WARMING IDEAS

HEATING ELEMENTS: the core of heat and energy production.

Synergies within the ELECTROLUX operating in the industrial sector are a guarantee of high global competence. They ensure research into and proposals for high quality technical solutions that provide rapid response to our customers' many different application needs, thanks to sophisticated design systems and the use of a wide range of component materials.

Our customers' ideas are the stimulus for analysing new opportunities and developing innovative projects. This allows Electrolux to be extremely versatile in production and affords a vast range from domestic applications, to industrial sectors.

ELECTROLUX

Heating Element Technologies

ELECTROLUX HEATING ELEMENTS

HEATING SYSTEMS | COMMERCIAL & COMFORT | COLD | ETCHED FOIL | PLASTICS | ELECTRONICS

TECHNOLOGY **EVERYWHERE** QUALITY INSIDE

Technology is everywhere and thanks to the invisible existence of high quality HEATING ELEMENTS, it can be used with maximum safety.

ELECTROLUX HEATING ELEMENTS

As a result of experience gained in different application sectors, Electrolux offers highly qualified technical - sultancy and works in close collaboration with customers in all design stages and compliance with the main certification and standards requirements.

The Rica divisions:

HEATING SYSTEMS	Tubular heaters and systems for industrial applications.
COMMERCIAL & COMFORT	Sheathed tubular elements and assemblies especiallly for the catering sector and commercial applications.
COLD	Vulcanised sheathed tubular elements for defrosting and heating elements for household boilers.
ETCHED FOIL	Etched foil technology flexible heating elements.
PLASTICS	Cartridge heaters and assemblies for industry and household heating, band heaters and assemblies for the plastics industry.
ELECTRONICS	Electronic controls applied to assemblies or elements for heat management.

COACH HEATING SYSTEM

HEATING SYSTEMS

Finned elements duct heater

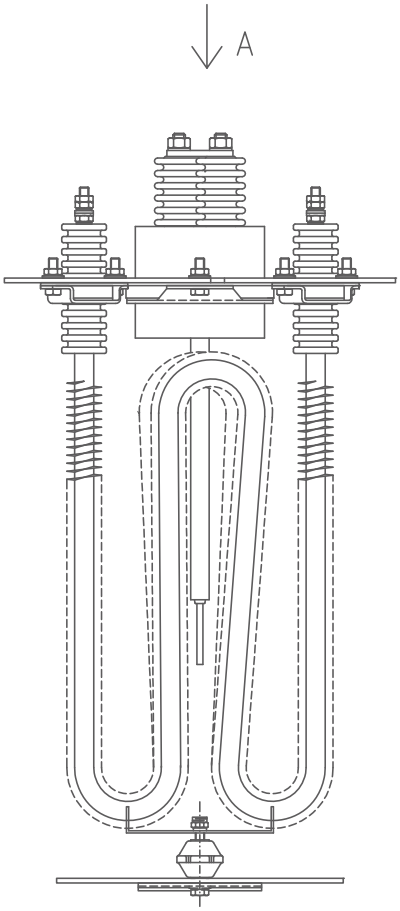
This type of heater provides reliable air heating for railway coaches, it is suitable for mounting in the air conditioning systems of carriages to heat air flow through the battery. Temperature sensors are supplied with the system to control work load temperature. Bimetallic ther mostats are used for both up and down flow as regulating sensors; furthermore, a thermal switch is used as a safety system in case of air flow failure; a large selection of set points being available in order to fulfil sensors customer's requirements.

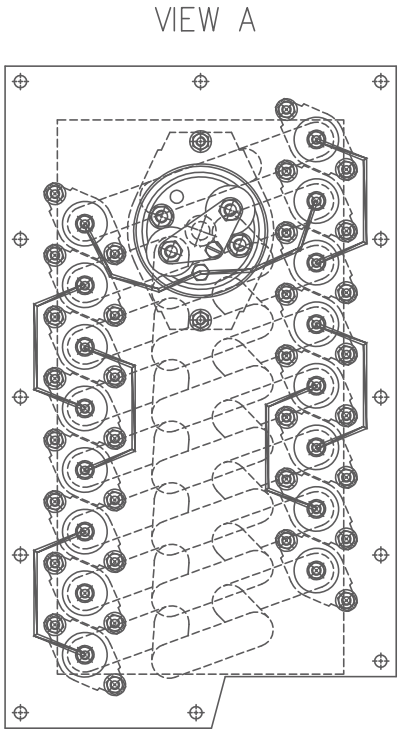
Main technical features:

Rated voltage	3000 V
Specific power	5.8 W/cm²
Double insulation	Achieved by using insulator strips
Elements temperature	According to air speed
Sheath material	AISI 304 / AISI 321
Frame	AISI 304
Thermal switch	Set according to maximum allowed temperature
Bimetallic thermostat	Set point 120°C

COACH HEATING SYSTEM

Finned elements duct heater





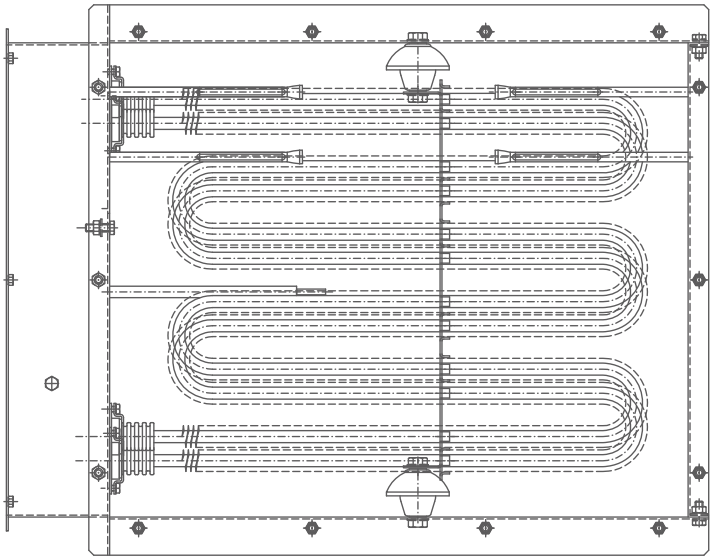
Main technical features:

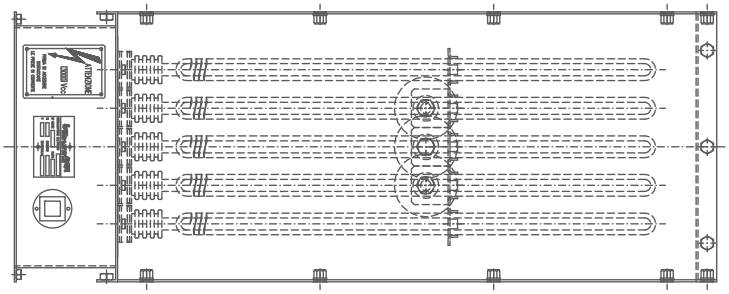
Rated voltage	1500/3000 V
Nominal power	15000 W
Double insulation	Achieved by micaver insulators
Sheath material	AISI 321
Fins material	AISI 304
Support	Aluminium
Safety device	Overtemperature cut-out

COACH HEATING SYSTEM

HEATING SYSTEMS

Finned elements duct heater



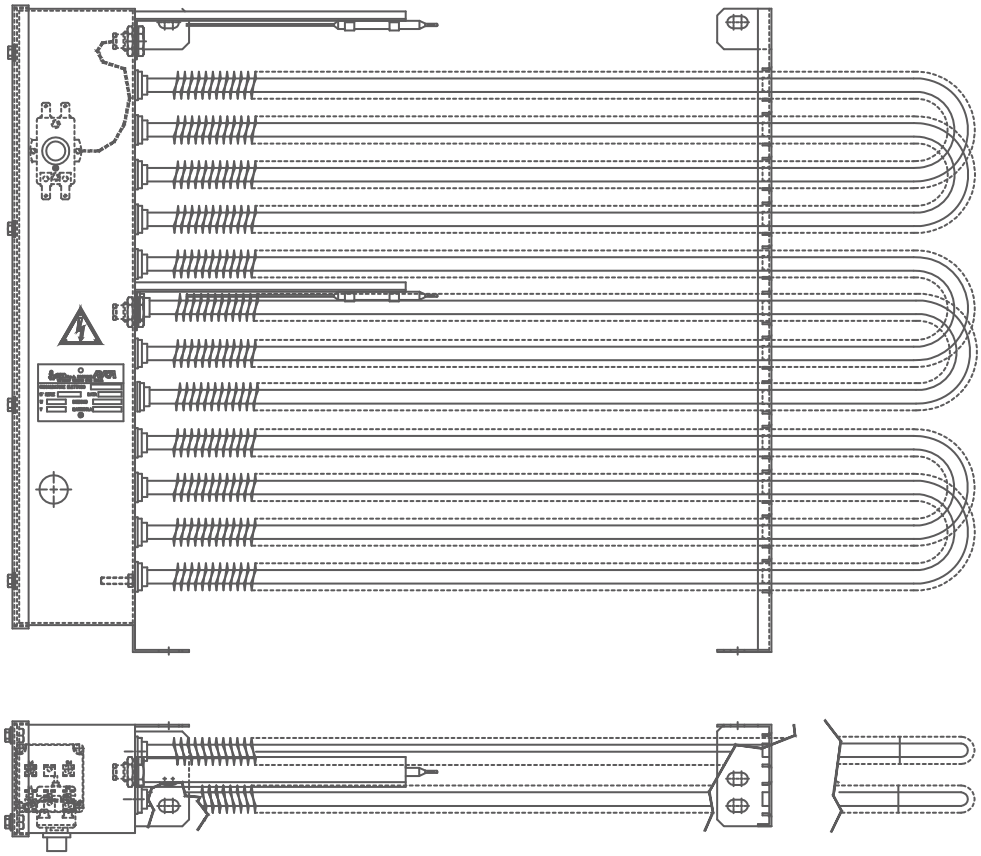


Main technical features:

Rated voltage	600 V
Nominal power	18000 W
Double insulation	Achieved by micaver supports
Fins material	AISI 304
Sheath material	AISI 321
Frame	AISI 304
Safety device	Overtemperature cut-out

COACH HEATING SYSTEM

Finned elements duct heater



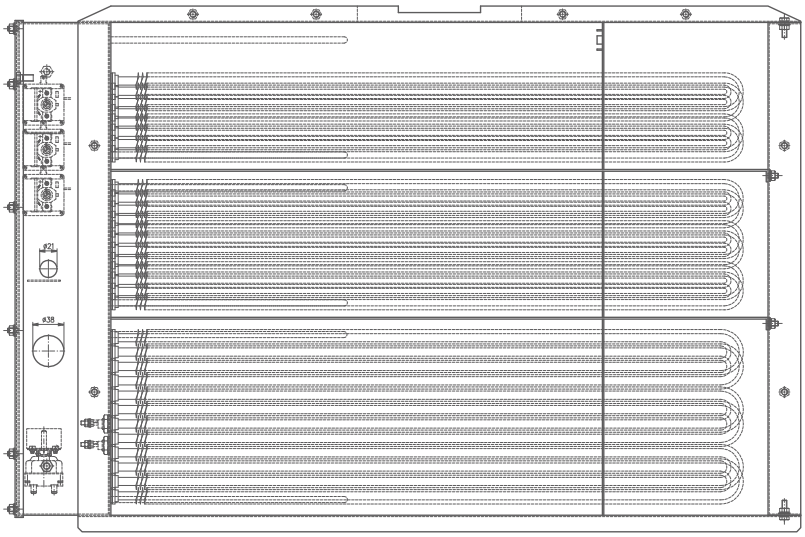
Main technical features:

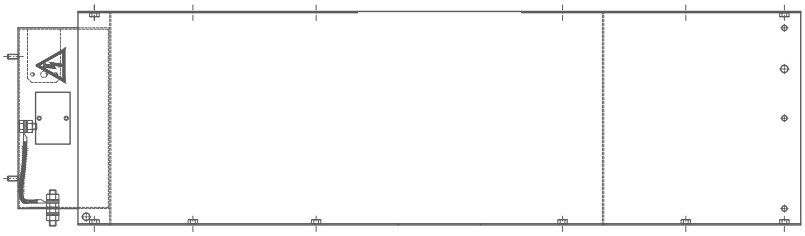
Rated voltage	380 V
Nominal power	9000 W
Sheath material	AISI 321
Fins material	AISI 304
Frame material	AISI 304
Elements temperature	Max 500°C
Control	Reset for safety and regulation thermostat

COACH HEATING SYSTEM

HEATING SYSTEMS

Finned elements duct heater





Main technical features:

Rated voltage	380 V
Nominal power	27000 W (3X9000 W heating zones)
Steps	2 steps per zone (3000 W + 6000 W)
Sheath material	AISI 321
Fins material	AISI 304
Control	Safety and regulation thermostat per zone
Frame material	AISI 304
Dimensions	950 X 600 X 260 mm

COACH HEATING SYSTEM

Air-conditioning duct heater

This type of heater provides reliable air heating for railway coaches, it is suitable for mounting in the air conditioning systems of carriages to heat air flow through the duct. Three sizes of frames are available according to the duct size, automatic reset overtemperature cut-out are available on request, as well as other components to meet customer's requirements.

