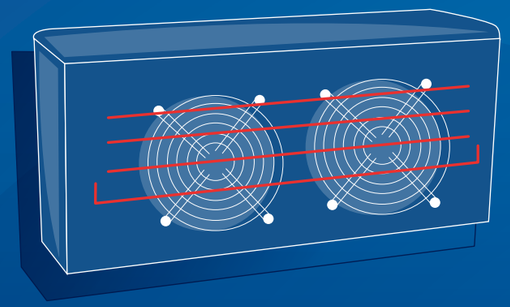
Zoppas Industries
Heating Element Technologies

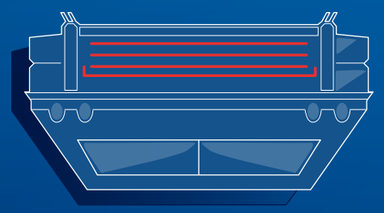
REFRIGERATION

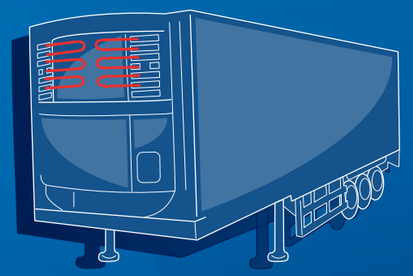
Zoppas Industries
Heating Element Technologies



BLAST CHILLING/RIPENING AND PRESERVATION

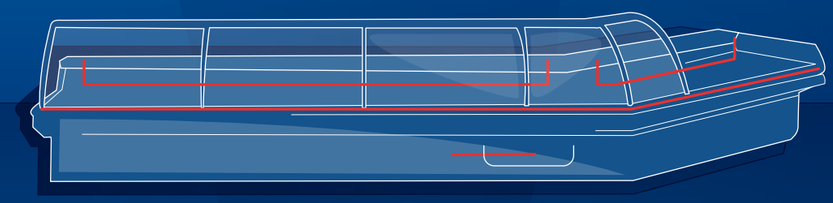
Aero evaporators for blast chilling, refrigerated cells and ripening chambers.





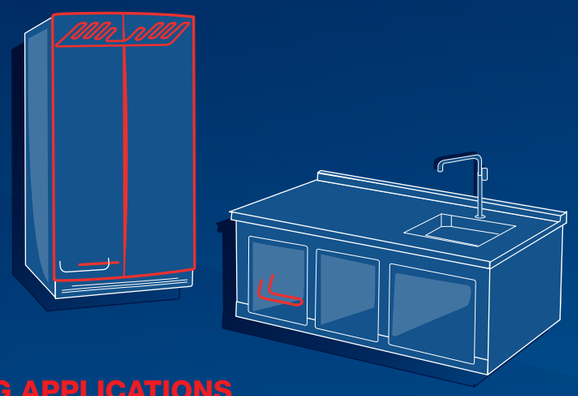
REFRIGERATED TRANSPORT

Cooling units for trucks and containers



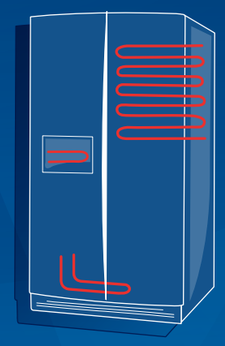
RETAIL

Refrigerated cabinets and counters



CATERING APPLICATIONS

Cabinets, counter refrigerators, showcases, blast chillers and retarder/prover cabinets

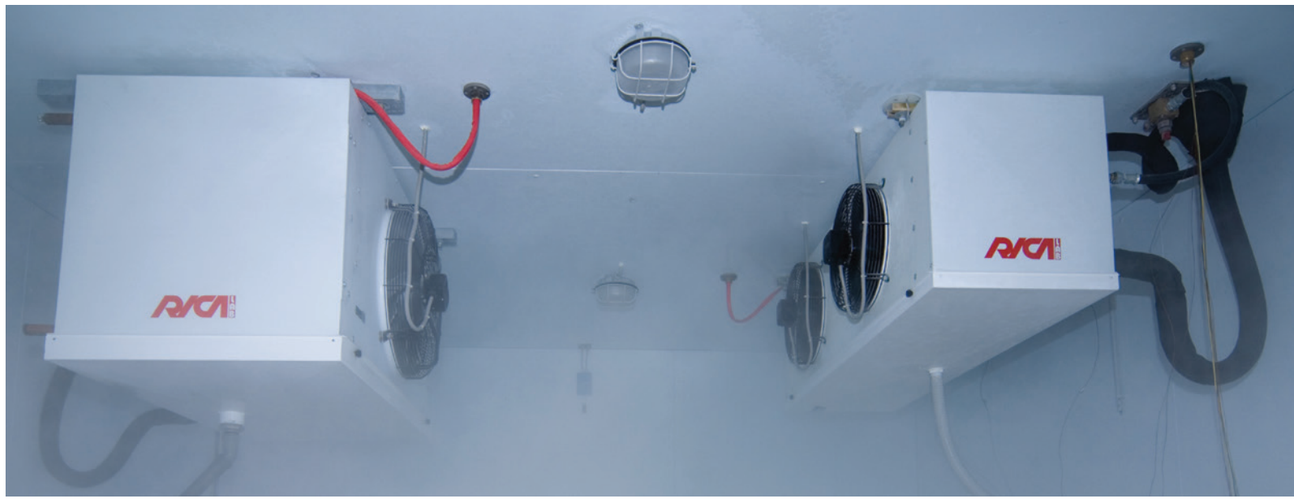


DOMESTIC PRESERVATION

Static and no-frost refrigerators

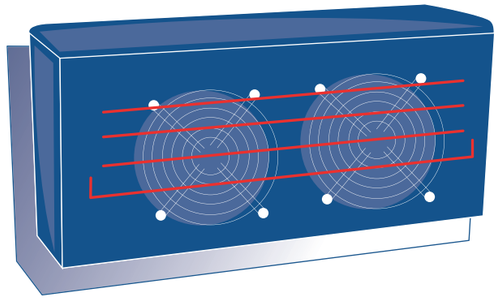
RESEARCH & DEVELOPMENT

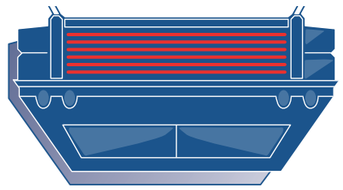
The Cold Business Unit has a dedicated R&D department created to support the Group's research and development with solutions and technologies specially designed for the refrigeration market.
The department has a laboratory provided with latest generation apparatus, where existing products and new technologies are tested.
Special attention is paid to energy savings and optimum use of heating elements.
Our collaboration with important private and university research institutes, as well as leading companies in the various application sectors, allows us to experiment alternative materials and technologies to meet the new needs of our customers.
For the purpose of guaranteeing high performance and reliability, every product developed by the R&D department undergoes strict life tests in extreme conditions of use.
The R&D department is happy to co-operate and share its know-how in order to continuously improve products for its customers.



