on the door of the enclosure.
  3. The panel shall be a weatherproof, NEMA-4X enclosure.
  4. The panel shall exercise dormant heat tracing systems every 24 hours for early warning to prevent shut-downs.

Note: Alarm relays: where required by applicable law, alarm outputs may also be required.

**Note: In all applications the heating cable circuit shall be protected with ground fault equipment in accordance with the National and Canadian Electrical Codes.**

b. Where redundant systems are required to ensure uninterrupted freeze protection, two heating systems shall be installed on the lines and a two-circuit controller shall be installed, with one heating cable being operational and the other being available as a stand-by back-up.

**Installation and Commissioning:**

a. Heat tracing cable and cable connection components shall be installed in accordance with Manufacturer's Installation Instructions, including compliance with maximum circuit lengths for the selected breaker size and the design ambient start up conditions.

b. Heating cable shall be affixed to piping using fiberglass tape or nylon cable ties. Polyvinyl electrical tape and metallic pipe straps shall not be used.

b. Safety labels shall be affixed to the exterior of the insulated line.

c. The system shall be considered acceptable when all of the following conditions are met:

- i. Heating cable has been correctly installed;
- ii. connection components have been correctly installed;
- iii. the heat tracing lines are insulated;
- iv. the monitoring and control panel has been correctly installed;
- v. the monitoring and control panel has been correctly programmed;
- vi. power has been applied to the heat tracing control panel; and
- vii. The heat tracing control panel shows no alarms.

viii. All of the above are certified by a representative of the manufacturer or an approved contractor.

Note: if thermostat and ground fault breaker are installed, then continuity must be confirmed after installation of insulation.

5. Constant Wattage Metallic High Temperature Heating Cable – Freeze Protection for Steam Condensate Lines.

a. Cables:

- a. Heating Cables supplied shall be Drexan™ HeatTracer PipeGuard™ CMH Parallel-Circuit Constant Wattage Heating Cables or equivalent
- b. Heat tracing applications with Maximum continuous operating temperatures from 150C to 300C or Maximum continuous exposure temperatures up to 350C shall use parallel-circuit, cut-to-length, metallic corrugated-sheath, 350C rated maximum continuous exposure temperature constant wattage heating cables. Continuous exposure (maintain) temperatures are based on wattage and voltage used; consult with vendor for specific cable temperature limits.
  - i. Cut-to-length, metallic, 350C rated maximum continuous exposure temperature constant wattage heating cables shall use a Corrugated Stainless-Steel metallic sheath. This sheath must have a thickness of at least 0.007 inches and be of a stainless steel grade appropriate for the application conditions.
  - ii. Aluminum sheaths shall not be permitted
  - iii. The metallic sheath shall have annular corrugations such that the heating cable can be bent easily and repeatedly around a 2 inch diameter mandrel without work hardening or stress cracking of the sheath after 15 flexes.
  - iv. Cut-to-length, metallic, 350C rated maximum continuous exposure temperature constant wattage heating cables shall be parallel zoned construction with zone lengths, bus to bus, of no more than 12 inches (30 cm) for voltages up to 277V, and no more than 24 inches (60 cm) for voltages of 480V and 600V.
  - v. Each zone in the heating cable shall incorporate multiple, redundant heating elements.
  - vi. The heating element shall be protected from mechanical abuse and handling stresses and strains by multiple layers of soft, flexible, dielectric insulation materials.
  - vii. All materials in the heating cable shall be inorganic. No polymeric materials shall be used. They shall have high temperature withstand potential (high softening or melting points).
  - viii. The cut-to-length, metallic, 350C rated maximum continuous exposure temperature constant wattage heating cables shall be Drexan™ HeatTracer PipeGuard™ CMH as supplied by Drexan™.
  - ix. Plastic Piping – PipeGuard™ CMH shall not be installed on non-metallic piping under any circumstances.

c. Components and Connection methods

- i. The components and connection methods used in conjunction with PipeGuard™CMH – including power connections, splices, tees, crosses, and end seals – shall be approved for the respective area classification, be of an approved /certified construction and conform to suitable electric codes. Under no circumstances shall terminations manufactured by a vendor other than the heating cable supplier be used. .
- ii. Terminals shall be wire connection types that assure reliable electrical connection, maintenance free operation and ease of reentry.
- iii. Components shall be rated to a minimum installation temperature of -40C, minimum usage temperature of -60C, and maximum usage temperature of 150C.
- iv. The component system shall be capable of the following connections: power connection, powered splice, powered tee, splice, tee, cross (4 cables), and shall be compatible with Quick-Connection systems which have similar Approval Agency ratings.
- v. Connection component systems shall be manufactured and supplied by Drexan™ HeatTracer and approved for use with PipeGuard™ CMH heating cables.

d. Heat-Tracing Panels

- i. For freeze protection or group control process temperature maintenance systems, distribution panels shall consist of an enclosure, including a panel-board with ground fault protection devices (30 mA trip level). The panels shall provide ground fault alarm capabilities. If more than one circuit is required, a main contactor shall be used. The panels shall operate with line-sensing controllers. The panels shall be as supplied by Drexan™ HeatTracer.
- ii. For individual control process temperature maintenance systems, distribution panels shall consist of an enclosure, including a panel board with ground fault alarm capabilities. Circuits shall be switched by individual contactors operated by line sensing controllers. The panels shall be supplied by Drexan™ HeatTracer.

