

GLOSSARY OF TERMS

ampacity	The current (in amperes) that a wire can carry without exceeding its temperature rating.
approved	Acceptable to the authority having jurisdiction (for enforcement of the National Electrical Code, for example).
ANSI	American National Standards Institute.
ASTM	American Society for Testing and Materials.
ATEX Directive 94/9/EC	A European product directive for hazardous locations designed to open up free trade across Europe, and mandatory for all electrical and mechanical equipment which may be used in potentially explosive atmospheres.
autoignition temperature (AIT)	The AIT is the minimum temperature at which a material can spontaneously ignite without an external source of ignition. This is different from the flash point of a liquid, which is the lowest temperature at which the liquid gives off sufficient vapor to form an ignitable mixture with air near the surface of the liquid or within the vessel used. The flash point of gasoline is -50°F and the AIT is 536°F.
autotherming	An operating characteristic of self-regulating heating cables that results in a substantial change of its electrical resistance over a small temperature increment—the autotherming temperature is the temperature at which this change occurs.
Auto-Trace	A historic trademark of the families of self-regulating heating cables manufactured by Pentair Industrial Heat Tracing Solutions (formerly the Chemelex Division of Raychem).
braid	The wires woven around the heating cable that provide an electrical ground path.
branch-circuit	The electrical current path from an individual branch-circuit breaker (or fuse) to all connected heating cable circuits.
cable sets	A preterminated MI heating cable complete with a heated section and nonheated cold lead section.
CE	Marking to show compliance with all essential safety requirements of European Union directives.
CEC	Canadian Electrical Code.
circuit breaker	A device that opens and closes a circuit by nonautomatic means; it also opens the circuit automatically on a predetermined overcurrent (without damage to itself) when properly applied within its rating.
cladding	An outer jacket, usually metallic, encasing the thermal insulation.
classified locations	A location that is classified into a class, division, and group, or into a class, zone, and group, because a fire or explosion hazard may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings.
cold lead	An electrically-insulated conductor that connects a heating cable–circuit conductor to the branch-circuit conductors; it does not produce any appreciable heat. Constant wattage heating cables require the use of cold leads.
combustible dusts	Any finely divided solid material of 20 microns or less in diameter (i.e., material passing through a U.S. No. 40 Standard Sieve) that presents a fire or explosion hazard when dispersed and ignites in air or other gaseous oxidizer.
combustible liquid	A liquid having a flash point at or above 100°F (37.8°C).
conduction	One of the three methods of heat transfer (the others: radiation and convection). The transfer of heat by molecular motion without the bulk movement of material. Conduction is the only way that heat can be transferred within a solid.
conductor	A long thin piece of metal used to carry current. An insulated conductor is a wire.