Zoppas Industries
Heating Element Technologies

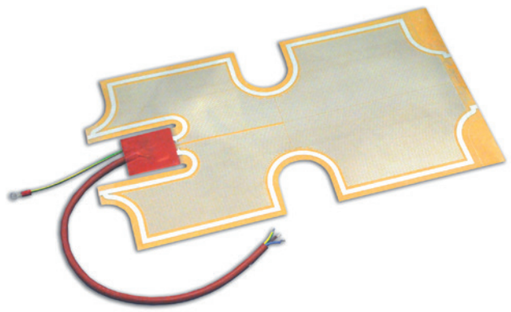
BLAST CHILLING/RIPENING AND PRESERVATION

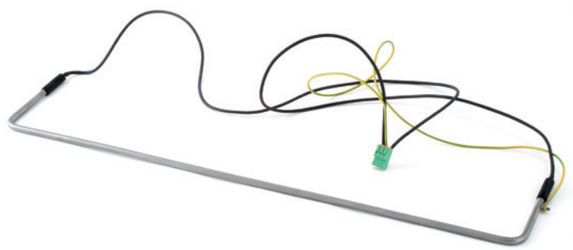




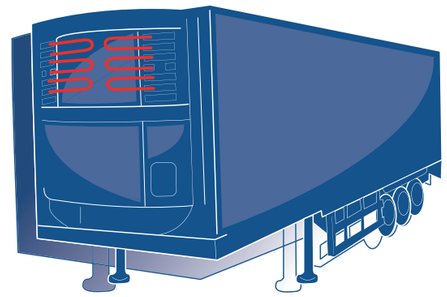
The reliability required of an electric heating element inserted in an aero evaporator must be 100% because the duration of an entire set of equipment and the food it preserves depends on the element itself and its operation cycle after cycle; for this reason Zoppas Industries vulcanised tubular heating elements are built to work in extremely critical conditions featuring continuous temperature changes and high humidity.

Zoppas Industries tubular products come in a wide range of diameters, sheath materials and power leads, all to the most important world standards. To its traditional range of sheathed tubular elements Zoppas Industries adds a monotube solution with connections on one side only to facilitate fitting and electrical connections. For many years Zoppas Industries has been involved in the development of energy saving solutions and has come up with an etched foil solution for defrosting water collection trays that guarantees even heat spread and a consequent reduction in the power employed. A full range of heating cables completes the products Zoppas Industries offers producers and fitters of aero evaporators.

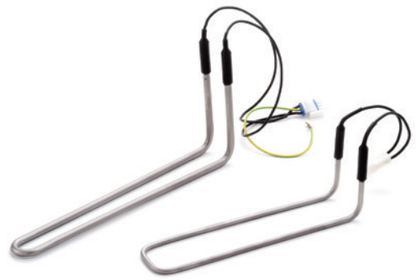




REFRIGERATED TRANSPORT

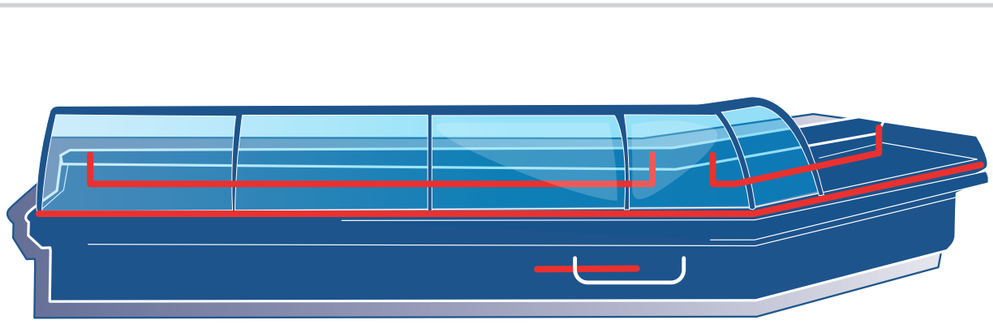


If aero evaporator conditions are critical, those for refrigerated transport equipment are even more so, given that the various external environmental conditions are so variable from the Arctic seas to the equator.
Long experience in producing sheathed heating elements allows Zoppas Industries to assess and propose to customers the most suitable technological choices for each individual application. This guarantees that manufacturers of trucks and containers for refrigerated transport have the best solutions for the most aggressive environments (the sea, to start with), due also to the use of defrosting elements as heating elements to provide fruit and vegetable ripening temperatures in transit.
Every situation presents special needs to which Zoppas Industries can supply the most suitable response, as it can count on the availability of a wide range of sheath materials, rubber or silicone for vulcanisation and cables suitable for a very wide range of temperatures, bearing in mind the end user's needs and ensuring long life and excellent operation.
Zoppas Industries also supplies elements capable of supporting the voltage peaks often involved in this type of equipment, thanks to the use of top quality resistive wires and insulating oxides.

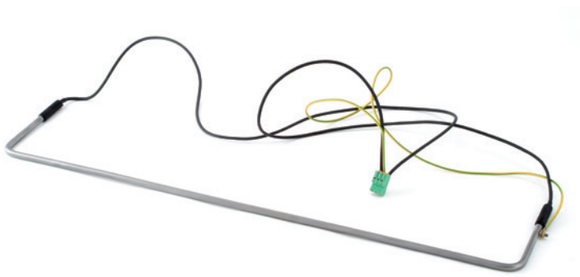


Zoppas Industries
Heating Element Technologies

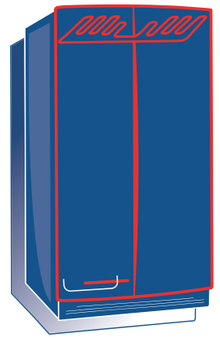
RETAIL

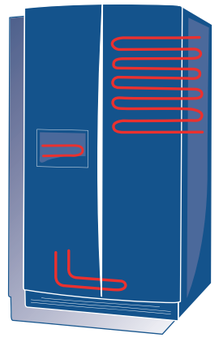


With its wide range of products for remote or plug-in refrigerated counters, Zoppas Industries is able to meet all electrical heating needs in this sector.
Zoppas Industries vulcanised tubular heating elements, smooth or finned, standard or monotube and available in different diameters for evaporator defrosting functions, can be put together in the most complex geometrical shapes to offer various solutions for earthing and electrical connections.
There is also a wide range of heating cables with PVC or silicone single or double insulation, with the possibility of metal plaits or fibreglass, fitted to adhesive aluminium sheet backing or fitted into aluminium sheaths for anti-condensation functions.
Cartridges and cables for heating compressor covers on plug-in counters, PTC effect cartridges for re-evaporating defrosting water, etched foil for drip trays are just some of the heating elements Zoppas Industries has developed for this sector, to which can be added various ad hoc solutions often deriving from experiences in application sectors different from that of refrigeration.

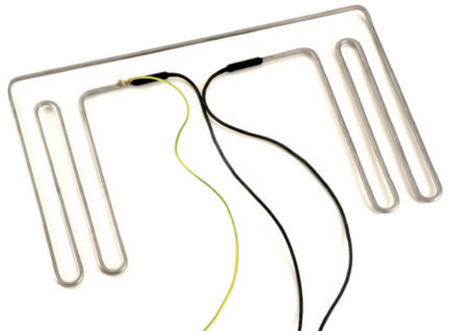


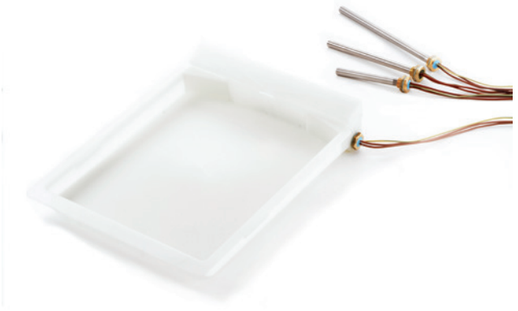
DOMESTIC PRESERVATION - CATERING APPLICATIONS

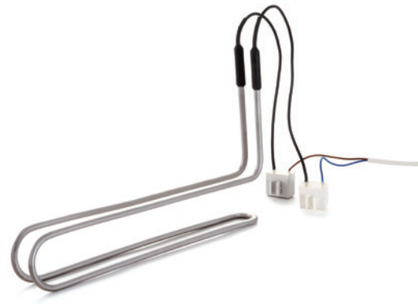




Attention to the strict standards regulating appliances for household use and constant research and development of new technologies and new solutions make Zoppas Industries a privileged partner for manufacturers of no-frost and commercial refrigerators.
Zoppas Industries unites the production capacity of a global industry that can guarantee high volumes with ability to react to increasingly frequent and sudden peaks in demand through the lean transformation of both its production and organizational processes. Integrated solutions are available (thermostats, safety devices, etc.) approved to international quality standards. Zoppas Industries' products for refrigerated cabinets include, besides its sheathed tubular elements, a full range of evaporation cartridges (PTC technology) and a large choice of heating cables for anti-condensation functions.