Main technical features:

Rated voltage	380 V
Specific	From 4 to 40 kW
Specific power	2.5 - 4.0 W/cm²
Steps	From 1 to 6
Double insulation	Available on request
Elements temperature	According to air speed
Sheath material	AISI 321
Dimensions	From 400 X 350 X 100 to 1000 X 650 X 250 mm
Frame	AISI 304

COACH HEATING SYSTEM

HEATING SYSTEMS

Air-conditioning duct heater

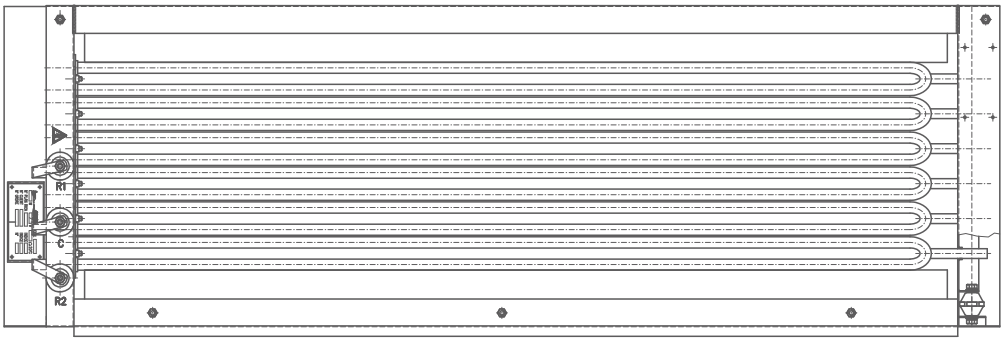
This type of heater provides reliable air heating for railway coaches, it is suitable for mounting in the air conditioning systems of carriages to heat air flow through the battery. The heater has been designed to achieve double insulation by using insulating supports between outer and inner frame (to assemble the heater on the duct). Six heating elements have been used to lower the specific power until safe value. Frame dimensions can be changed according to the duct size, automatic reset overtemperature cut-outs are available on request as well as other components to meet customer's requirements.

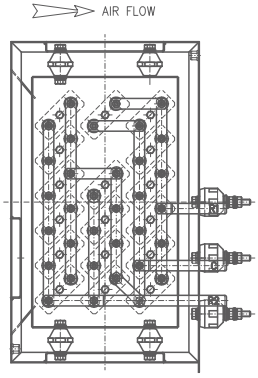
Main technical features:

Rated voltage	1500 V
Specific power	2.4 W/cm²
Double insulation	Achieved by micaver supports
Elements temperature	According to air speed
Sheath material	AISI 321
Frame	AISI 304

COACH HEATING SYSTEM

Air-conditioning duct heater





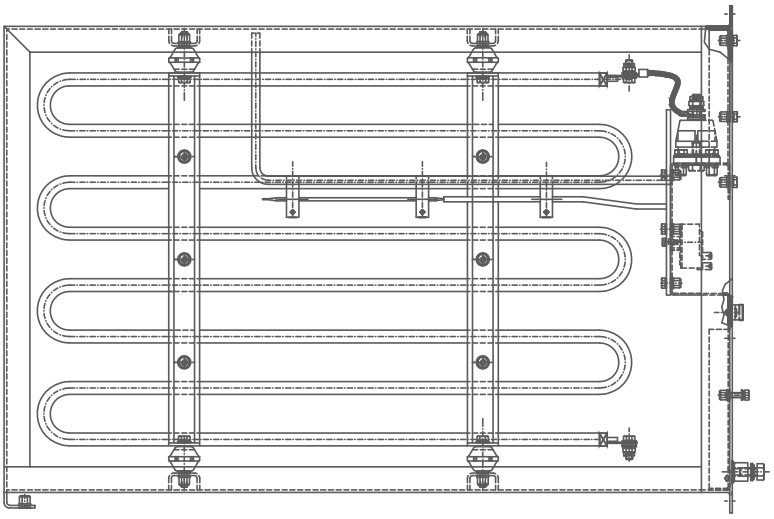
Main technical features:

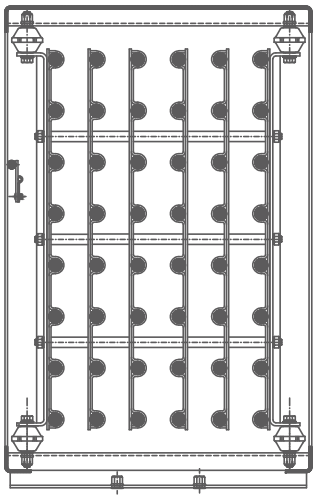
Rated voltage	600 V
Nominal power	40800 W
Sheath material	AISI 321
Frame material	AISI 304
Double insulation	Achieved by micaver supports

COACH HEATING SYSTEM

HEATING SYSTEMS

Air-conditioning duct heater





Main technical features:

Rated voltage	1500 V
Nominal power	25000 W
Double insulation	Achieved by micaver insulators
Sheath material	AISI 321
Frame material	AISI 304
Control	Safety thermostat

COACH HEATING SYSTEM

Air conditioning duct heater

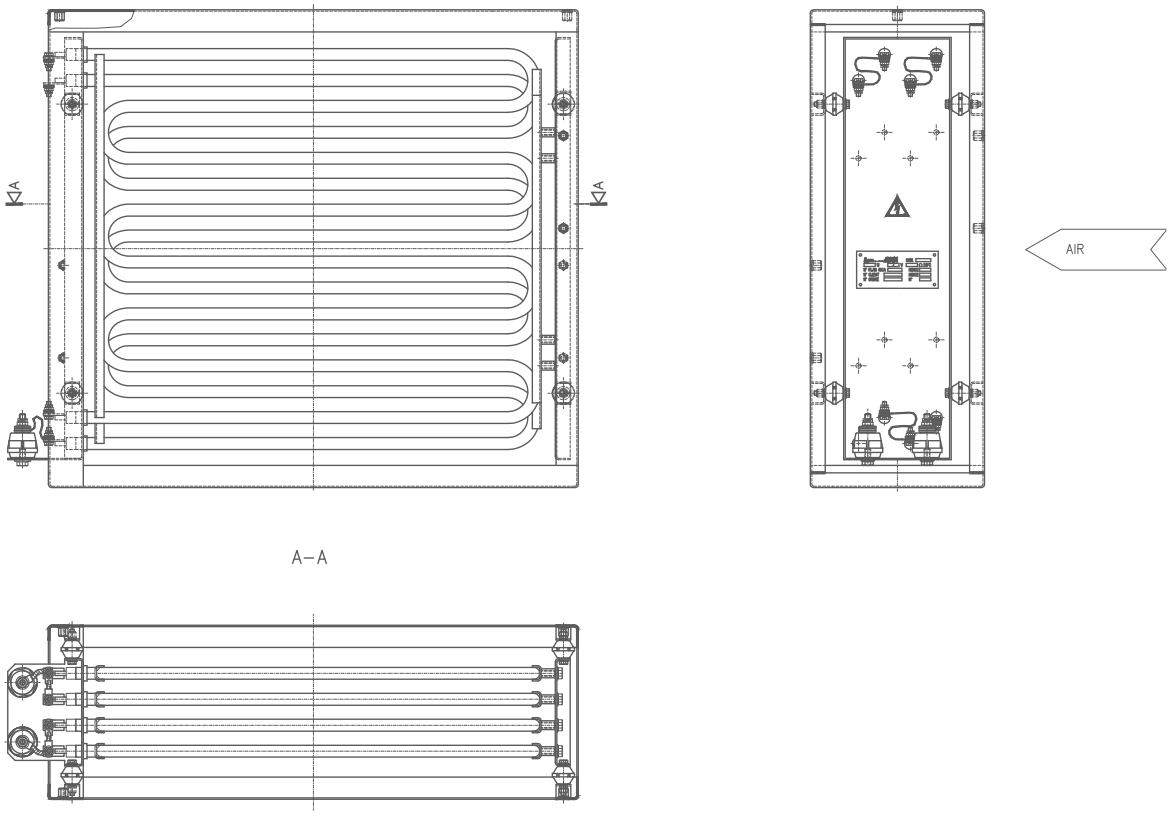
Main technical features:

Power	40000 W
Volt	400 V

COACH HEATING SYSTEM

HEATING SYSTEMS

Air-conditioning duct heater

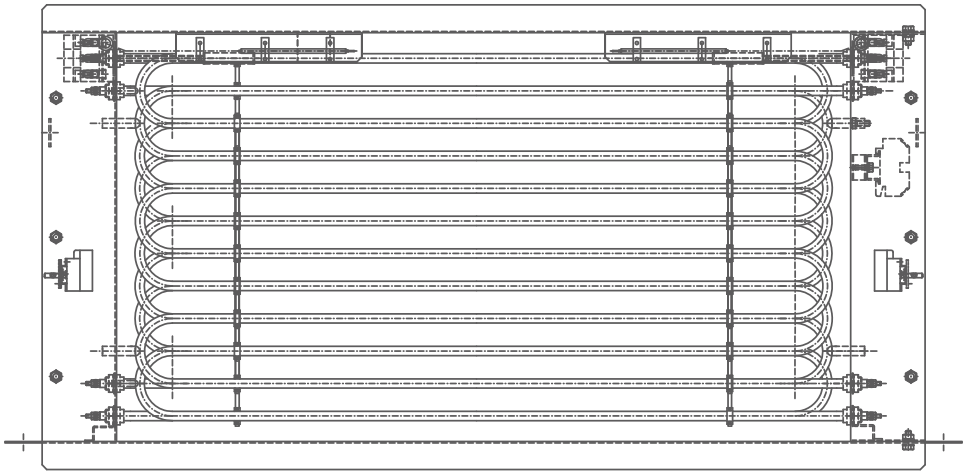


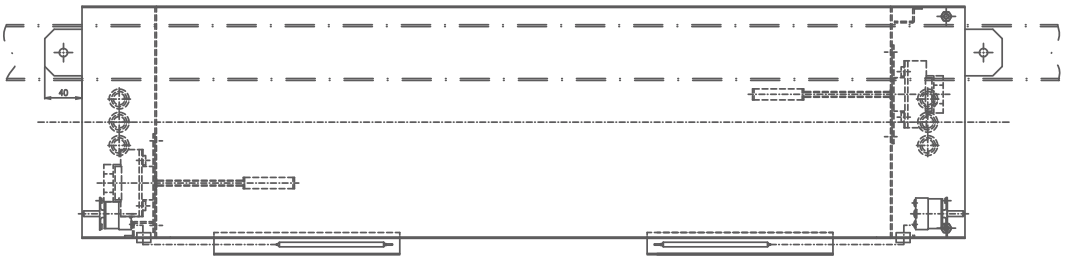
Main technical features:

Rated voltage	1500 V
Nominal power	18000 W
Specific power	1.9 W/cm²
Sheath material	AISI 321
Double insulation	Achieved by micaver insulators
Frame material	X5 CrNi1810 (AISI 304)

