INDEECO

TraceFREE
Electric Pipe Heating

Impedance Frequently Asked Questions (FAQ)

Q. What on-site materials are supplied by Indeeco?

A.

- Transformer
- Control Panel
- Secondary Power Wire
- Terminal Plates Wire Lugs
- Flange Isolation Kits
- Specialized Cable Ties
- Temperature Sensors

Q. What on-site services are supplied by Indeeco?

A.

INDEECO can provide field audits, troubleshooting, and installation commissioning.
Typical Services:

- Confirm control panel wiring and function.
- Inspect transformer wiring and supply voltage.
- Temperature sensor pipe contact and wiring checked.
- Flange isolation kit installation review.
- Check terminal plate and lug connections.
- Power up and performance verification.

Q. What is required at site

A.

Accredited electrical installation team
Pipe installers and insulators
Weld equipment for thermocouple and terminal plates
Standard electrical tools for routing and terminating power wire and cable

Q. Is it safe?

A.

Impedance heating has a long history of safe and reliable service. The lines operate at low voltage (up to 50 V) which is considered by OSHA to be safe for personnel. In addition, the conductors are protected from incidental contact.

Impedance heating systems are designed per NEC, CSA, and IEEE standards. NEC recognizes impedance heating for installation in Class I and II, Division 2 area hazardous area locations.

There are redundant mechanisms in place to safeguard from improper system operation and any potential safety risks. A separate relay is included for automatic cut-off due to ground fault and over-temperature.

Q. What is the failsafe feature on the transformer to limit the voltage to a maximum 50V?

A.

Transformers are passive devices that are incapable of producing voltage spikes independently. In the event that the primary supply voltage supply is elevated, the secondary voltage would reflect a proportional increase. The system fuse protection would trip in the event of excessive power.

Q. What happens if there is corrosion on the terminal plates?

A. Terminal plates connect the wire lugs to the pipe. Excessive corrosion or loose connection of wire lugs could result in poor impedance system performance, localized over-heating, voltage drop, or system failure.

Q. How is the T rating (electrical classification) determined on an impedance system?

A. Impedance systems use a control limited approach to limit the sheath temperature as outlined by IEEE 844.3 Annex B3.3. An additional temperature sensor is included for over-temperature cut-off. This is used to independently cut-off power in the event of elevated temperature.

Q. Does impedance meet Class 1 Division 2 hazardous area classification?

A. Impedance systems can be installed in Class I, Division 2 locations. NEC Article 427 covers the requirements for impedance heating systems. ANSI/IEEE 844 is referenced for further information that covers requirements for hazardous locations.

Q. What if a need to maintain a higher temperature, can I change the set point of the control temperature?

A. It is possible to increase the set point for impedance systems provided that the temperatures are within the design, system, and fluid parameters. The transformer is typically supplied with multiple voltage taps where the middle tap provides optimum design performance. The additional taps are provided for deviations from the designed pipe length, change in insulation specification or future temperature modifications.

Q. What flange isolation gaskets are recommended?

A. Any dielectric material can be used as a flange isolation gasket. Application compatibility must be considered including process fluid, temperature, and pressure rating. Some of the common gasket materials are aramid fiber and mica.

Q. What pipe support isolation is required?

A. Pipe supports require electrical insulation to provide isolation for the heating system. This can be achieved in different ways. Saddle supports can use a fluoropolymer pad, hanging supports with polymer inserts, non-metallic sleeve covers insulation jacket, and insulating gaskets and bolt kits for pipe flanges.

Q. Can impedance heating be used without insulation?

A. Yes, it is possible to heat without insulation, though it is unusual. Insulation is normally installed to reduce the system heat loss and provide personnel protection.

Q. What is the maximum length for an impedance system?

A. Single circuit impedance systems over 1000 feet are possible. The maximum length is dependent upon the pipe size and material along with overall heat loss.

Q. What annual maintenance is required?

A. Check control panel for alarms or ground faults, and confirm the maintain temperature. Visually inspect all secondary power wire connections, terminal plates, and temperature sensors. Check for loose connections and corrosion.