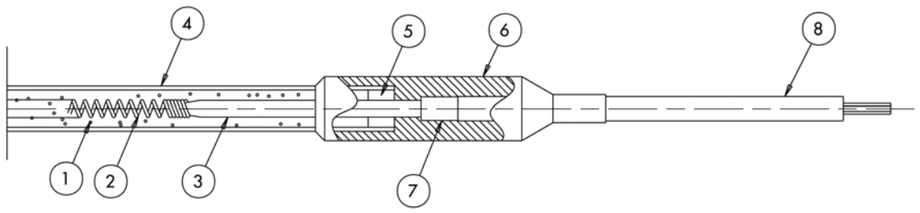




Zoppas Industries
Heating Element Technologies

VULCANISED TUBULAR ELEMENTS

Tubular electric heating elements are insulated with MgO (magnesium oxide) and protected externally by a sheath in stainless steel or alloys specially chosen for the particular application.
These elements are designed to operate in refrigerated environments with a high rate of relative humidity and are tested to current European and international standards. All the materials used comply with the RoHS Directive.



1. Magnesium oxide
2. Resistive coil
3. Terminal
4. Sheath
5. Sealant
6. Vulcanised mix
7. Cable connection
8. Power supply lead

The electrical properties of our products are guaranteed over time by the use of the most suitable materials for the sheaths, as well as electric connections protected by vulcanisation.

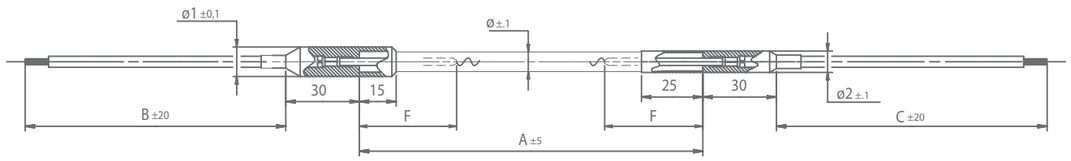
All our heating elements are annealed before sealing in order to achieve the following:
- complete absence of humidity inside the sheath
- improved resistance to corrosion for the sheath
- easier bending of the elements even with tight bends

Special attention is also paid to choosing the power supply leads, in terms of working temperature, mechanical resistance and required insulation.

To meet the most demanding needs, as well as Neoprene mix insulation, PCE, Levapren and silicone, the range includes double insulation in Evaprene and with UL approval. There is also a wide range of connectors available to complete the choice of power supply leads.

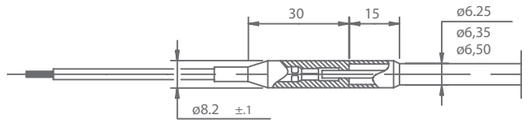
Heating elements can be supplied complete with connections and earthing wires, if necessary (different solutions are possible), and other accessories.

Usual dimensions of a sheathed element

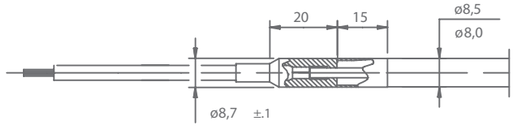


Vulcanisation

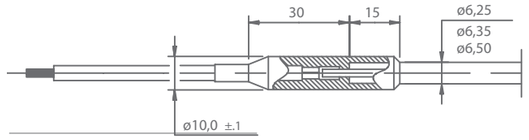
Ø Tube	Vulcanisation Ø	Type	Vulcanisation L
6.25 mm	8.20 mm	A	45 mm
	10.00 mm	B	45 mm
6.35 mm	8.20 mm	A	45 mm
	10.00 mm	B	45 mm
6.50 mm	8.20 mm	A	45 mm
	10.00 mm	B	45 mm
8.00 mm	8.70 mm	C	55 mm - short version 35 mm
	12.00 mm	D	45 mm
8.50 mm	8.70 mm	C	55 mm - short version 35 mm
	12.00 mm	D	45 mm



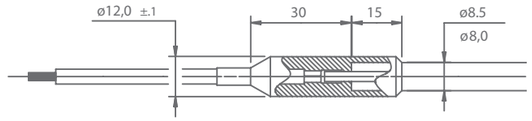
A



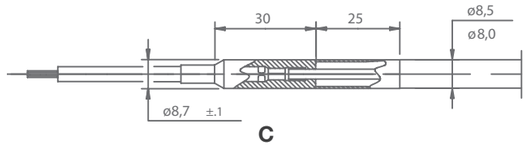
C “short”



B



D



C

Zoppas Industries
Heating Element Technologies

Sheath material

Din	% Nickel	Material	Ø 6.25	Ø 6.35	Ø 6.50	Ø 8.0	Ø 8.50	Flake T
1.4301	8 ÷ 12	AISI 304				•	•	760
1.4307	8 ÷ 12	AISI 304L		•	•			760
1.4404	10 ÷ 14	AISI 316L	•	•	•			760
1.4571	10 ÷ 14	AISI 316Ti				•	•	800
1.4541	9 ÷ 12	AISI 321				•	•	800
1.4876	30 ÷ 35	INCOLOY 800	•	•	•	•	•	927
2.4858	38 ÷ 46	INCOLOY 825	•	•	•	•	•	593
1.4847	18 ÷ 22	INCOLOY 840	•	•				927
2.4816	≥ 72	INCONEL 600				•	•	982
1.4529	25	CRONINFER	•	•	•	•	•	927
BT1-0 Gost	-	TITANIO					•	320

- AISI 304: Basic austenitic stainless steel, excellent for welding and highly resistant to corrosion at ambient temperatures. At high temperature (450° - 760° C) inter-granular corrosion may occur.
- AISI 316L: Contains 2-3% molybdenum which makes it particularly resistant to aggressive corrosive chemicals. The small amount of carbon (less than 0.03%) reduces corrosion hazards due to chromium carbide precipitation.
- AISI 316Ti: The addition of titanium further improves resistance to corrosion at high working temperatures (above 450°C).
- AISI 321: This is an AISI 304 type basic steel enriched with titanium that considerably improves resistance to corrosion at above 450°C.
- INCOLOY 800: Refractory alloy with high nickel and chrome content. It has high resistance to flake formation at high temperatures, very good aggregate breaking load and good resistance to corrosion, also at high temperatures.
- INCOLOY 825: The different alloy composition, with a greater amount of nickel and chrome, makes it resistant to corrosion by sulphuric acid and inter-granular corrosion, also at high temperatures.
- INCOLOY 840: A combination of the characteristics of the other incoloy alloys, with strong resistance to corrosion also at high temperatures.
- INCONEL 600: This is the highest strength refractory alloy, with very high nickel content. Excellent resistance to any type of corrosion, also at very high temperatures.
- CRONINFER: Austenitic alloy with high molybdenum content and low carbon content, it has very strong resistance to pitting and inter-granular corrosion, also at high temperatures.
- TITANIUM: Grade 1 titanium is the purest; much lighter than steel, it is the best against corrosives with hydrochloric acid base, chlorides in general and sulphuric acid.