COACH HEATING SYSTEM

Air-conditioning duct heater





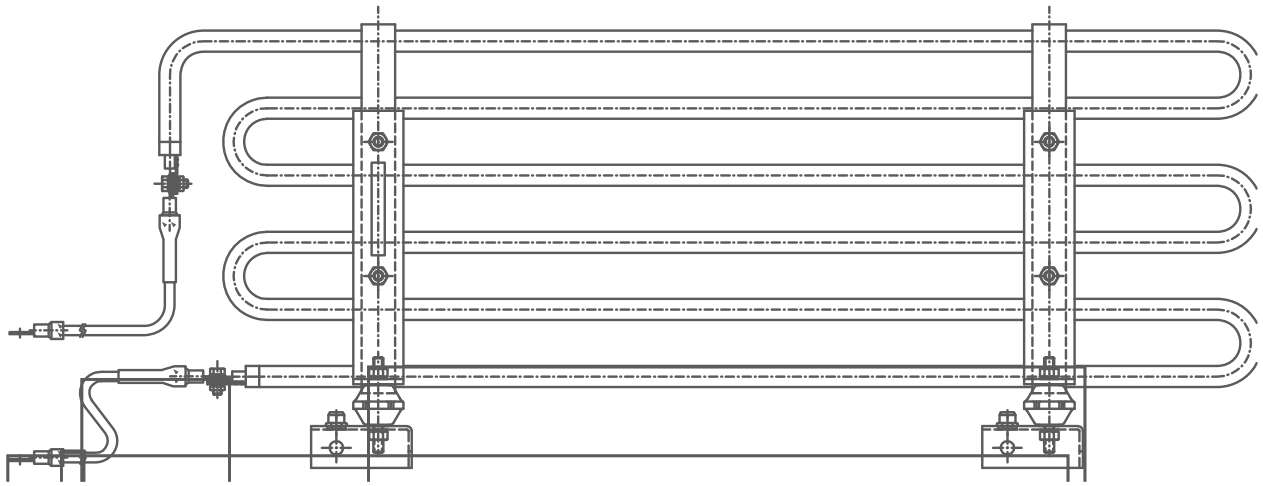
Main technical features:

Rated voltage	400 V
Nominal power	25000 W
Sheath material	AISI 321
Frame material	AISI 304
Safety device	Overtemperature cut-out
Control	Regulation thermostat
Dimensions	950 X 500 X 250 mm

COACH HEATING SYSTEM

HEATING SYSTEMS

Air-conditioning duct heater



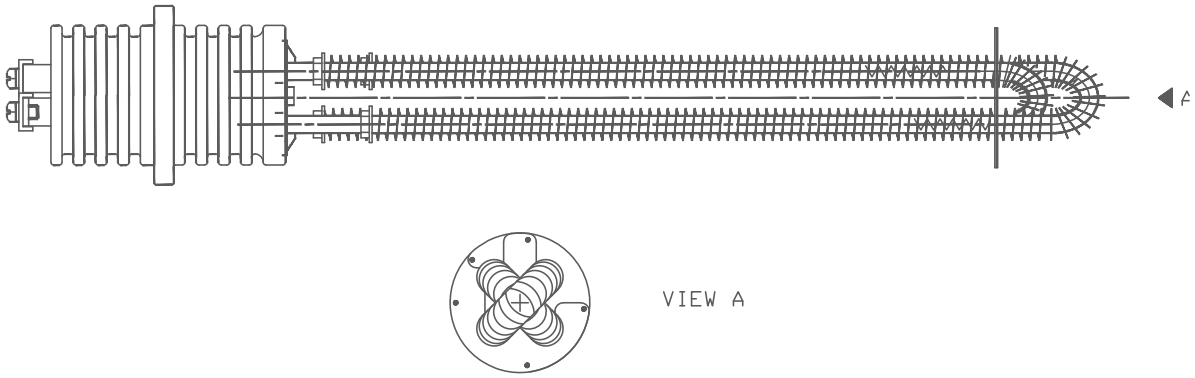
Main technical features:

Rated voltage	345 V
Nominal power	2000 W
Specific power	2.2 W/cm²
Double insulation	Achieved by insulation
Sheath material	AISI 321

COACH HEATING SYSTEM

Insulator mounted heater

This type of heater is supplied as a component for air duct heaters. A special feature is its high dielectric strength due to the ceramic insulator. Length can be changed according to the duct size and baffles; may be mounted in order to avoid duct vibrations.



Main technical features:

Rated voltage	230 - 500 V
Elements temperature	According to air speed
Specific power	4 - 8 W/cm²
Double insulation	Achieved by ceramic insulator
Sheath material	AISI 304 / AISI 321
Fins material	AISI 304 / AISI 321

COACH HEATING SYSTEM

HEATING SYSTEMS

Body side

Main technical features:

Cover	Stainless steel 3,0 mm
Profile	Aluminium extruded

COACH HEATING SYSTEM

Catering area heater

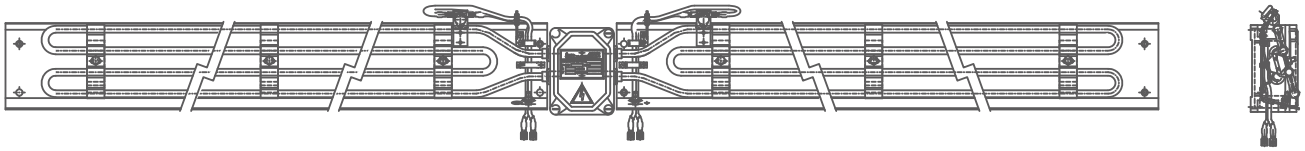
Main technical features:

Power	3000 W
Volt	230 V
Case	Aluminium

COACH HEATING SYSTEM

HEATING SYSTEMS

Cab heater unit



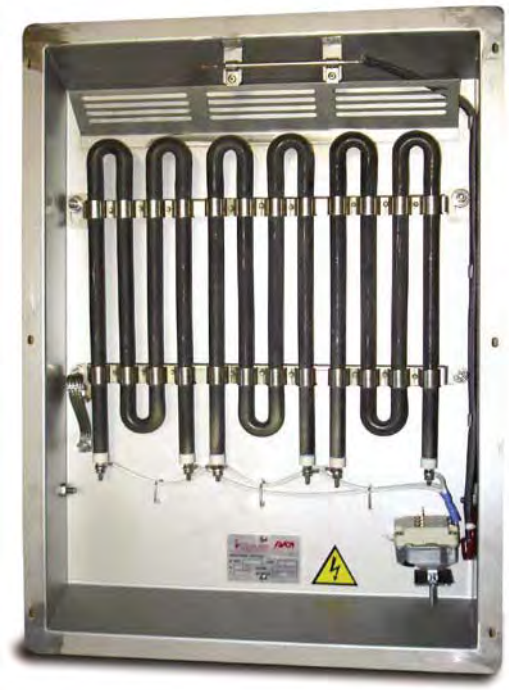
Main technical features:

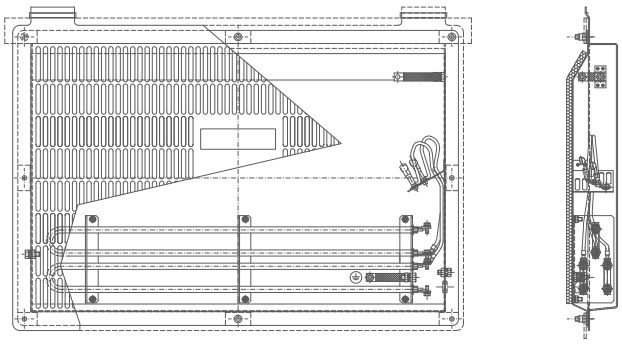
Rated voltage	725 V
Nominal power	2400 W
Sheath material	AISI 321
Deflector	Peralluman
Junction box	Polyester
Control	Safety thermostat
Dimensions	Lenght 2700 mm

COACH HEATING SYSTEM

Cab heater unit

This model of heater is suitable for installation in a horizontal position on the inner operating cab wall due to its small dimensions, working with natural convection. The heating element (round cross-section) inclination is tested to get the best heat transfer according to natural convection laws. The system is supplied assembled with a cover made either of stainless steel or aluminium perforated metal sheeting. Automatic reset over-temperature cut-outs are available on request as well as other components to meet customer's requirements.





Main technical features:

Rated voltage	750 - 900 V
Specific power	1.3 W/cm²
Double insulation	Achieved by teflon nipples and pamitherm strips
Elements temperature	200 - 250 °C
Sheath material	AISI 304 / AISI 321
Frame	AISI 304 / peraluman
Connection box	Self-extinguish polyester

COACH HEATING SYSTEM

HEATING SYSTEMS

Underseat heater

Main technical features:

Power	2600 W
Volt	230 V
Air flow	2 x 300 M^3/h
Case	Zinc-coated steel
Dimensions	400 x 425 x 150 mm

COACH HEATING SYSTEM

Vestibule heater

Main technical features:

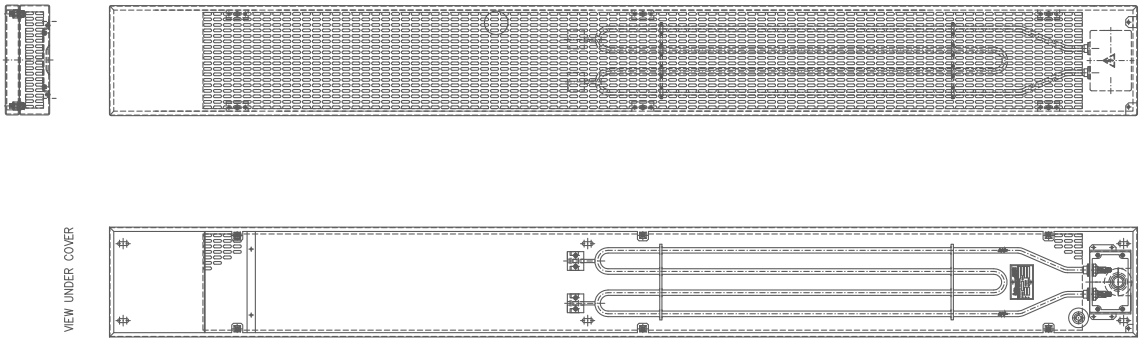
Power	1300 W
Volt	230 V
Air flow	200 M^3/h
Case	Steel
Dimensions	300 x 210 x 210 mm

COACH HEATING SYSTEM

HEATING SYSTEMS

Vertical convection heater

This type of vertical convection heater is designed to be mounted on the door sideways with the purpose to mix cold outside air with the temperature controlled inside air during train stops. It may be designed either for natural convection, or as a blower heater by adding a fan, creating an artificial air movement to make the air up-flow quicker.
Frame dimensions can be changed according to the door size, automatic reset over-temperature cut-outs are available on request as well as other components to meet customer's requirements.



Main technical features:

Arated voltage	750 - 900 V
Nominal power	500 W
Specific power	0.5 W/cm^2
Double insulation	Achieved by using insulator strips
Sheath material	AISI 304 / AISI 321
Junction box	Polyester
Duct frame	AISI 304 / peraluman

COACH HEATING SYSTEM

Toilet heater unit

This type of heater provides reliable air heating in small environments like toilets. It works as a blower heater by adding a fan, creating an artificial air movement, it allows a more compact heater than natural convection since rapidly moving air removes the heat from the heater surface more quickly. Moreover, the finned element improves heat transfer efficiency. Frame dimensions can be changed according to the duct size, automatic reset over-temperature cut-outs are available on request as well as other components to meet customer's requirements.