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constant-wattage heating cable	Heating cables that have effectively the same power output over a large temperature range. Zone heating cables that use Nichrome® heating wires and most series-resistance heating cables are examples of constant-wattage heating cables.
contactor	A heavy-duty relay that controls electric power circuits.
continuity	The presence of a complete path for current flow.
continuous load	A load in which the maximum current is expected to continue for three hours or more.
controller	A device that regulates the state of a system by comparing a signal from a sensor with a predetermined value and adjusts its output to the predetermined value. Controllers used in electric heat-tracing systems normally include some form of monitoring and alarming. Thermostats typically include little or no monitoring. Temperature sensors used with controllers are usually electronic (thermocouple, RTD, thermistor). Temperature sensors used with thermostats can be mechanical (bulb and capillary, bimetallic) or electronic.
convection	One of the three methods of heat transfer (the others: conduction and radiation). The transfer of heat by the bulk motion of a fluid (liquid or gas). Convection is also the transfer of heat between a solid and a fluid.
corrosive environment	An area where chemically-aggressive gases or liquids are present either in the pipe or in the surrounding atmosphere.
CSA International	CSA International is a leading provider of product testing and certification services worldwide. They test products for compliance to national and international standards and issue certification marks for qualified products across North America and around the world.
deadband	The range through which a measured signal can vary without initiating a response by the controlling device.
deadleg	A segment of pipe that is designed to be in a permanent no-flow condition. This pipe section is often created for use as a control point for a larger system.
dielectric	A material with a large resistance to the flow of electricity; an insulator.
DTS	Distributed Temperature Sensing (DTS) is a method of monitoring temperature along the continuous length of a pipeline. It provides a temperature profile for the full length of the pipeline for better visibility of hot/cold spots than can be provided by widely spaced RTD's.
electric heat-tracing system	A system of electric heating cables, connection kits, and a power distribution system that may include cables, panelboards, and transformers whose purpose is to maintain a piping system at or above a given temperature. The system may also include a control system with sensors, alarms, and controllers. Electric heat-tracing systems are sometimes referred to as electric pipe heating or trace-heating systems.
electrical insulation (cable)	The part of the cable that consists of dielectric (see above) material.
electromechanical relay (EMR)	An electromechanical device that completes or interrupts a circuit by physically moving electrical contacts into or out of contact with each other. (See Contactor)
equipment	A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like used as part of, or in connection with, an electrical installation.
explosion-proof	A method of protection for electrical equipment used in Class I hazardous locations. Explosion-proof apparatus is apparatus enclosed in a housing that is capable of withstanding an explosion of a specified gas or vapor that may occur within it, and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.
factory fabricated	A heating cable assembled by the manufacturer, including hot and cold end terminations and cold lead. Mineral insulated (MI) cable is generally factory fabricated. Self-regulating heating cables are generally not factory fabricated.
Fiber Optic Cables	Fiber Optic cables are traditionally used in telecommunications. However, they are being deployed as sensors for continuous temperature monitoring, leak detection and intrusion detection on pipelines in industrial applications. These fiber optic cables are specially armored for durability.

field assembled	Heating cable supplied in bulk; terminating kits to be assembled (terminated) by field personnel.
flash point	The minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture with air near the surface of the liquid, as specified by tests.
FM Approvals	FM Approvals offers worldwide quality management systems and certification and testing services of industrial and commercial products to national and international standards.
FM Approved	A product or system which has been evaluated by FM Approvals, and found to comply with a given standard or set of standards or has been evaluated for its use by utilizing accepted engineering practices and performance approaches.
fuse	An overcurrent protective device with a circuit-opening fusible part that is heated and severed by the passage of overcurrent through it. A fuse is a one-use device, unlike a circuit breaker, which can be reset and used many times.
ganging	The practice of combining multiple heating cables onto one branch circuit breaker.
grounded	Connected to earth or to some conducting body that serves in place of the earth.
ground fault	The passage of current from a circuit to earth-ground.
ground-fault circuit breaker	A device that protects equipment; it turns off a circuit within an established period of time when a current to ground exceeds some predetermined value (usually from 5 to 100 mA) which is less than that required to operate the overcurrent protective device of the supply circuit.
ground-fault circuit interrupter	A device intended for the protection of personnel; it turns off a circuit within an established period of time when a current to ground exceeds some predetermined value (usually 5 mA) which is less than that required to operate the overcurrent protective device of the supply circuit.
ground-fault protection of equipment	A system that protects equipment from damaging line-to-ground-fault currents by disconnecting all ungrounded conductors of the faulted circuit. This protection is provided at current levels less than those required to protect conductors from damage from a supply circuit overcurrent device.
hazardous locations	Same as a classified location. A location that is classified into a class, division, and group, or into a class, zone, and group, because a fire or explosion hazard may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings. For a more detailed description, refer to the National Electrical Code, Articles 500 through 503 in particular, as well as other related articles.
hazardous locations divisions	Divisions 1 and 2 as defined in the National Electrical Code describe the likelihood that a flammable or combustible mixture will be present in ignitable quantity.
hazardous locations groups	Groups A, B, C, D, E, F, and G in the National Electrical Code Article 500 classification system, and Groups IIA, IIB and IIC in the National Electrical Code Article 505 method of classification. For purposes of testing, approval, and area classification, various air mixtures (not oxygen-enriched) are grouped together because they have similar explosion characteristics.
heat loss	The rate of energy lost from a pipe, vessel, or equipment to the surrounding environment due to the difference in temperature between the pipe and the surrounding environment. The heat loss needs to be calculated because the heat tracing selected must be of sufficient power to replace the heat lost if the desired temperature is to be maintained.
heat sink	A part that conducts and dissipates heat away from the pipe or equipment. Heat sinks can be pipe supports, valve operators, etc.
heat transfer aids	Thermally-conductive materials, such as metallic foils or heat transfer cements, used to increase the heat transfer rates from the heating cables to the process piping or equipment.
heating cable circuit	A discrete length of heating cable that is directly wired to a single power connection kit at one end and terminated with an end seal kit. Intermediate branch heating cables (connected to the primary run of heating cable with a tee connection kit) are considered part of the heating cable circuit. Note that multiple-entry power connection kits will accommodate multiple heating cable circuits.