Vulcanisation material

Material	Minimum temperature	Maximum temperature
Hypalon	- 40°C	+ 110°C
Silicone*	- 50°C	+ 180°C

* Silicone vulcanisation is used only with silicone cables.

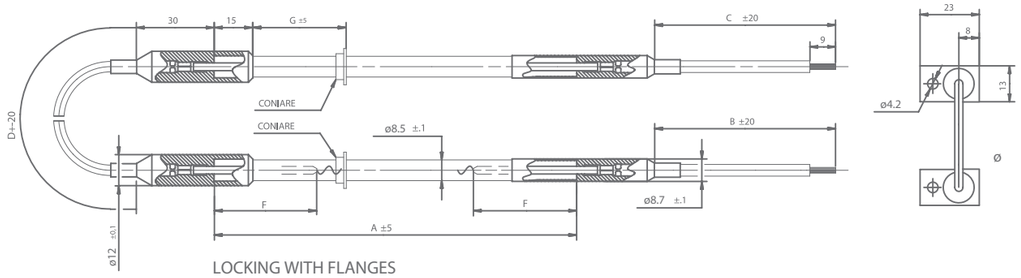
Power supply leads

Material	Min. T	Max. T	Conductor section	Outer Ø
PCE	-40°C	+90°C	1.0 mm²	3.3 mm
			1.5 mm²	3.3 mm
			2.5 mm²	4.0 mm
Levaprene	-40°C	+110°C	1.0 mm²	3.3 mm
			1.5 mm²	3.3 mm
			2.5 mm²	4.0 mm
			4.0 mm²	4.4 mm
Double insulated Evaprene	-40°C	+120°C	1.0 mm²	4.0 - 4.2 mm
			1.5 mm²	4.0 - 4.2 mm
			2.5 mm²	4.0 - 4.2 mm
Silicone	-50°C	+180°C	1.0 mm²	3.3 mm
			1.5 mm²	3.3 mm
			2.5 mm²	4.0 mm
Double insulated silicone	-50°C	+180°C	1.0 mm²	3.3 mm
			1.5 mm²	3.3 mm
UL certified Neoprene	-40°C	+90°C	AWG 16	3.9 - 5.5 mm
			AWG 18	3.8 - 5.4 mm
3-pole Neoprene	-40°C	+90°C	3x0.75 mm²	7.5 mm
3-pole silicone	-50°C	+180°C	3x1.5 mm²	9.0 mm

Also available: UL certified Neoprene cable (AWG 16 and AWG 18 diameters)

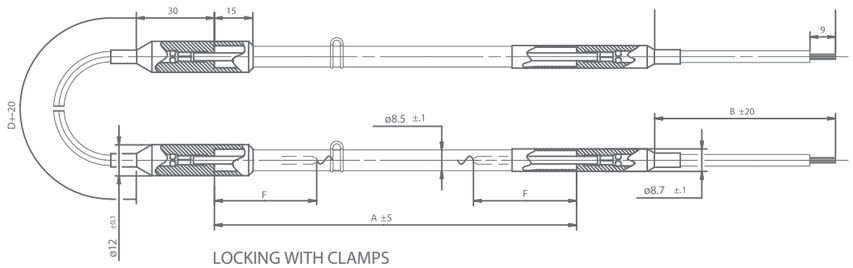
Fasteners

• Coining of special flanges drilled on the sheath, to attach to the evaporator body.



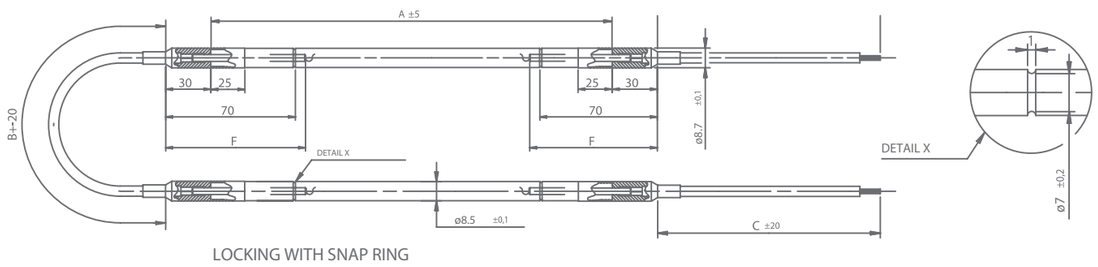
LOCKING WITH FLANGES

• Application of steel clamps to stop the element moving on the evaporator.

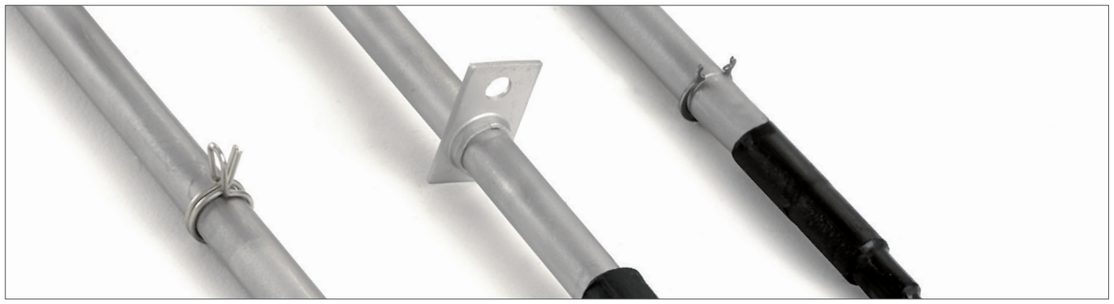


LOCKING WITH CLAMPS

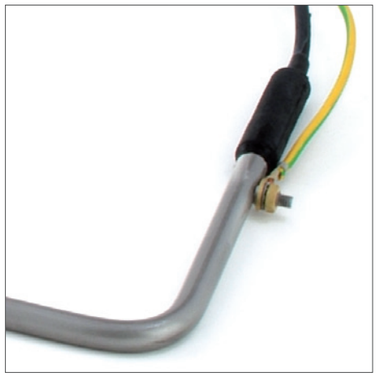
• Possibility to form a groove on the sheath for the fitting of a snap ring.



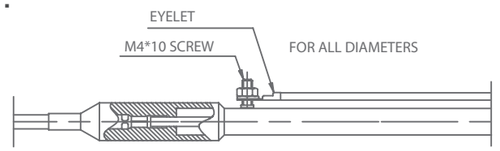
LOCKING WITH SNAP RING



Earthing connections



1.