Main technical features:

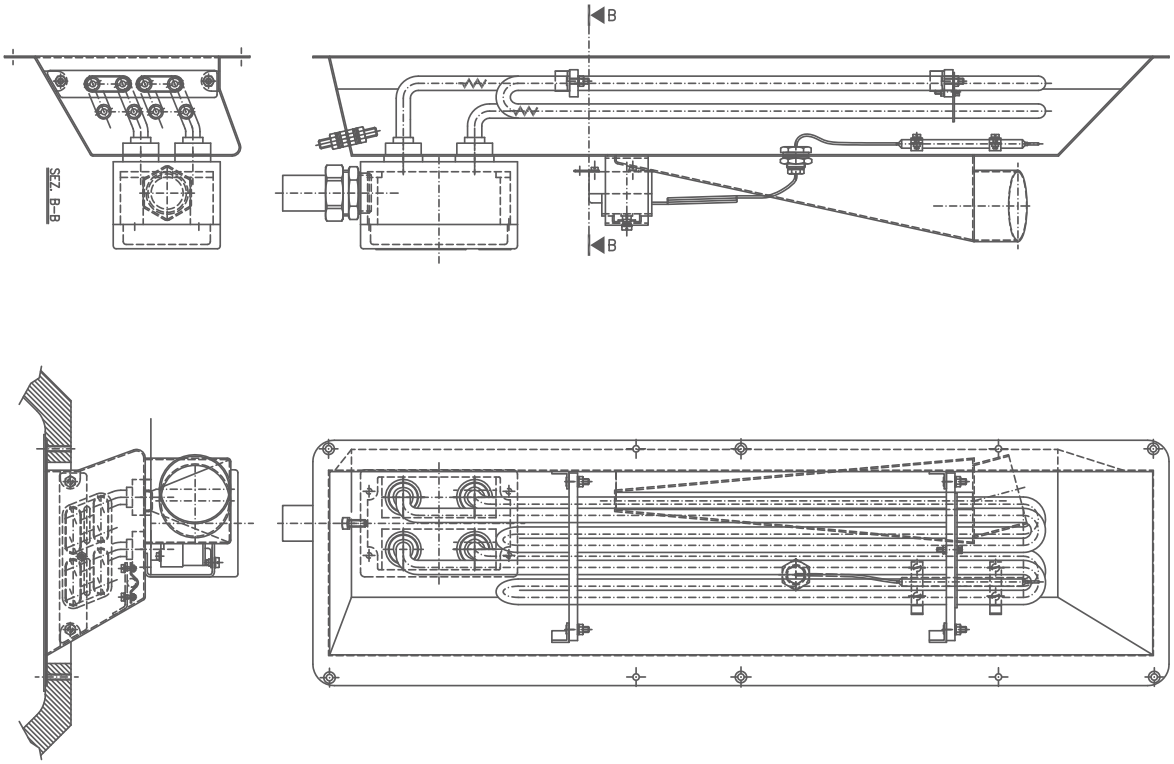
Rated voltage	230 - 400 V
Specific power	2 W/cm^2
Double insulation	On request
Elements temperature	According to air speed
Sheath material	AISI 304 / AISI 321
Fins material	AISI 304 / AISI 430
Frame	AISI 304 / peraluman
Connection box	AISI 304 / peraluman

COACH HEATING SYSTEM

HEATING SYSTEMS

Toilet heater unit

These toilet heater units are designed to be mounted on inner walls to warm the air. Two “U” bent sheath elements have been used to reduce the specific power, allowing an easier maintenance as well. Due to its low width and its high power, forced air is necessary to reduce element temperature.
Dimensions and temperature set points can be changed to fulfil customer’s requirements.



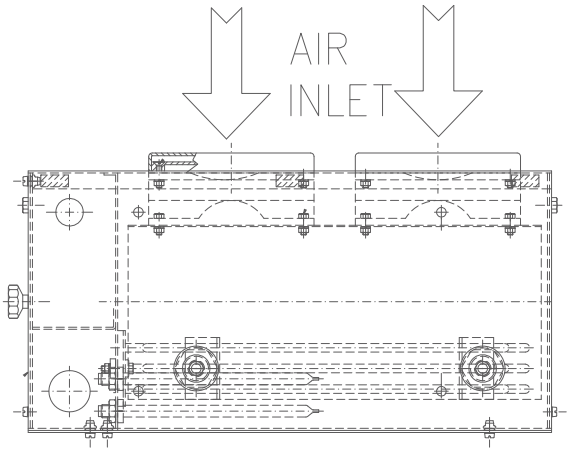
Main technical features:

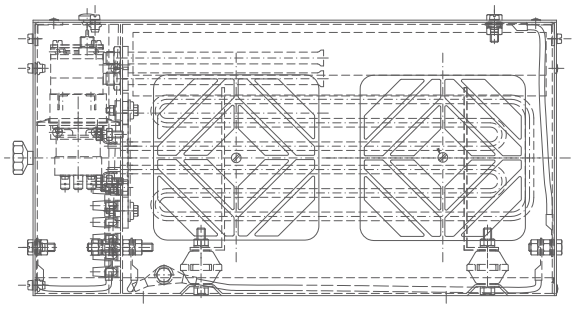
Rated voltage	1000 V
Elements temperature	According to air speed
Power	700 W
Specific power	0.7 W/cm^2
Double insulation	Achieved by teflon nipples and pamitherm strips
Sheath material	AISI 304 / AISI 321
Frame material	AISI 304
Safety thermostat	0-60 °C automatic reset
Connection box	Self-extinguish polyester

COACH HEATING SYSTEM

Cab heater unit

This type of heater is designed to be mounted uder the driving seat to heat the driver's cab but is versatile and flexible for other applica tions. Two axial-flow fans are installed to force air through elements reducing the surface temperature and increasing the elements life. Thermal cut-outs for both regulation and safety open the circuit and provide a signal for control panel. Dimensions and temperature set points can be changed to fulfil customer's requirements.





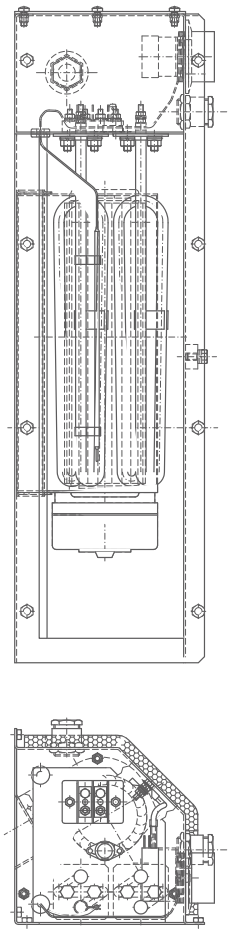
Main technical features:

Rated voltage	650 - 750 V
Power	1500 W
Specific power	1.5 W/cm^2
Double insulation	Achieved by using both teflon nipples and strip
Elements temperature	According to air speed
Sheath material	AISI 304 / AISI 321
Frame	Black anodized aluminium
Safety thermostat	90 - 110 °C manual reset
Control thermostat	30 - 90 °C automatic reset
Fan	2 axial fans

COACH HEATING SYSTEM

HEATING SYSTEMS

Cab heater unit

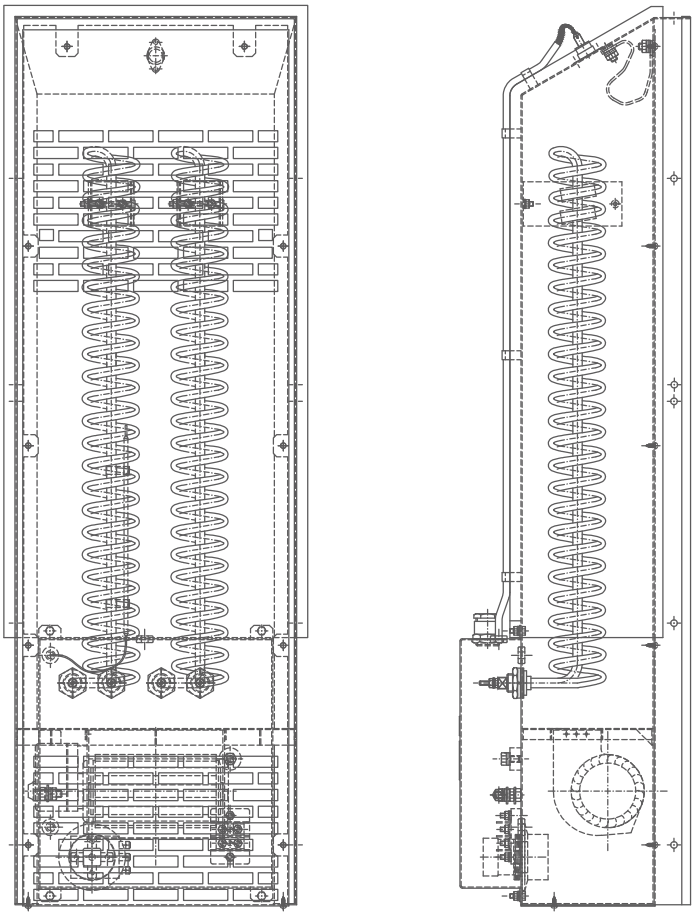


Main technical features:

Rated voltage	230 V
Nominal power	600 W
Sheath material	AISI 321
Duct frame	AISI 304
Control	Safety and regulation thermostat
Dimensions	Width 532 mm
Fan	Centrifugal fan

COACH HEATING SYSTEM

Cab heater unit



Main technical features:

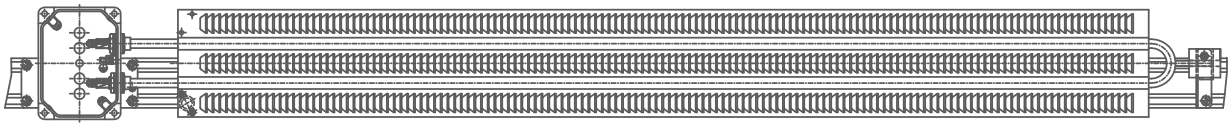
Rated voltage	230 V
Nominal power	1000 W
Sheath material	AISI 304
Duct frame	AISI 304
Control	Safety and regulation thermostat
Dimensions	810 x 270 x 200 mm
Fan	Centrifugal fan

COACH HEATING SYSTEM

HEATING SYSTEMS

Cab heater unit

This Heater Assembly is designed to be installed in a horizontal position on the inner operating cab wall due to its small dimensions, working as a natural convector. It can be supplied as a component of the complete heater unit (with 2 or 3 heating elements) or assem bled with a cover made either of stainless steel or peraluman metal sheeting. Automatic reset over-temperature cut-outs are available on request as well as other components to meet customer's requirements.



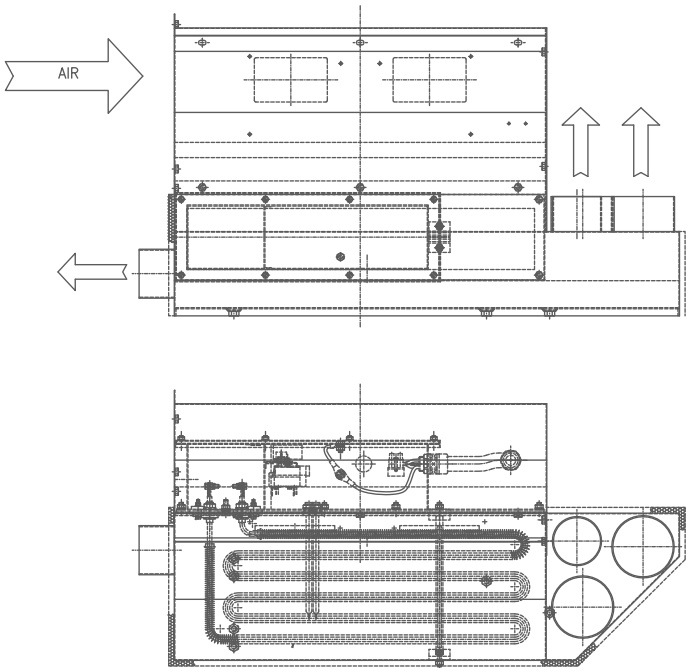
Main technical features:

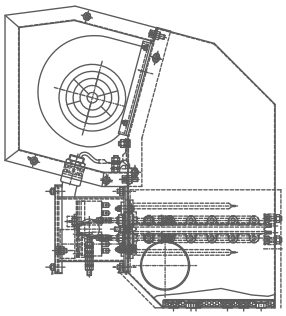
Rated voltage	230 - 750 V
Specific power	0.8 - 2.1 W/cm^2
Double insulation	Achieved by using insulator strip
Elements temperature	200 - 250 °C
Sheath material	AISI 304 / AISI 321
Diffusor layer material	Extruded aluminium
Frame	AISI 304 / peraluman
Connection box	Self-extinguish polyester

COACH HEATING SYSTEM

Windshield defrosting system for loco cabins

The unit has been designed to provide reliable windshield demist on trolley buses. It is supplied as a complete system with double wheel centrifugal-flow fan and two finned heating elements connected to the frame with double insulation solution. Thermostats are provided to protect both fan and heating elements from high temperature; a control thermostat is installed downstraem to detect outgoing air. A particular feature is its easy maintenance due to the separation between heating elements and fans. Dimensions and temperature set points can be changed to fulfil customer's requirements.