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high-limit temperature	The maximum allowable heat-tracing system temperature of the heat-traced equipment. A marking that indicates the maximum temperature that a piece of equipment will reach based upon a 40°C (104°F) ambient temperature. The temperature marking is compared to the ignition temperature of explosive gases, vapors, dusts, or flyings that may be encountered in hazardous areas.
IECEX	IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres.
IEEE	Institute of Electrical and Electronics Engineers is the world's largest professional association for the advancement of innovation and technological excellence.
IEx - Institute of Certification	IEx is a Brazilian company with international renowned experts in electrical equipment for explosive atmospheres. IEx is accredited by INMETRO, National Institute of Metrology, Standardization and Industrial Quality, for hazardous locations products.
isometric	An engineering drawing: a three dimensional view of the object or system.
jacket	A thermoplastic or thermosetting plastic covering, sometimes fabric-reinforced, applied over the insulation, core, metallic sheath, or armor of a cable.
Joule effect	The heating effect produced by the flow of current through resistance.
lagging	See cladding.
listed	In accordance with the National Electrical Code and other NFPA standards this means equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or material, and whose listing states either that the equipment or material meets appropriate designated standards or has been tested and found suitable for use in a specified manner.
maintain temperature	Specified temperature of the fluid or process material that the heat tracing is designed to hold at equilibrium under specified design conditions, normally at minimum ambient temperature.
maximum ambient temperature	Highest expected environmental temperature surrounding the heat-traced object.
maximum contact temperature	The maximum withstand temperature of the heat traced plastic pipe. The temperature depends on its pressure rating and material.
maximum equilibrium temperature	The highest equilibrium pipe temperature that occurs when the heating cable is continuously energized at the maximum ambient temperature (defined as runaway pipe temperature by IEEE 515).
maximum intermittent exposure temperature (power on or off)	The highest temperature to which the heating cable may be exposed intermittently. Defined as high-temperature excursions of not more than 48 hours in duration, with total cumulative exposure of less than 1000 hours. Intermittent high-temperature exposure may occur during process upset conditions or steam-cleaning operations.
maximum maintain temperature	The highest temperature at which the heating cable may be operated continuously (power on).
maximum operating temperature	The maximum temperature of the process fluid during normal continuous operation. This temperature may be the same as the maintain temperature, but it is sometimes substantially higher. This is assumed to be the highest temperature to which the heating cable will be continuously exposed.
minimum ambient temperature	The lowest expected ambient temperature at the design location. The effect of wind is covered in the design. The wind chill factor should not be used.
minimum operating temperature	The lowest process-operating temperature of the fluid during flow conditions. This temperature is frequently the same as the design maintain temperature.
NEC	National Electrical Code.
negative temperature coefficient	A device or material whose resistance decreases with an increase in temperature and increases with a decrease in temperature. A thermistor generally has a negative temperature coefficient.
NEMA	National Electric Manufacturers Association.