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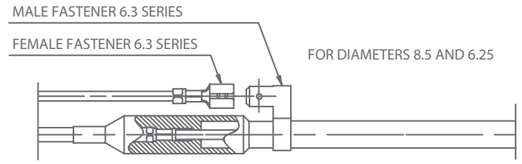

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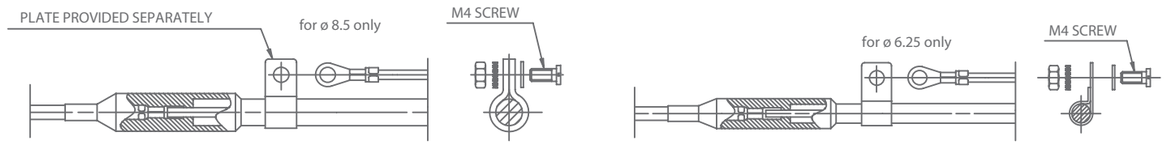


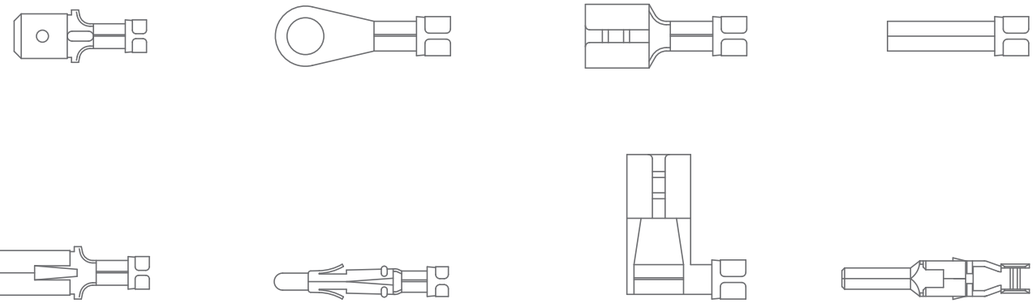
1. M4 terminal electro-welded to the sheath and earthing cable with eyelet fastener fixed with nut and washer.
2. Lug fixed to sheath and earthing cable with female fastener.
3. Drilled band fixed to sheath and earthing cable connected with screw, nut and washer.

Bending

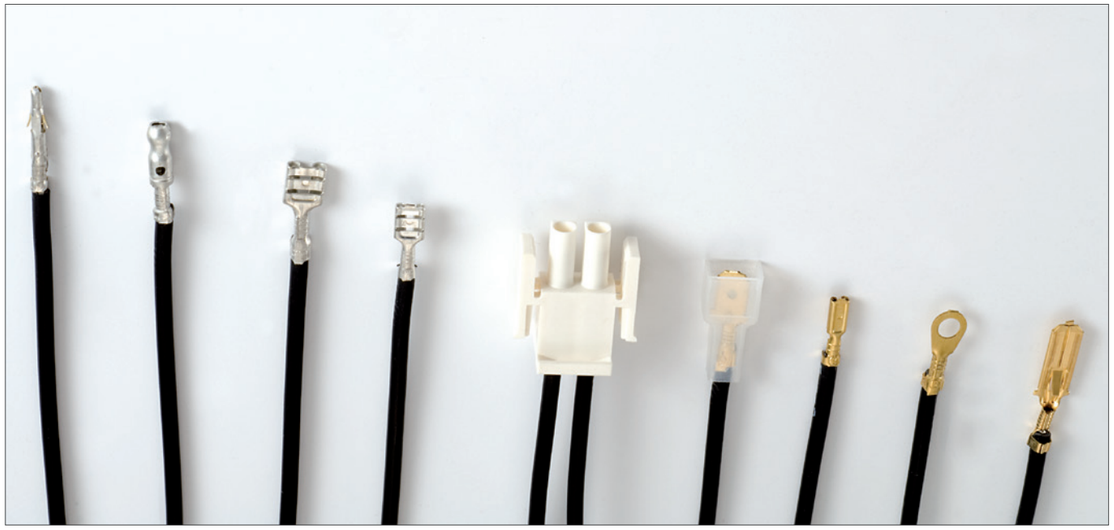
Sheath Ø	Standard minimum radius (from tube axis)		Special minimum radius allowed *
	AISI	INCOLOY	
6.25 mm 6.35 mm 6.50 mm	13.0 mm	13.5 mm	6.5 mm
8.00 mm 8.50 mm	14.5 mm	18.5 mm	6.0 mm

* Special bends can be obtained by additional processes, at extra cost; it is preferable to keep a uniform radius over the whole element.

Terminals

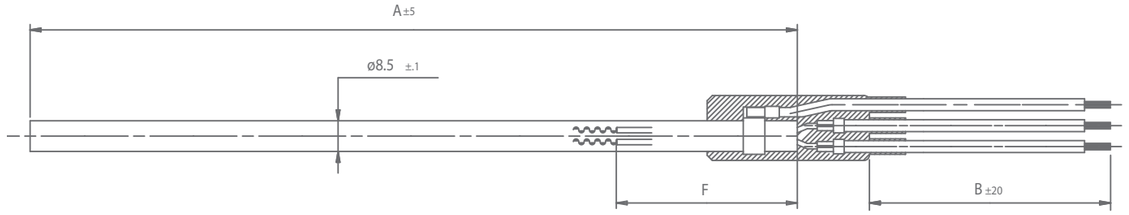


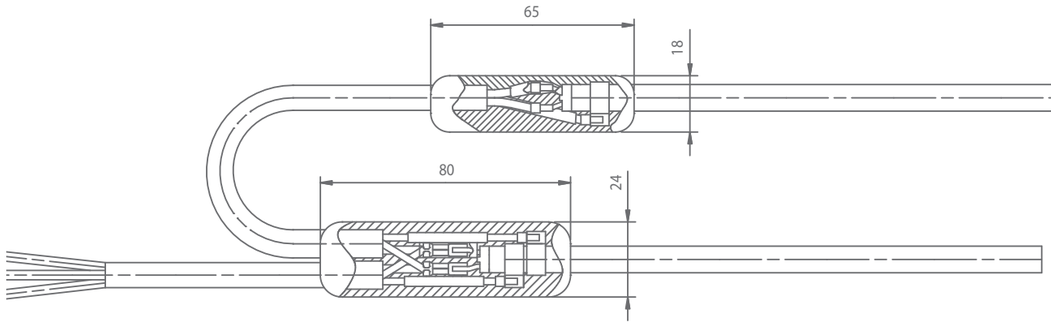
RICA has a wide range of terminals for connection cables: fasteners and covers, connectors with covers which can also be watertight, staples and simple caps. Any type of customization is also possible, at the customer's request.



MONOTUBE HEATING ELEMENTS

Monotube elements are particularly suitable in situations where it is difficult to insert elements into a finned pack.
Electrical connections all on the same side ensure quick simple wiring.
At the moment four types of finish are available for the choice of connecting cable required.



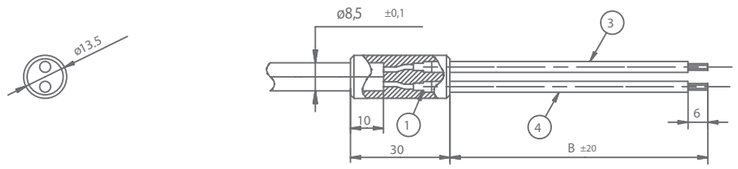


Zoppas Industries
Heating Element Technologies

Vulcanisation measurements (mm)			Section	Cables	Figure
H_1	H_2	L			
Ø 13.50 mm			Round	2 x 1.0 mm section cables	1
24.0	14.0	80.0	Rectangular	2 x 3-pole 0,75 mm triple wire cables	2
18.0	12.0	65.0	Rectangular	3-pole x 0,75 mm triple wire cables	3
18.0	12.0	45.0	Rectangular	3 x1.0 mm section cables	4

Special vulcanisation available on request.

1.