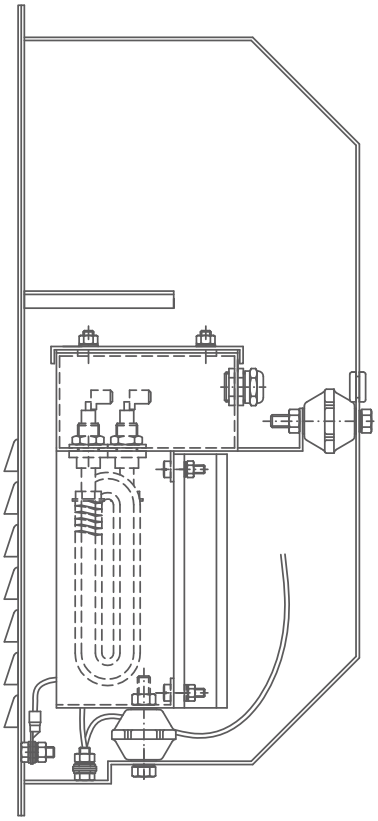
Main technical features:

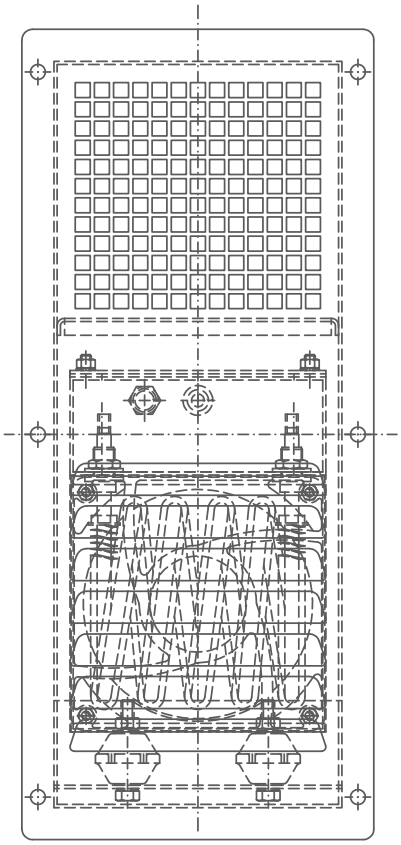
Rated voltage	750 V
Nominal power	3000 - 5000 W
Specific power	2.8 - 4.5 W/cm^2
Sheath material	AISI 321
Fin material	AISI 304
Double insulation	Achieved by ptfe supports
Duct frame	AISI 304
Control	Safety and regulation thermostat
Fan	Centrifugal fan

COACH HEATING SYSTEM

HEATING SYSTEMS

Cab heater unit



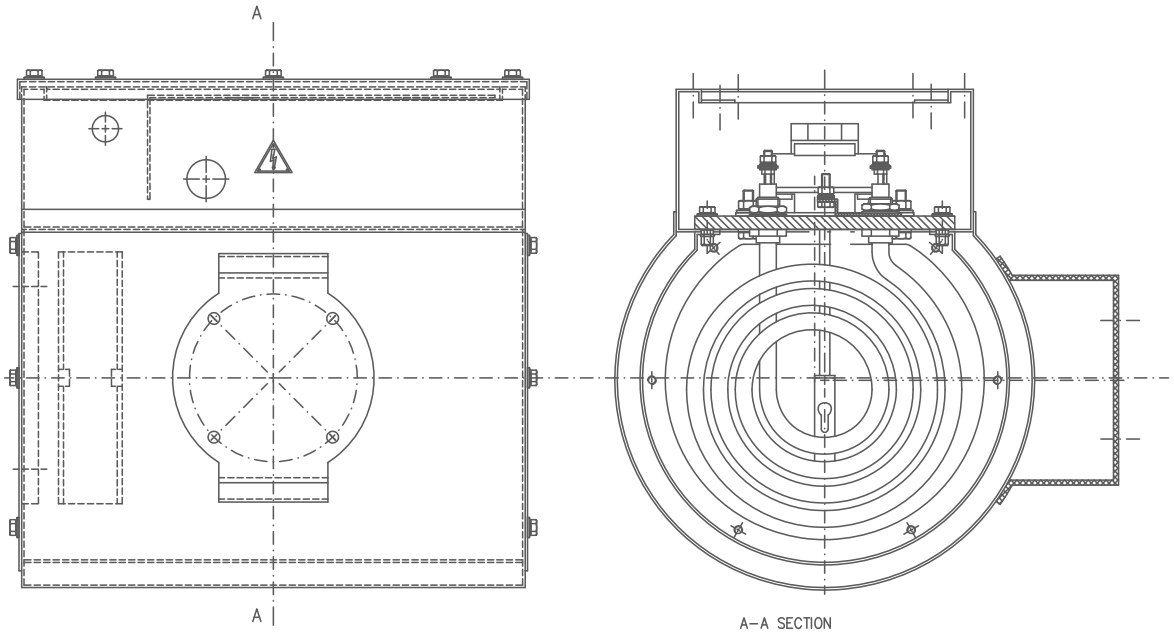


Main technical features:

Rated voltage	230 V
Nominal power	300 W
Specific power	1.6 W/cm^2
Sheath material	AISI 321
Fin material	AISI 304
Duct frame	AISI 304
Control	Safety and regulation thermostat
Dimensions	380 x 160 x 150 mm
Fan	Axial fan

COACH HEATING SYSTEM

Under seat



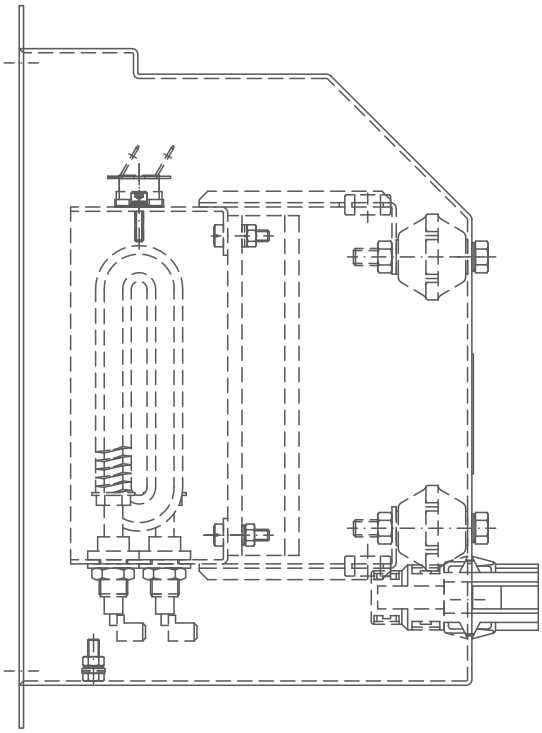
Main technical features:

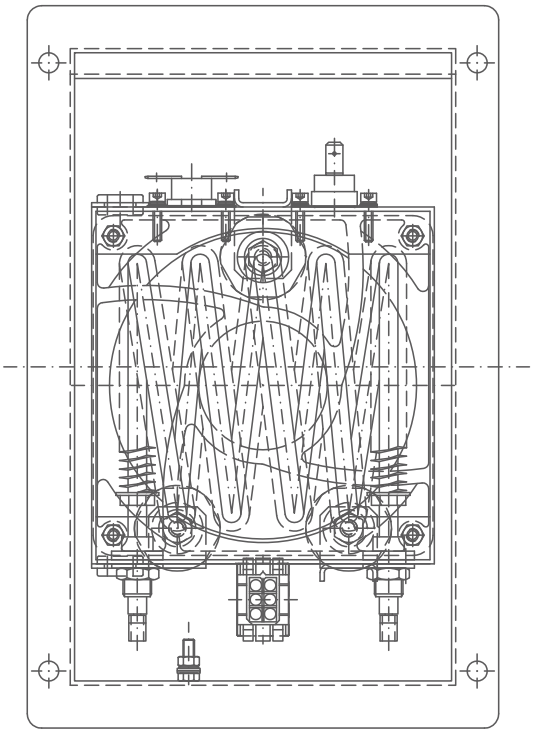
Rated voltage	220 - 380 V
Nominal power	1700 W
Specific power	1.4 W/cm^2
Sheath material	AISI 321
Duct frame	AISI 304
Safety	Overtemperature cut-out
Control	Regulation thermostat
Fan	Axial fan 24 V

COACH HEATING SYSTEM

HEATING SYSTEMS

Bodyside heater



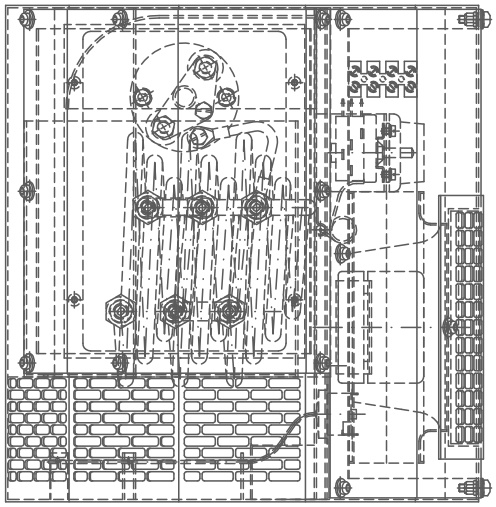


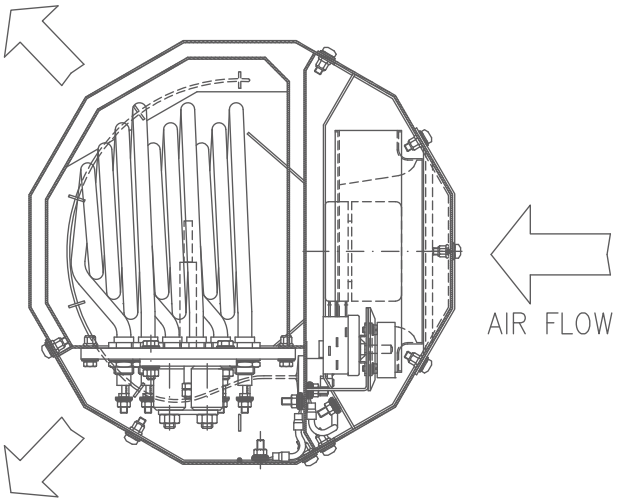
Main technical features:

Rated voltage	230 V
Nominal power	300 W
Specific power	1.6 W/cm^2
Sheath material	AISI 321
Fin material	AISI 304
Duct frame	AISI 304
Control	Safety and regulation thermostat
Fan	Axial fan

COACH HEATING SYSTEM

Underseat heater





Main technical features:

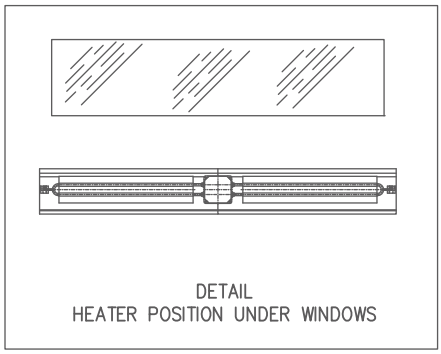
Rated voltage	750 V
Nominal power	1800 W
Specific power	1.4 W/cm^2
Sheath material	AISI 321
Structure	AISI 304
Safety	Overtemperature contactor
Control	Regulation thermostat
Fan	Axial fan 24 V
Dimensions	Height 320 mm - max width 308 mm

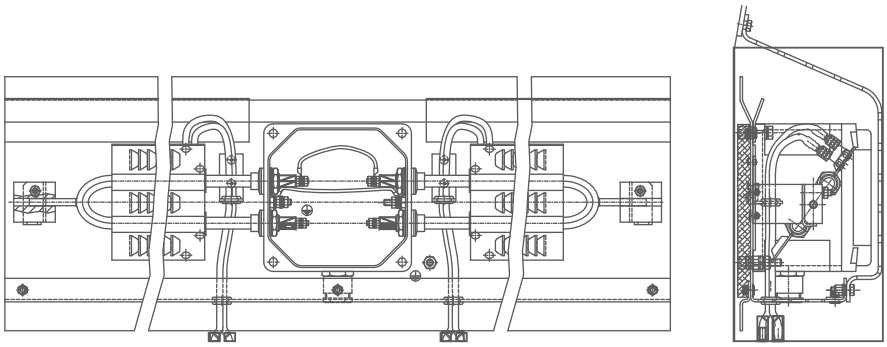
COACH HEATING SYSTEM

HEATING SYSTEMS

Horizontal upflow heating

This model of heater is for installation in a horizontal position on a heater carriage wall, working as a natural convector. It can be supplied as a component of the complete heater unit or assembled with a cover made of stainless steel or anodized aluminium perforated metal sheeting. The more the surface is open, the more effective the air flow will be. Automatic reset overtemperature cut-outs are available on request as well as other components to meet customer's requirements.