NFPA	National Fire Protection Association is an international nonprofit organization established in 1896. The company's mission is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating consensus codes and standards, research, training and education.
noncorrosive environment	An area where chemically-aggressive gases, vapors, or fluids are not present.
orthographic	An engineering drawing; the plan, section, and elevation views of the object.
outdoor location	The installation is subjected to environmental extremes, including exposure to a high wind velocity (assumed to be 20 mph [32 km/h] for an insulated, heat-traced pipe).
overcurrent	Any current in excess of the rated current of equipment or the ampacity of a conductor. It may result from overload, short circuit, or ground fault. A current in excess of rating may be accommodated by certain conductors for a given set of conditions. Hence, the rules for overcurrent protection are specific to particular situations.
overcurrent protective device	An in-line component of an electric circuit used to cause and maintain the interruption of current flow to the protected device when the protected device is subjected to an overcurrent condition (e.g., circuit breaker, fuse).
overload	Operation of equipment in excess of normal, full-load rating, or of a conductor in excess of rated ampacity when, if it persists for a sufficient length of time, it would cause damage or dangerous overheating. A fault, such as a short circuit or ground fault, is not an overload.
oversize insulation	A term applied to thermal insulation when the thermal insulation inner diameter must be larger than the nominal outer diameter of a particular pipe in order to accommodate the heating cable.
P & ID	Piping and instrumentation diagram.
panelboard	A single panel or group of panel units assembled in a single panel that includes buses, and automatic overcurrent devices. A panelboard may or may not have switches for the control of light, heat, or power circuits. Designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front.
parallel heating cable	A heating cable with heating elements that are electrically connected in parallel, either continuously or in zones, such that watt density per linear length is approximately equal along the length of the heating cable (allowing for the drop in voltage down the length of the heating cable).
pipe schedule	An index that specifies the nominal wall thickness as a function of pipe size.
pipe size	The nominal diameter of the pipe. For tubing, the size and outside diameter are the same.
pipe support	A device for supporting a section of pipe.
pitch	The degree of slope or the distance between two points of a spiraled heating cable.
PLI	[Power Line carrier Interface] A set of components that provide temperature-monitoring capability for heat-tracing control & monitoring systems by communicating the temperature data to the control system using the heat tracing and power distribution wiring thus eliminating the need for RTD wiring.
plot plan	A representation of the layout of a particular facility or area. It typically shows the position of roads, buildings and other constructions inside an industrial plant with their coordinate lines.
positive temperature coefficient (PTC)	A characteristic of a device or material whose resistance increases with an increase in temperature and decreases with a decrease in temperature. Self-regulating heating cables have positive temperature coefficients and are often referred to as PTC heating cables.
power-limiting heating cable	A type of heating cable that shows PTC behavior based on the properties of a metallic heating element. The PTC behavior exhibited is much less (a smaller change in resistance in response to a change in temperature) than that shown by self-regulating heating cables.

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process control (also process-temperature control)	These terms are generally used to denote any heat-tracing application other than freeze protection of water lines.
process operating temperature	The maximum temperature of the process fluid during normal continuous operation. This temperature may be the same as the maintain temperature, but it is sometimes substantially higher. This is assumed to be the highest temperature to which the heating cable will be continuously exposed.
radiation	One of the three methods of heat transfer (the others: conduction and convection). The transfer of heat by the propagation of energy waves. When dealing with insulated pipes and vessels the effect of radiation is usually insignificant.
rated output	The expected minimum power output of a heating cable for a given set of conditions. These conditions may include applied voltage, pipe or surface temperature, and total length.
rated voltage	The voltage to which operating and performance characteristics of heating cables are referenced.
redundant or redundancy	The introduction of auxiliary elements and components to a system to perform the same function as other elements in the system for the purpose of improving reliability. Redundant electric heat-tracing systems consist of duplicate independent heating cables and controllers, each with its own sensor supplied from separate power systems, all independent of each other but all applied to the same mechanical piping, valves, tanks, etc.
routine test	A test carried out by the manufacturer of the heating cable during production.
RMM2	Remote Monitoring Module which aggregates RTD temperature data in the field and sends it over one wire pair to the control & monitoring panel. This allows reduction of RTD wiring runs in the field while ensuring all temperature data is provided to the heat tracing control & monitoring system.
self-regulating	The inherent capability of polymer-core heating cables to inversely vary their power output in response to an increase or decrease in the actual temperature in the immediate vicinity of the heating cable.
sensor, sensing element	The first system element that responds quantitatively and performs the initial measurement. In electrical heat-tracing systems, sensors respond to the temperature of the system and may be directly connected to controllers. Sensors can be mechanical (bulb and bellows, bimetallic) or electrical (thermocouple, RTD, thermistor).
series heating cable	A heating cable using a high resistance wire in order to create heat via electrical resistance. These cables provide a constant heat output and cannot be overlapped.
SES	Smart End Seal transmitter that enables monitoring signals to transmit through heating cable bus wires and power cables. No additional field wire is necessary. Part of the Power Line Carrier Interface (PLI) option on certain Raychem control & monitoring systems.
sheath	The outermost continuous covering for the cable.
sheath temperature	The temperature of the outermost heating cable jacket covering that may be exposed to the surrounding atmosphere.
short circuit	A fault consisting of a lower-resistance connection across a voltage source, which normally results in an excessive current. It should cause the overcurrent device (circuit breaker or fuse) to open.
silicon-controlled rectifier (SCR)	A four-layer semiconductive device that is used as an electrical switch in ac and dc circuits. An activation signal is required to turn the SCR on or off.
Skin Effect	The phenomena which results from AC Current traveling through a wire located inside a ferromagnetic metal tube in which the return current flowing in the metal tube limits the current flow to the inside surface of the metal tube. No current or voltage potential exists on the outside of the tube.
solid-state relay (SSR)	A solid-state switching device that completes or interrupts a circuit electrically. An SSR has no moving parts.
SPC	Smart Power Connector is part of the Power Line Carrier Interface (PLI) option which allows MI and VPL technology heating cables to be used with the PLI option on certain Raychem control & monitoring systems. The SPC takes the place of the power connection kit.