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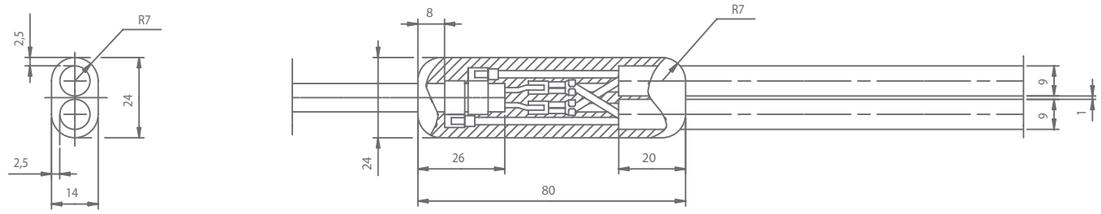

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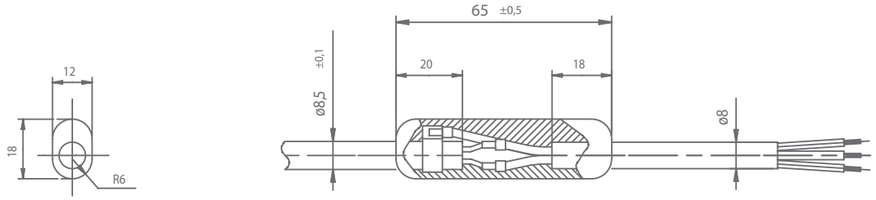

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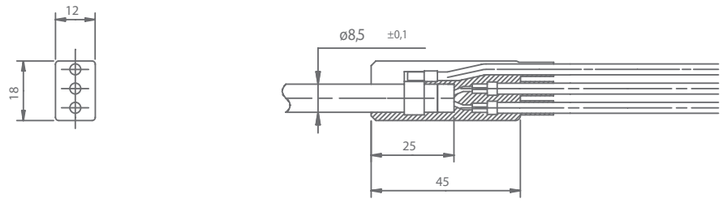
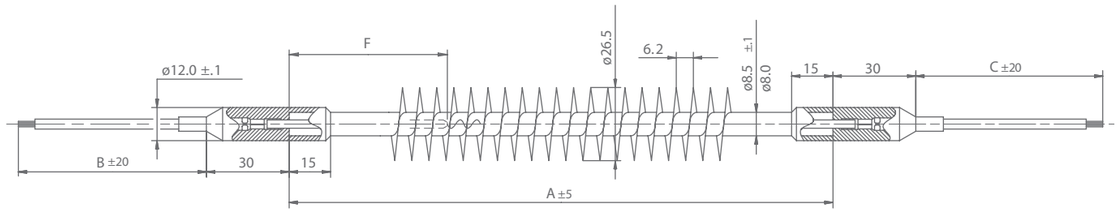


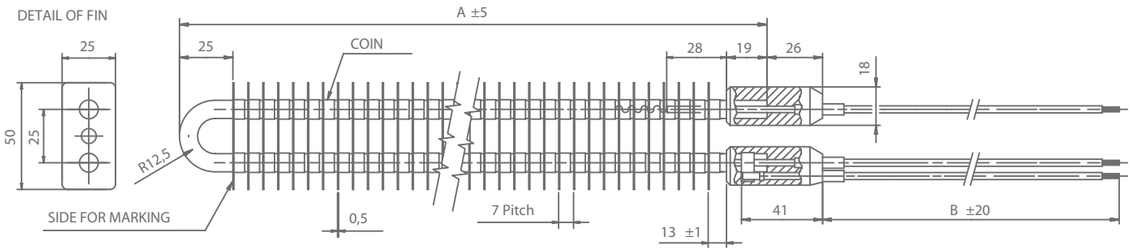
FINNED HEATING ELEMENTS

Monotube elements are particularly suitable in situations where it is difficult to insert elements into a finned pack.
Electrical connections all on the same side ensure quick simple wiring.
At the moment four types of finish are available for the choice of connecting cable required.

Type	External fin dim.	Min. pitch	Max. pitch	Tube Ø	Tube bend	Min. distance from vulcanisation
Spiral	Ø 18.5 mm	5.2 mm	6.2 mm	8.0 - 8.5 mm	min. 25.0 mm	45.0 mm
Spiral	Ø 26.5 mm	5.2 mm	6.2 mm	8.0 - 8.5 mm	min. 25.0 mm	45.0 mm
Rectangular	25.0 x 50.0 mm	7.0 mm		8.5 mm	fixed 12.5 mm	13.0 mm

Spiral and rectangular fins are in AISI 304; perfect adherence to the element sheath guarantees better external heat exchange.





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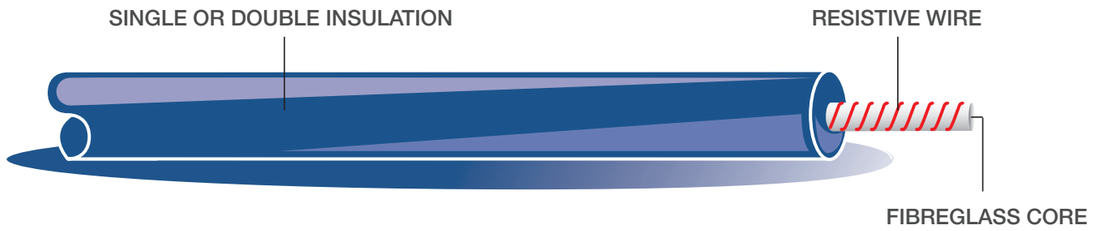
Heating Element Technologies

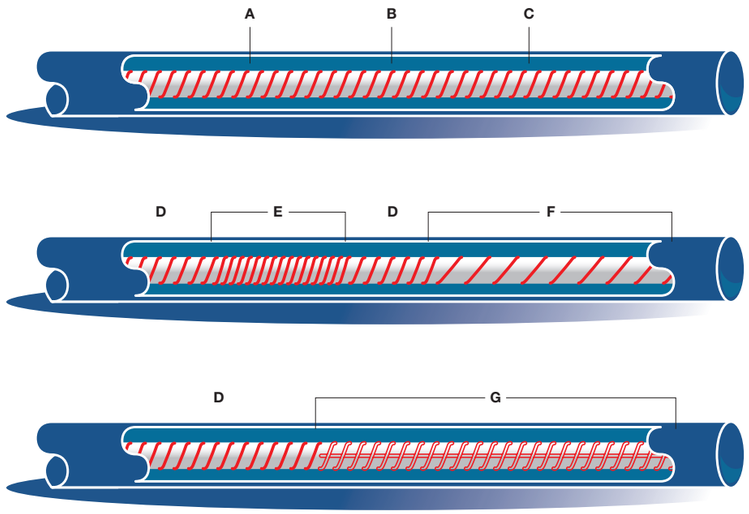
ANTI-CONDENSATION AND DRAINAGE CABLES



Heating cables are the best way to avoid the formation of condensation in industrial and household freezers and refrigerating appliances (refrigerated counters, refrigerated cells, refrigerated showcases, etc.).
Heating cables are also very important to prevent the formation of ice in drainage channels and water collection trays.
Zoppas Industries provides a wide range of cables in various materials with different finishes, to meet all needs.
The flexibility of cable elements makes them adaptable to all situations; the care taken in their manufacture ensures maximum insulation also in extreme conditions (immersion or high humidity at variable temperatures).
Heating cables can also be made with differentiated power zones and integrated cold sections (without joins).

POWER DIFFERENTIATION AND COLD SECTIONS

A Insulation
B Resistive wire
C Fibreglass support
D Hot section
E Hottest section
F Cooler section
G Cold section



Resistive values obtainable:
Max. 20,000 Ohm – Min. 10 Ohm
Main coverings used: PVC 105°C, silicone rubber, fibreglass, PVC + silicone, silicone + fibreglass.

Insulating Material

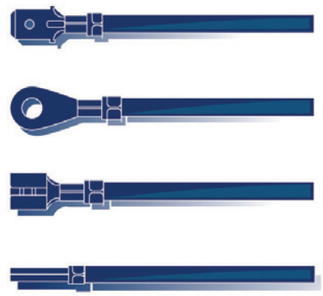
Heating cables are suitably insulated for their applications with PVC 105°C used for maximum working temperatures of 65°C (external sheath reading) or with silicone rubber for working temperatures of 120°C (external sheath reading). To prevent possible damage to the insulation it may be necessary to protect the cable with metal plaiting or a sheath.