Main technical features:

Rated voltage	230 - 750 V
Elements temperature	200 - 250°C
Specific power	0.8 - 1.5 W/cm^2
Double insulation	Achieved by using pamitherm strips
Sheath material	AISI 304 / AISI 321
Frame material	AISI 304 / peraluman
Diffusor layer material	Extruded aluminium
Connection box	Self-extinguish polyester

COACH HEATING SYSTEM

Heating elements for floors

This kind of heater is designed for mounting to the underside of floors for comfort heating. It can be supplied in many different shapes in order to be mounted where it is easy to install a standard heater. The low specific power guarantees a safe temperature on the heated area. Electrical connections are vulcanized to give a perfect tight seal in case of humidity.

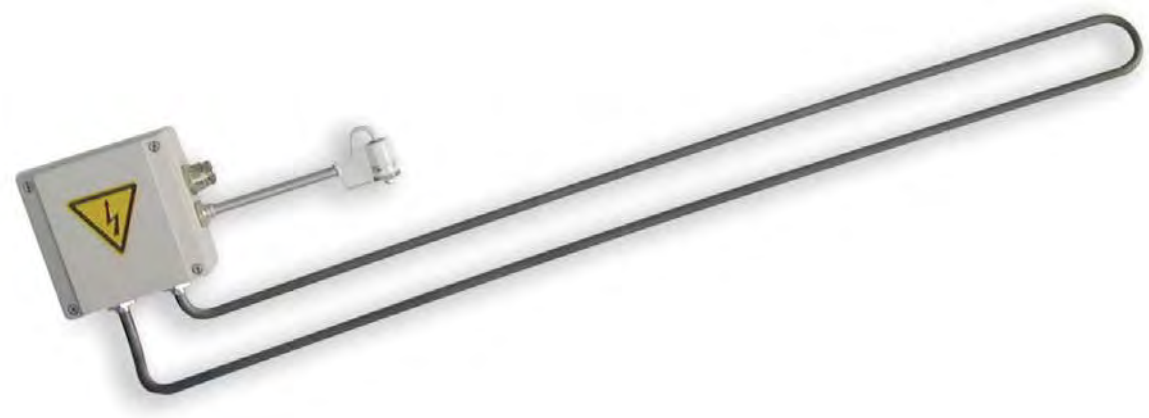
Main technical features:

Rated voltage	230 V
Specific power	0.5 W/cm^2
Sheathed material	AISI 304
Vulcanization	Silicon
Connections	Silicon cables

COACH HEATING SYSTEM

HEATING SYSTEMS

Body side heater



Main technical features:

Power	750 W
Volt	230 V
Length	1750 mm

COACH HEATING SYSTEM

Boiler for toilets

Main technical features:

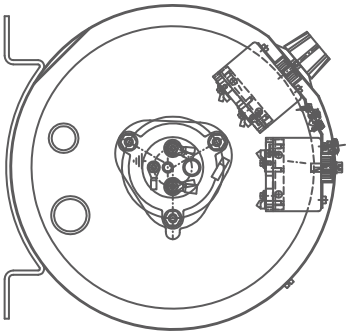
Power	800 / 1200 W
Volt	230 V
With limiter stainless steel case	175 mm

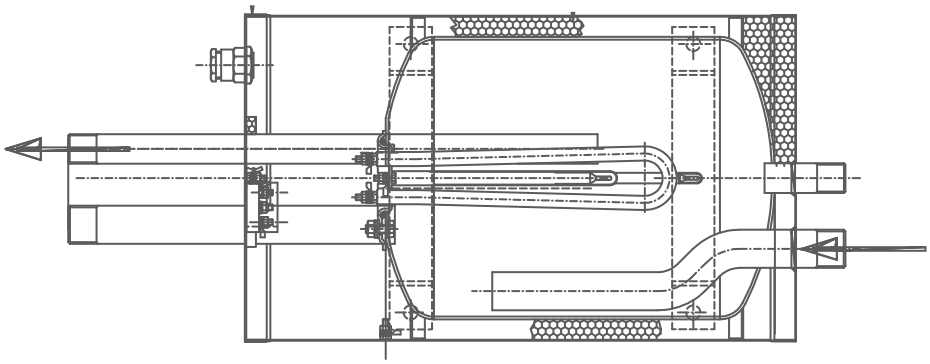
COACH HEATING SYSTEM

HEATING SYSTEMS

Toilet boiler

Toilet heater units are designed to be mounted in the inner toilet wall. They are built with two main parts, an AISI 304 vessel and flange immersion heater mounted on the bottom side. The four pipes shown provide the following functions two for inlet and outlet, one for draining and one as a safety valve. Both regulation thermostat and safety thermostat are mounted. Three versions are available according to the water quantity required for each drawing. The standard boiler diameter is 240 mm.





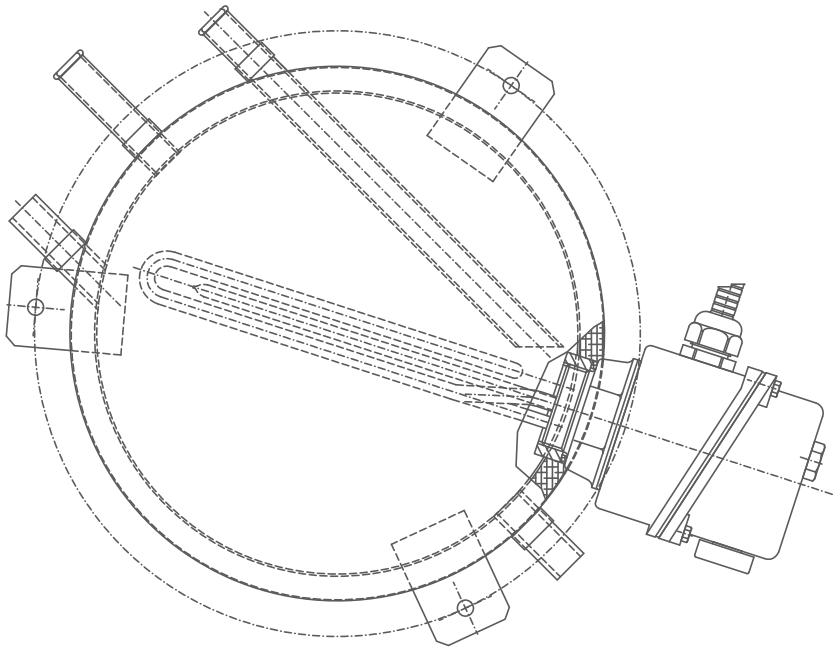
Main technical features:

Rated voltage	230 V
Nominal power	750 W
Specific power	7.3 W/cm^2
Sheath material	INCOLOY 800
Boiler	AISI 304
Insulation	Elastomer (NBR)
Capacity	8 Lt
Control	Safety and regulation thermostat
Dimensions	Height 390 mm - ext. diameter 230 mm

COACH HEATING SYSTEM

Toilet boiler

Toilet heater units are designed to be mounted in the inner toilet wall. They are built with two main parts, an AISI 304 vessel and flange immersion heater mounted on the bottom side. Four pipes are designed with different purposes, two as inlet and outlet pipes, a pipe, for draining and one as a safety valve. A thermostat provides regulation and safety cut-out. The total capacity is 7Lt, other capacities are available on request.



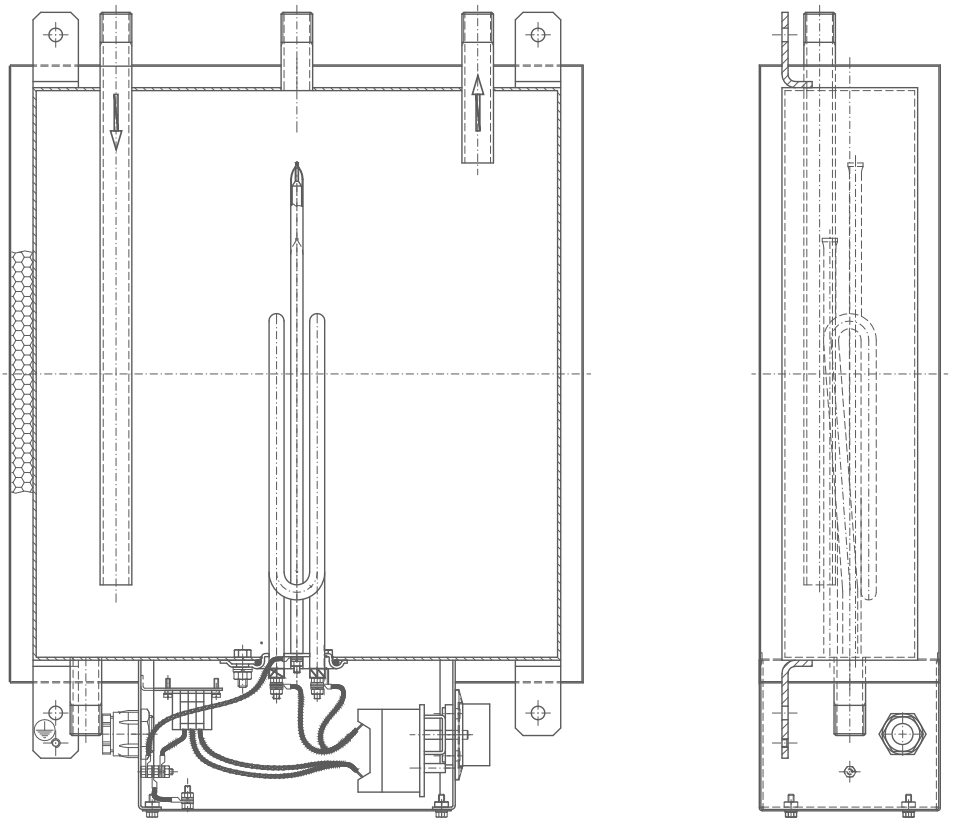
Main technical features:

Rated voltage	220 - 380 V
Nominal power	1000 W
Specific power	2.6 - 4.3 W/cm^2
Sheath material	INCOLOY 800
Boiler	AISI 304
Insultion	Polyethylene
Capacity	7 Lt
Connection box	ALUMINIUM IP55
Control	Safety and regulation thermostat
Dimensions	Width 160 mm - ext. diameter 340 mm

COACH HEATING SYSTEM

HEATING SYSTEMS

Toilet boiler



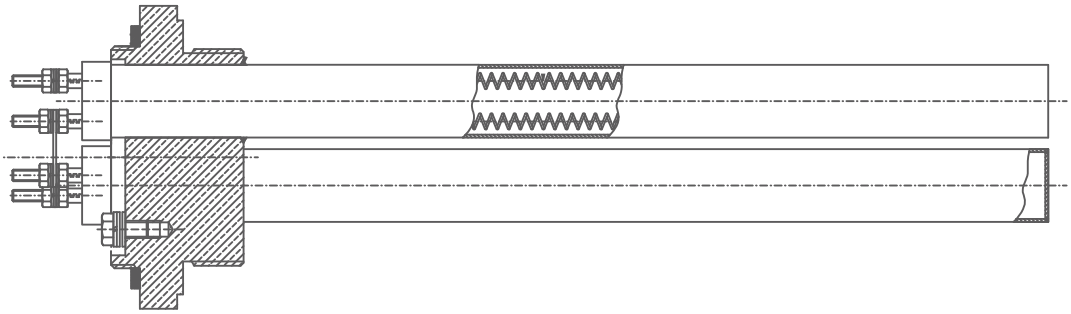
Main technical features:

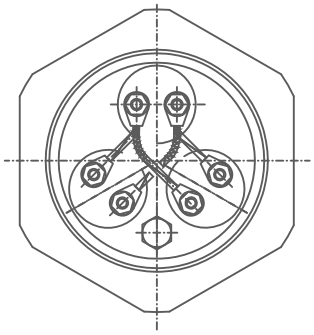
Rated voltage	230 V
Nominal power	2000 W
Specific power	8.3 W/cm^2
Sheath material	INCOLOY 800
Boiler	AISI 304
Insultion	Elastomer (NBR)
Capacity	11 Lt
Control	Safety and regulation thermostat
Dimensions	380 x 120 x 410 mm

COMPONENTS

Waste tank heater

The unit provides reliable waste tank heating to prevent toilet waste from freezing. It is supplied with both regulation and safety thermo stats with bulb inserted in two different thermowells. A cartridge heating element is inserted in a thermowell; this execution allows a quick replacement in case of heater failure. Other models are available with three cartridge elements to lower specific power.