- e. Control and Monitoring Systems shall be Drexan™ HeatTracer ControlTrace™ systems or equal – All control and monitoring systems shall be capable of communicating with one or more host PC's and/or a central programming, status review, and alarm annunciation. All systems shall include, but not be limited to, the following:
  - i. Alarm limits and set-point temperatures shall be programmable from the central monitoring and control panel in degrees F and degrees C. The system shall include an alphanumeric display with multi-language support and password protection or lockable cabinet to prevent unauthorized access to the system. System shall also be programmable through a handheld device.
  - ii. The system shall be switched by an external solid state or mechanical relay with a minimum rating of 30 Amps.
  - iii. System shall be equipped to communicate with RS-232, RS-485 and Ethernet protocol.
  - iv. System shall have soft-start and load-shedding capability.
  - v. System shall be equipped with preventative maintenance cable-condition-check function ensuring all circuits are working properly when energized or de-energized.
  - vi. Control module components shall be DIN rail connected allowing module expansion without powering down rail.
  - vii. The system shall be capable of assigning one or more RTD's to a circuit to monitor temperature. The controller shall be capable of having one RTD to control the heating circuit and a second RTD to use as an additional control point or to measure heater sheath temperature for high temperature cutout.
  - viii. The system shall monitor temperature, voltage, and line current to the systems
  - ix. The system shall monitor ground fault current and offer the option of alarm or trip if the ground fault exceeds the selectable level.
  - x. The system shall have CSA certification for Class I, Division 2, groups A, B, C, D when using a solid state switching device or using electromechanical relays and z-purge system.
  - xi. Enclosure type shall be NEMA 4X glass-fiber reinforced plastic with viewing window or stainless steel for Class I Division 1 applications, corrosion resistance and protection from moisture.
  - xii. System shall have the capability to utilize supervisory software allowing both control and monitoring via single PC or multiple PC licenses.
  - xiii. Software shall have master/slave capability regardless of active PC quantity.
  - xiv. Individual circuit parameters shall be able to be configured remotely and downloaded to software allowing instant controller configuration.
  - xv. Software shall be capable of accepting Excel, pdf, and CAD files for reference.
- f. Thermostats and Contactors
  - i. Freeze protection systems shall operate using STAT-LS-40F or STAT-LS-ADJ thermostats in nonhazardous areas and STAT-TXR-ADJ thermostats in hazardous areas, as supplied by Drexan™ HeatTracer.
  - ii. Process Temperature maintenance systems shall operate using STAT-LS-40F or STAT-LS-ADJ thermostats in nonhazardous areas and STAT-TXR-ADJ thermostats in hazardous areas, as supplied by Drexan™ HeatTracer.
- b. Engineering:
  - a. The vendor shall be given a piping line list from which to design and estimate a complete heat tracing system. The bid package shall also include area layout and orthographic drawings.
  - b. The vendor shall provide detailed design utilizing CMH Designer heat tracing design software as provided by Drexan™ HeatTracer or equal. At minimum, the design must provide/accommodate the following:
    - i. Circuit identification number
    - ii. Maintain temperature
    - iii. Line size and thermal insulation type and thickness
    - iv. Heat loss for pipe, valves, and supports
    - v. Amount and part number of PipeGuard™CMH heating cable required
    - vi. Spiral pitch requirements, if any
    - vii. Heating cable service voltage
    - viii. Heating cable power output at the maintain temperature
    - ix. Minimum and maximum maintain temperature vs. minimum and maximum ambient temperatures
    - x. Maximum Sheath Temperature
    - xi. Circuit breaker and transformer sizing
    - xii.
  - c. The vendor shall provide heat-tracing isometric drawings at the buyer's request, using either hard copy or machine readable inputs.
- c. Testing
  - a. Factory inspections and tests for constant wattage heating cables shall include but are not limited to the following:

- i. Testing shall be done per the latest CSA C22.2 No. 130-03 test section and applicable manufacturer's standards.
- ii. In the field, all heating cables shall be meggered. The following separate field megger readings shall be taken on each PipeGuard™ CMH heating cable:
  - 1. PipeGuard™ CMH heating cable shall be meggered when received at job site before installation.
  - 2. PipeGuard™ CMH heating cable shall be meggered after installation, but before thermal insulation is applied
  - 3. PipeGuard™ CMH heating cable shall be meggered after thermal insulation has been installed.
- iii. All three of the above field megger readings shall be greater than 10 megohms; otherwise the PipeGuard™ CMH heating cable will be deemed unacceptable and shall be replaced.
- iv. Field megger tests shall be recorded for each PipeGuard™ CMH heating cable circuit, and certified reports shall be submitted to the user.

d. Ground Fault

- a. Grounding in the components as per Code
- b. Grounding to the pipe as per code

e. Tagging

PipeGuard™ CMH shall be tagged with the following:

- a. Manufacturer's Name and Contact Information
- b. Product Name "PipeGuard™ CMH"
- c. Wattage Output per foot or per meter
- d. Design Voltage (one of 120, 208, 240, 277, 480, 600)
- e. Maximum Exposure Temperature – Power Off