Type of cable	Minimum Ω/m	Maximum Ω/m	Diameter
PVC 105°C insulated cable	10-50	30000	2.5 - 3.5 mm
Silicone 120°C insulated cable	10-50	30000	2.4 - 4.2 mm
Silicone + fibreglass insulated cable	10-50	30000	max 4.2 mm
PVC double insulated cable	10-50	30000	3.5 - 4.2 mm
Silicone double insulated cable	10-50	30000	3.5 - 4.2 mm
Silicone + metal plait insulated cable	10-50	30000	max 6.5 mm
Silicon + metal plait double insulated cable	10-50	30000	8.0 mm

Mechanical protection and standard terminals

Protection - Sheath	Diameter (mm)
Fibreglass	4.0
Tinned copper	3.5 - 5.3
Aluminium	4.5 - 5.0

The table shows the protection used according to the dimensions of the cable. Illustrated in the figure are some examples of standard terminals.

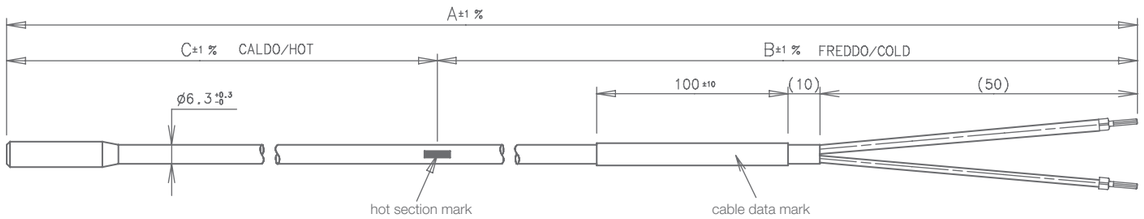


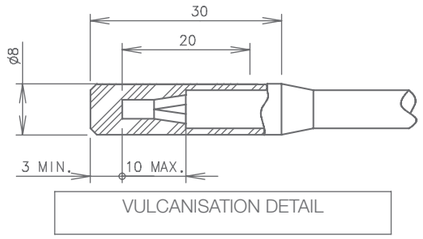
Please note

With an anti-condensation function and for effective application of the elements, make sure the cable does not come into contact with sharp edges, very tight bends or overlapping cables.

Zoppas Industries
Heating Element Technologies

SINGLE OUTPUT CABLE





Description

The main features of heating cable elements are the possibility to provide heat with extremely versatile flexible elements by using power supply leads that coincide with the terminal sections, and guaranteed maximum insulation values even when operating in very high relative humidity.
They are particularly popular where there is a need to apportion and differentiate heat according to special requirements, as specific differentiated power can be gauged inside the element.

Applications

Normally used as heating elements to prevent the formation of ice in drainage channels and water collection trays.

RE-EVAPORATION TRAYS

This “functional assembly” is particularly useful where reduced evaporating capacity is required – e.g. Gastronorm type cabinets (Reach-in). It comprises a fibreglass filled polypropylene tray (400 x 325 mm, capacity approx. 3.5 litres) and a cartridge element with ceramic PTC. The “self-regulating” heating elements with PTC have minimum absorption in dry conditions (without water) which increases during use to meet requirements; this feature makes them easy to install and eliminates the need for regulation and safety checks (checks on level, thermostats and thermofuses).
The three standard models of cartridge elements with PTC are differentiated according to their capacity for water evaporation (0.1 to 0.3 Kg/hr) and suitable for supply voltages of 100 V to 260 V and are available from stock.

If customers wish to use their own evaporation trays individual cartridge elements can be supplied, also with customization and complete with assembly accessories.

A - Cu-silicone tear-resistant double insulated cable, section 0.75 mm2

B - Fibreglass + silicone sheath

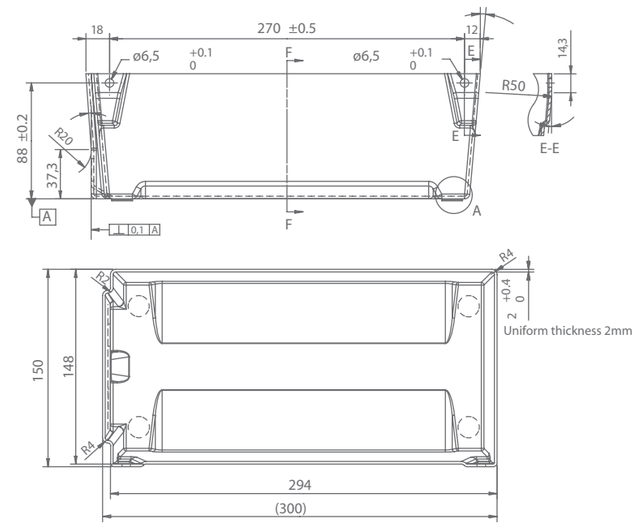
C - 3/8 gas thread brass connection, spanner 24 (SW)

D - AISI 304 sheath

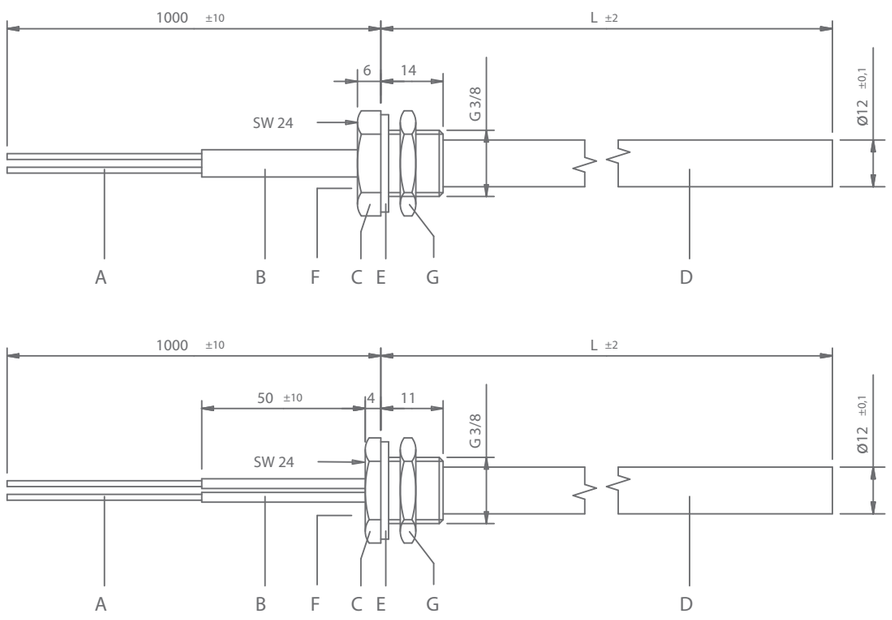
E - Asberit gasket

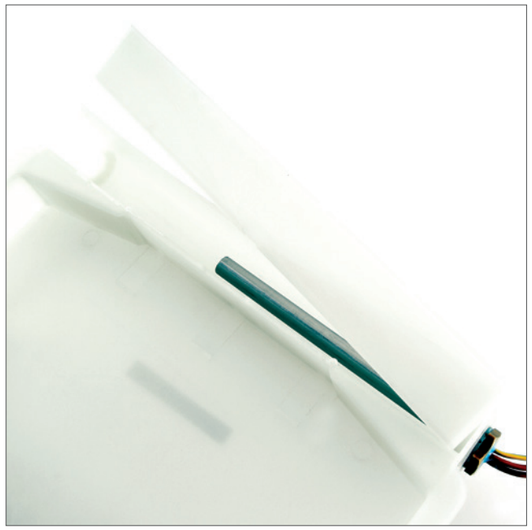
F - Epoxy resin seal

G - 3/8 gas thread nut, spanner 24, height 4.5 mm



Characteristics	Type		
	1	2	3
Evaporation capacity (20°C, 70% r.h.)	0.07 Kg/h	0.17 Kg/h	0.26 Kg/h
Length of cartridge	120 mm	180 mm	240 mm
Cartridge external diameter	12 mm	12 mm	12 mm
Absorbed power (water at 100°C)	60 W	150 W	230 W
Absorbed power (air at 0°C)	80 W	190 W	280 W