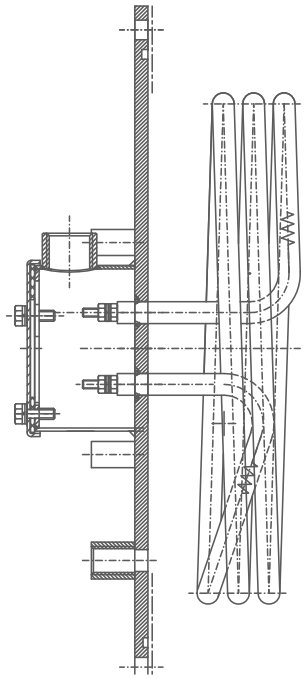


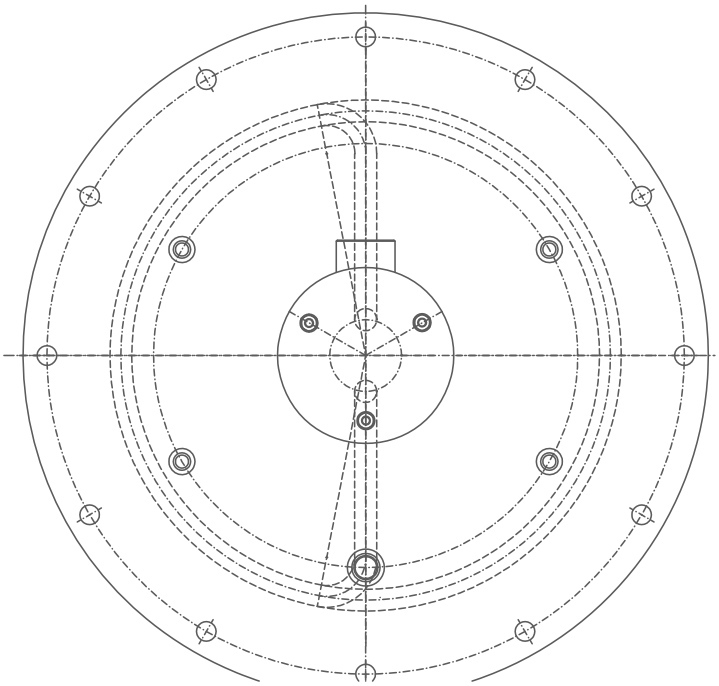
Main technical features:

Rated voltage	220 - 440 V
Nominal power	750 W
Specific power	1.4 W/cm^2
Cartridge	INCOLOY 800

Waste tank heater

The unit provides reliable waste tank heating to prevent toilet waste from freezing. It is supplied with both regulation and safety thermo stats with bulb inserted in two different thermowells. A cartridge heating element is inserted in a thermowell; this execution allows a quick replacement in case of heater failure. Other models are available with three cartridge elements to lower specific power.



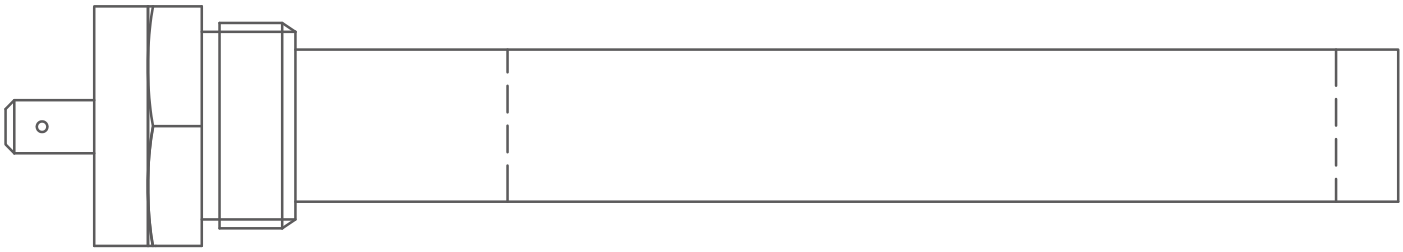


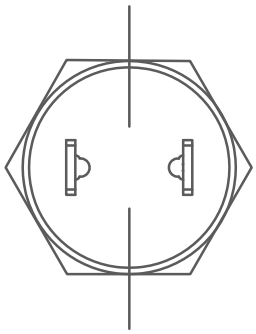
Main technical features:

Rated voltage	220 V
Nominal power	750 W
Specific power	1.2 W/cm^2
Sheath material	INCOLOY 800
Flange	AISI 304

COMPONENTS

Point heaters

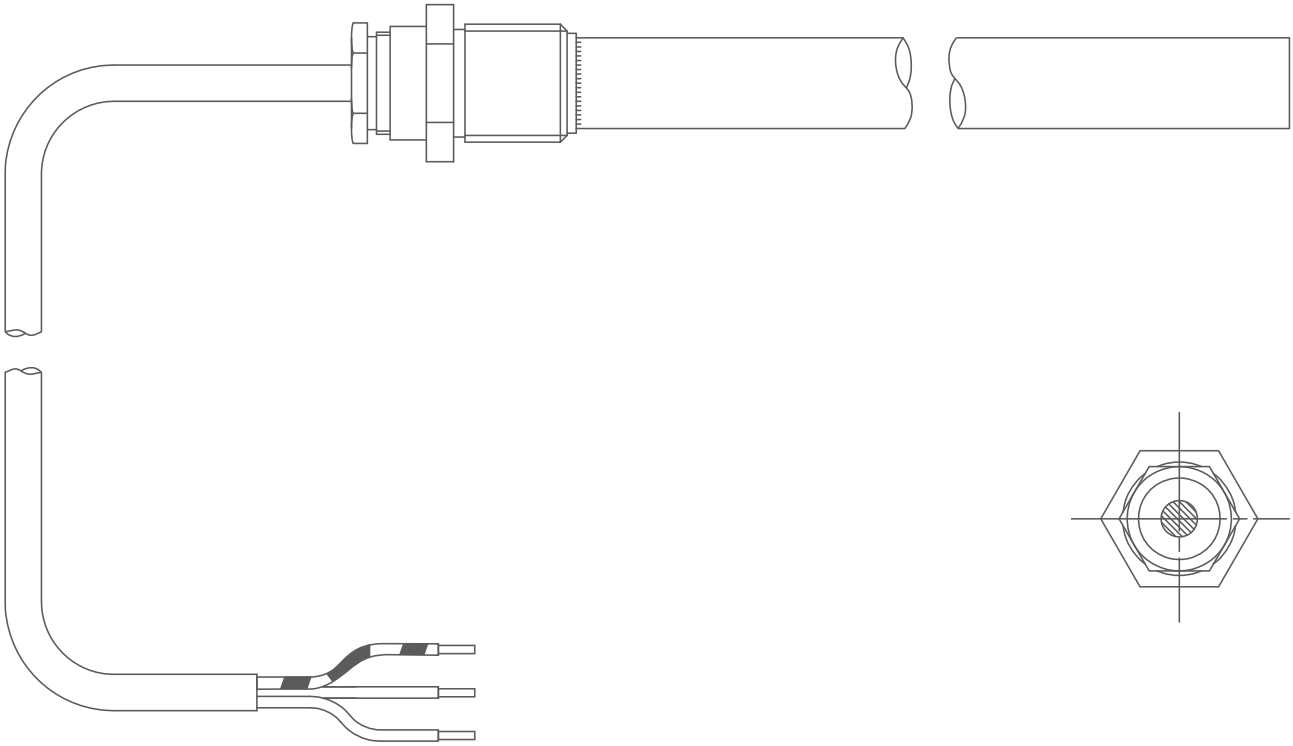




Main technical features:

Rated voltage	110 - 200 V
Nominal power	80 - 400 W
Specific power	4.1 - 7.9 W/cm^2
Cartridge	AISI 321

Breaking system heating device

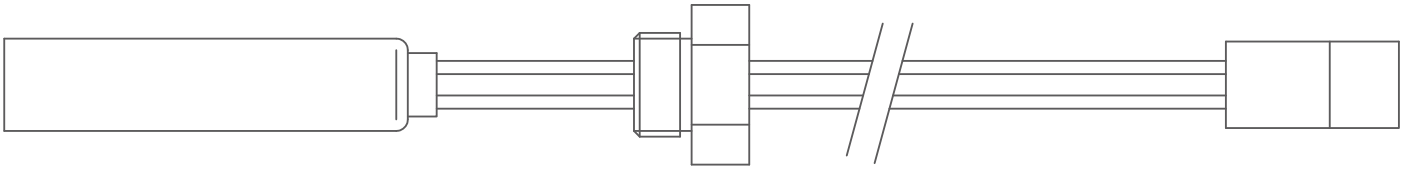


Main technical features:

Rated voltage	110 V
Nominal power	200 W
Specific power	3.3 W/cm^2
Cartridge	AISI 316 TI

COMPONENTS

Point heaters



Main technical features:

Rated voltage	150 V
Nominal power	50 W
Specific power	1.7 W/cm^2
Cartridge	AISI 316 TI

COACH HEATING SYSTEM

HEATING SYSTEMS

Flexible heater applicatons

The flexible heaters are used for various applications thanks to their easy manufacture. Forms and dimensions cover a large range of specific needs. This technology is based on the use of dielectic substrates which contain, in a “sandwich structure”, one or more resistive tracks made by “etching” technology.

The main applications of the Etched Foil Technology are the following:
- passenger car wall heating
- tank and exhaust pipe heating
- defrosting of some car entry zones such as hall steps and lifting platforms for disabled people and other zones which need to be temperature maintained during the winter seasons.
- heating of the anti-slip system for locomotives.

Assembly on the part to be heated can be carried out through glueing or mechanical fixing. The Etched Foil heaters can be supplied with a sensor or temperature control device already installed.

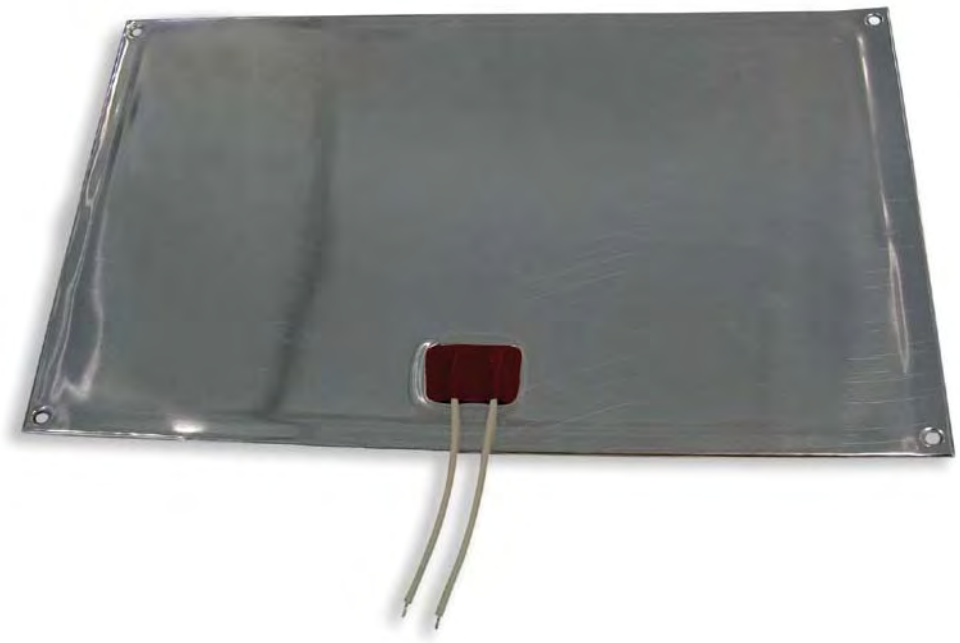
Main technical features:

Rated voltage	10 ÷ 800 V
Specific power	Up to 1 W/cm^2
Maximum working temperature	Polyester 100 °C max
	Silicone 200 °C max
	Silicone + adhesive 175 °C max
Minimum working temperature	- 50 °C

COACH HEATING SYSTEM

Passenger car wall and floor heating

This solution has been studied to reduce to the minimum the space occupied by the heat sources to heat the environment. To heat the walls, heaters are placed under the windows. This also serves to demist them.