start-up current	The initial current drawn by a heating cable when it is energized at the start-up temperature.
start-up temperature	The lowest temperature expected at a time when the heat-tracing cable will be switched on. This can be an important design consideration for self-regulating cables because the start-up current depends on the start-up temperature.
STS	Raychem's Skin-effect heat Tracing System (STS) is a pipe heating technology designed for long pipeline applications. It is capable of providing high heating power to over 25Km of pipeline between power points.
system limit temperature	The highest temperature that the heat-tracing system is allowed to impose on the rest of the system. For example, a plastic pipe system will have a relatively low system limit temperature to protect the plastic pipe. A temperature-sensitive fluid will have a system limit temperature to protect the fluid from high temperatures from the heating cable.
thermal insulation	Material that is designed to have a low thermal conductivity. Thermal insulation is placed on the outside of pipes and vessels to reduce the rate of heat loss.
thermistor	A temperature-sensing element composed of sintered semiconductor material which exhibits a large change in resistance in response to a small change in temperature. Thermistors usually have negative temperature coefficients.
thermocouple	A temperature-measuring device consisting of two wires of dissimilar metals. The voltage difference across the wires can be related to the difference in the temperature of the two junctions.
thermostat	A device that senses temperature and activates a relay to control the flow of current to a downstream device.
Touch 1500	A state-of-the-art user interface using a 15-inch (381 mm) color display with touch screen for the Raychem NGC-40 system.
TraceCalc Pro	Pentair Industrial Heat Tracing Solutions' heat-tracing system design software. Performs thermal calculations, selects products, and generates the required Bill of Materials based upon the input design parameters.
turnkey installation	Complete, cost-effective installation using front-line, direct-hire labor. Includes complete documentation of the system.
type test	A test or series of tests carried out on equipment; representative of a type, to determine compliance of the design, construction, and manufacturing methods within specified requirements.
UIT2	User Interface Terminal. This is the touch screen display used for local control and monitoring of Raychem NGC-30 controllers.
UL	Underwriters' Laboratories is an independent product safety certification organization that tests products and writes standards for the safety of commercial and industrial products.
V.A.S.T.	Value-added steam tracing
volatile flammable liquid	A flammable liquid having a flash point below 38°C (100°F), or a flammable liquid whose temperature is above its flash point, or a combustible liquid having a vapor pressure exceeding 40 psia at 38°C (100°F) whose temperature is above its flash point.
watt-density	Thermal output of heating cable in watts per unit area.
weather barrier	A material or materials, which, when installed on the outer surface of thermal insulation, protects the insulation from the weather, such as rain, snow, sleet, wind, solar radiation, or atmospheric contamination and physical damage.
zone heating cable	A parallel resistance heating cable which uses a resistive element between the bus wires to act as a heater. The resistive element makes contact with alternate bus wires at a distance called the zone length.



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