Q. How can you check the integrity of the system?

A. Check control panel for alarms or ground faults, and confirm the maintain temperature. Check the current draw to confirm that it is within the design specification.

Q. What control features are available?

A. A full range of temperature control features are available. The selection includes simple discreet control, multi-loop, PID, PLC, and HMI options. Features can include over-temperature cut-off, multiple alarm options, remote communication, and data logging. Contactor, SSR, SCR switching are available.

Q. What is the temperature range available for impedance heating?

A. The temperature is only limited by the pipe and fluid thresholds. Impedance systems are used for pipe heating from ambient up to, and in excess of 1000°F.

Q. What happens if there is a pipe or scaffold placed against the pipe that is being heated by impedance?

A. A pipe or scaffold in contact with the insulation or pipe could be the source of a ground fault. This could result in the ground fault trip that shuts down the system. It could also be a cause for a current loss, which could cause a pipe section to run below design operating temperature.

Q. What are some applications that impedance heating has been used for?

A. There is a wide range of industries that utilize impedance heating including petroleum, food, and power generation. Heating fluids include asphalt, molten salt, chocolate, sugars, oils, molten lead, and many more.

Q. For troubleshooting, is there a way to determine where there is a failure mode/ location?

A. It is possible to get an estimated ground fault location by taking incremental voltage measurements down the line. The values can be used to calculate the estimated fault location. Detailed instructions are available upon request.

Q. Can a fiber-optic cable be used for troubleshooting location of failure?

A. Fiber-optic cables can be used to locate failure locations. Fiber-optic cable can monitor the temperature of the entire line, and locate cold sections.

Q. **As far as instrumentation goes on the heated line, do we need to make any modifications to the temperature or pressure instrumentation if there is wiring going back to JB and control house? Or any modifications to the tapping points themselves?**

A. Any grounded instrumentation or equipment must be electrically isolated from the impedance heating system. Flange isolation and jumper kits are available.

Q. **One of the main concerns with impedance heating is the possibility of missing an electrical isolation point (or something else that would require us to open up lines) requiring us to take an unplanned downtime. What kind of activities and checks can you do to ensure that the system has no unintended pathways to ground after installation. Does all the insulation need to be on to perform the test and ensure no misses?**

A. The main components that require isolation are supports, pipe tees, grounded instrumentation and equipment, and bulkheads. A site walk down of the entire heated length prior to start-up should be performed to confirm that full electrical isolation of the line is accomplished. The start-up procedure will identify if any fault locations were missed.

Q. **If welding is to be conducted on the pipe for maintenance, can this cause the system to be energized and hurt the control panel/transformer?**

A. It is recommended that the impedance system power is shut off and the secondary power wires are disconnected for line welding to protect the transformer and control panel.

Q. **What is maximum voltage allowed by OSHA / for safety?**

A. OSHA regulations require guarding live components operating at, or above, 50 V. Impedance systems operate at voltages no higher than 50V.

Q. **How are secondary power wires recommended to be routed?**

A. It is recommended that secondary power wires are secured to the exterior of the pipe insulation in free air. This provides for minimum voltage drop, and helps to cancel the magnetic field generated from the current flow. Polymer coated stainless steel straps are normally recommended to be installed every 6-9 ft.

Q. **Do power wires provide any interference?**

A. Secondary power wires produce a magnetic field that can interact with the heating. For this reason, secondary power wires are evenly spaced around the pipe to balance the load if multiple wires are used. When routed properly there is no apparent interference to surrounding structure or equipment.

Q. **What if there is a conductive fluid that is in the pipe? Does the fluid carry a current and will it have enough potential for a spark?**

A. Skin effect refers to the tendency of current within the conductor (pipe) to be driven to the outer surface of the conductor. For this reason, there is little current on the inside of the pipe. Additionally, pipe resistivity is measured in micro-ohms, much lower than even the most conductive fluids. If necessary, middle-fed systems can be used for highly conductive fluids as the ends do not require electrical isolation.