Main technical features:

Rated voltage	10 ÷ 700 V
Specific power	Up to 0.1 W/cm^2
Maximum working temperature	Polyester 100 °C max
Minimum working temperature	- 50 °C

COACH HEATING SYSTEM

HEATING SYSTEMS

Defrosting of some car entry zones such as hall steps and lifting platforms for disabled people and other zones which need to be temperature maintained during winter seasons

In order to avoid ice on the steps or in the passenger entry zones, silicone and polyester heaters are used. The heaters are designed with different geometrical forms to satisfy various applications using special adhesives for high-humidity environments.
The reduced size of heaters helps use, in applications where space is lacking.

Main technical features:

Rated voltage	10 ÷ 800 V
Specific power	Up to 0.5 W/cm^2
Maximum working temperature	Polyester 100 °C max
	Silicone 200 °C max
	Silicone + adhesive 175 °C max
Minimum working temperature	- 50 °C

COACH HEATING SYSTEM

Heating of anti-slip systems for locomotives

The tube, through which the sand is forced, has to be clear from ice and snow.
Due to the peculiar use conditions of this heater (high- humidity environment and danger of mechanical damage), a particular mechanical protection has been designed inside a waterproof silicon vulcanisation.

Main technical features:

Rated voltage	10 ÷ 240 V
Specific power	Up to 0.5 W/cm^2
Maximum working temperature	Kapton 200 °C max
	Silicone 200 °C max
Minimum working temperature	- 50 °C

COACH HEATING SYSTEM

HEATING SYSTEMS

Pipe and exhaust tank heating

In order to avoid ice on inlet pipes and exhaust tanks, waterproof silicon heaters are used.
The heaters are designed in different geometrical forms in order to satisfy most various applications. Special adhesive, for high-humidity environments, is used to fix them.

Main technical features:

Rated voltage	10 ÷ 800 V
Specific power	Up to 1 W/cm^2
Maximum working temperature	Silicone 200 °C max
	Silicone + adhesive 175 °C max
Minimum working temperature	- 50 °C

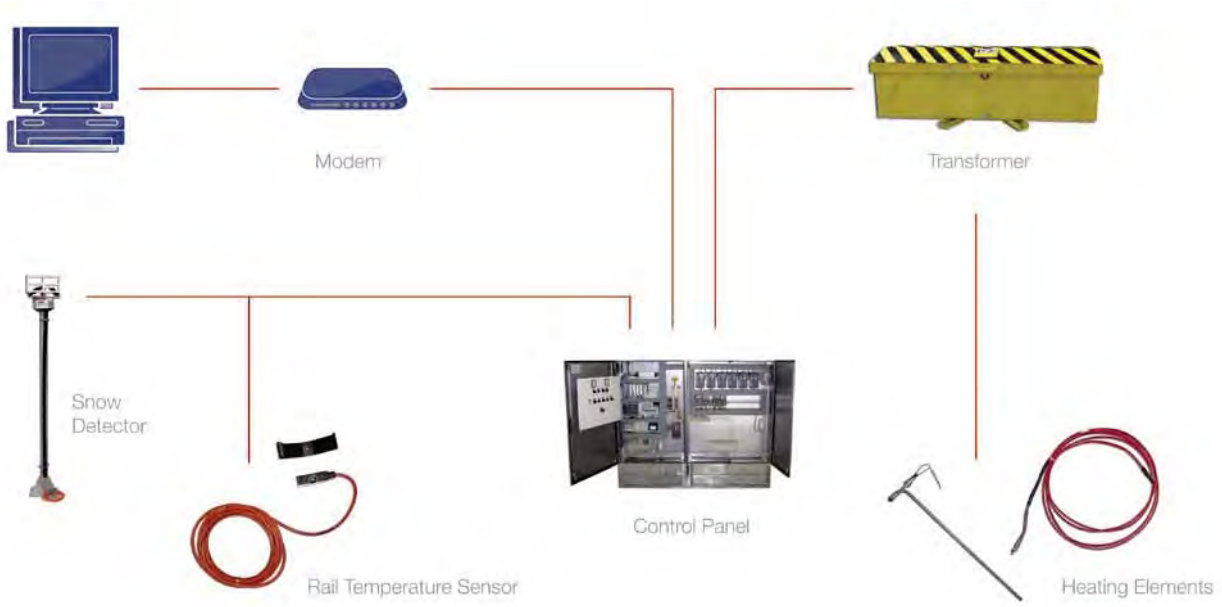
SWITCH POINTS HEATING SYSTEMS

Our develops, designs and produces Switch point heaters - in compliance with the specific techniques in force.
Installed in the Italian Railway Network, in both traditional and high-speed lines and comprising:

· electric heating elements
· outdoor transformers
· switchboards for command and control, also remote
· environmental conditions measurement equipment

We offer their experience to design with customers the right solution according to customer requirements.

Executive project and in system installation and start-up operations. It uses the competences it has gained through its experience in this sector over 20 years, and avails itself of the cooperation of switch points and other supervision systems manufacturers.



Switchboards

Switchboards are for outdoor and are therefore housed in containers made of plastic reinforced by fibre glass or in AISI 304 stainless steel if installed outdoor, or in varnished steel if installed indoors. They feature blind-type double doors, to protect signallers and controls, and are provided with canopy protection against rain as well as with aerators to allow air circulation and avoid over-temperatures.
They basically comprise three parts: the power - related to the feeding of the points; the management of the heating function by means of the snow detector which integrates with the power circuit; and the supervision and diagnostic - carried out by a PLC which commu nicates also with a remote point.
Signalling lamps, for eventual checks on the status of the switchboard, will turn on only when the doors are open and by pressing the proper selector. That avoids over consumption menages rises in temperature and above all reduces maintenance interventions.
The switchboards are installed along high-speed lines, near the pole where the pole transformer has been placed, by fixing them-using the brackets supplied to a concrete base specially prearranged for cables entering from the bottom. We suggest using a support structure in the rear part of the switchboard to improve the reliability of the installation. Such structures integrated to the base, will avoid problems, in cases of strong wind or pressure waves. Only the base of the switchboard works as resistant element. As an example, the picture below shows the front view of a 150 KVA switchboard.

Transformer

The current transformers are of the type with silicon oil cooling, with natural circulation, suitable for functioning outdoors and homologa ted.

Their main features are:
- capacity: 7.5 KVA and 15 KVA
- primary circuit voltage: 400 V monophase 50 Hz ± 15% (without adjustment taps);
- secondary circuit voltage: 50 V (no load) 50 Hz;
- outlets at the secondary circuit: 4 for the 7.5 KVA and 6 for the 15 KVA (2.5 KVA each)
- primary and secondary circuit protected by fuses.

Mechanical execution, accessibility to live parts, types of connection and employed electric materials comply with the Italian Railways (F.F.S.S.) specifications and regulations in force.
To ensure they are weatherproof also in seaside areas, the housing is galvanized and then varnished according to DY991/1 specification. Furthermore, some parts that may be damaged more easily are in stainless steel. Its colour is yellow RAL 1004 with black stripes on the lid. Installation is carried out on special concrete platforms, according to installation needs.

Snow detector

To optimise the management and consumption of power in switch points heating systems, we suggest installing a snow/ice detector. The insertion of this equipment will allow the feeding and disconnection of systems, without operator intervention. Operators will only have to turn the voltage to the system on and off, at the beginning and the end of the cold season respectively.

The equipment is shown in schematic way in the previous drawing and comprises:

· a humidity sensor made up of three strips, that can be oriented according to the prevalence of the wind, at the installation site, and which measures precipitations of snow and rain according to the outside temperature. The three strips will be placed on the top of a support pole, underground for ≈ 60 cm or fixed to a concrete platform and protected by a ring to avoid accidental impacts;

· a temperature sensor, comprising two NTC probes (R4, R5), that measures the ambient temperature. To obtain a more realistic mea surement, due to system requirements, the control unit should be placed near or between the points to be heated and not at stations where it could be more protected or affected by heated buildings;

· a temperature sensor, placed under the stock rail heated and fixed at ≈ 20 cm from the heater tip; for correct working it is necessary that this sensor is placed under the point more exposed to the north and/or more in the shadow;

· a control unit to process data received from the sensors, emitting a signal that is used to operate the system automatically, with S1 switch set on “Automatic”. When the switch is set on “Manual”, the heating time will be that set for tests (≈ 5 min.)

Points-toe heaters

The heaters comprise an AISI 321 sheath containing the Ni/Cr resistance wire, insulated in compressed Mg magnesium oxide. Their-spe cific power ranges from 250 W/m to 450 W/m according to climatic zone. They are produced in a standard length of 4.2 or 5.3 meters and in right and left executions, according to the length of the points. One end is airtight closed by means of welding while the other is welded to a brass connector to fix the junction box. They are fixed to the track by means of special steel brackets.

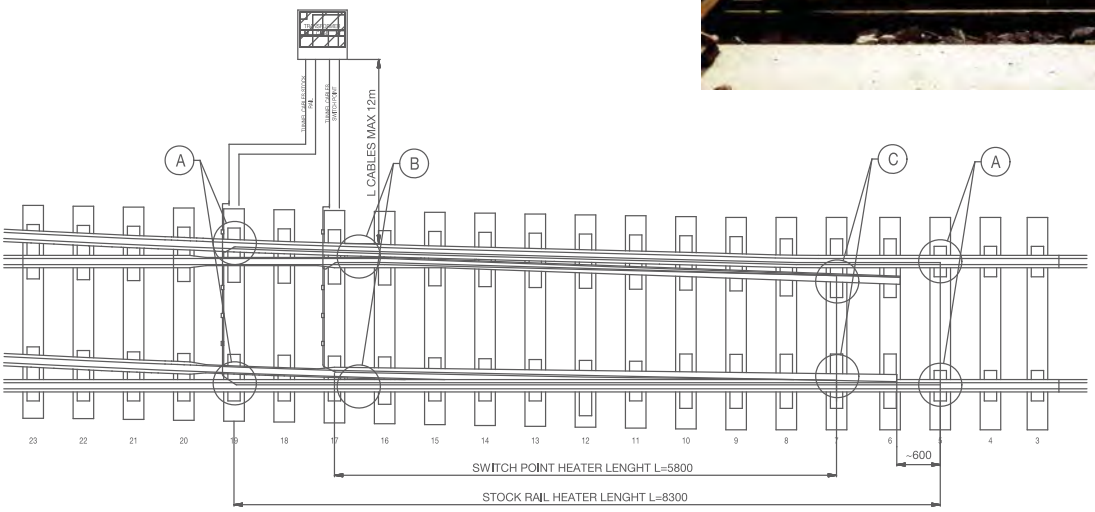
Rod heaters

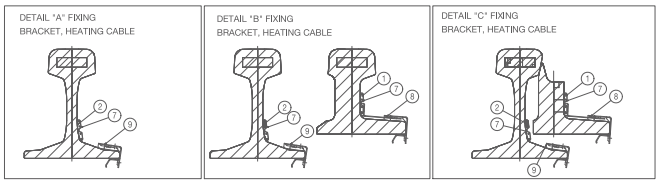
The heaters comprise an AISI 321 sheath containing Ni/Cr resistance wire, insulated in compressed Mg magnesium oxide. Their specific power is 750 W. They are produced in standard lengths of 1.35 or 1.75 meters and in a single execution. One end is hermetically closed by means of welding while the other is welded to a brass connection to fix the junction box.
They are fixed to the track by means of an aluminium bracket that fixes the junction box and by a (telescope) steel bracket that allows for expansion.

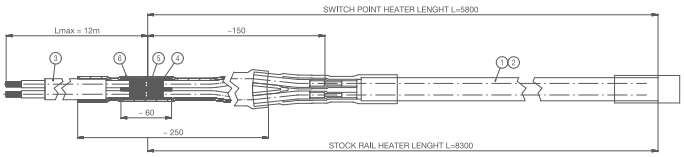
SWITCH POINTS HEATING SYSTEMS WITH SELF REGULATION CABLES

HEATING SYSTEMS

Designs and products switch point heating system with self-regulating cables as an option for the traditional system with a constant power tubular element. This new solution guarantees a lower power consumption due to the selfregulating action with easy installation and maintenance.







Main technical features:

Rated voltage	24 V
Nominal Power	80 W/m (4416 W)
Overjacket	Fluoropolymer
Transformer	400 V - 24 V