Tray characteristics

Evaporation capacity	Power supply voltage	Power at 100°C	Power in air
0.07 Kg/h	230/265	60W	80W
0.14 Kg/h	230/265	150W	190W
0.2 Kg/h	230/265	230W	280W

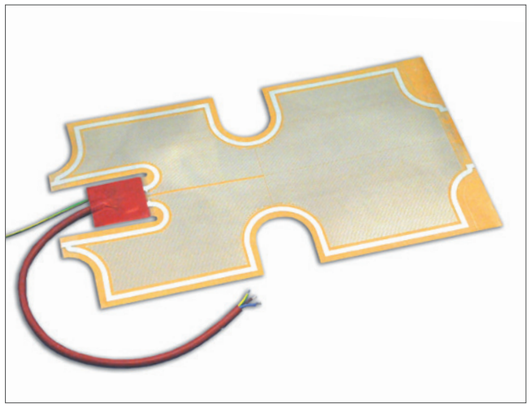
TANK BOTTOM HEATING ELEMENTS
rapid disposal of water and ice

These flexible sheets comprise a circuit on a silicone and/or polyester backing with silicone supply leads. They can be provided with a thermostat for temperature control, or with various types of sensors.

Technical data

Materials	Thickness (mm)	Max. temperature
Silicone	0.9	175°C
Polyester	0.5	100°C

Our design office is available for studies of ad hoc solutions to meet specific application needs.



Installation

The heating elements have an adhesive side (can be eliminated if not necessary) to facilitate fitting. They are usually fitted to the bottom of a tank or drip trays under evaporators.
Flexible sheet technology is the ideal solution in an application where rapid heating, easy installation, uniform heat distribution and reduced energy consumption are the primary requirements.

Applications

They are mostly used in aero evaporators and refrigerated counters (for ice cream, confectioner's and butcher's shops, etc.) during defrosting cycles.

The use of these elements makes it possible to significantly reduce defrosting times; during defrosting it takes the bottom of the tank to a temperature above 0°C (avoiding the risk of further ice forming) to facilitate rapid water flow and maintain the characteristics of the preserved product intact.

Cartridge elements for compressors

Applications

These elements are used where oil must be pre-heated when compressors are turned on in air conditioning equipment, heat pumps and special refrigeration equipment.
The elements can operate directly immersed in the oil or in areas in indirect contact with the fluid.

Manufacture

The elements are designed for high or low power density to customers' specifications or according to the actual conditions of use and are produced to European EN 60335 – 1 (CE) standards.
The sheath material is stainless steel (AISI 321 or 304) and the elements can be completed with connections and connectors with IP67 protection rating.

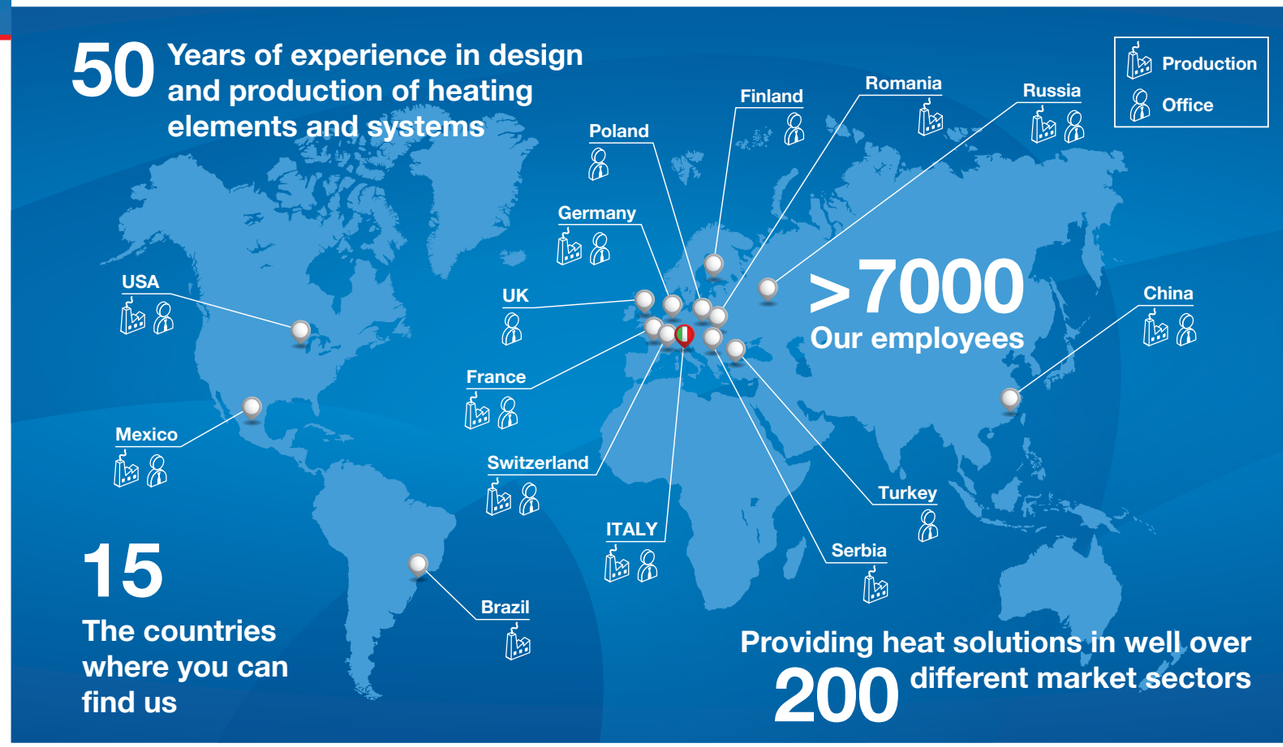
Technical data

Heating	Connection	Sheath material	Diameter (mm)	Length (mm)	Power (W)	Voltage (V)
Direct/Indirect	3/8 ″ NPTF	AISI 304	10.0	132 ÷ 200	70 ÷ 100	124 ÷ 380
Indirect	NO	AISI 321	12.7	76	100 ÷ 200	230
Indirect	NO	AISI 304	12.7	120	75 ÷ 180	110/230

The locking systems are studied ad hoc by our engineering office, to customers' specifications.
An element holder can be provided for indirect heating.

Worldwide Local Supplier

Zoppas Industries
Heating Element Technologies



ZOPPAS INDUSTRIES Partner

- Experience Zoppas Industries increasing efficiency using lean enterprise across all facilities and departments.
- Access our state-of-the-art laboratory facilities with over 30 years' design experience.
- Benefit from Zoppas Industries manufacturing and design facilities which maintain Quality Management Systems according to ISO 9001, EN 9100, Environmental Management System according to ISO 14001 and Energy Management System according to ISO 50001.
- Access one of the widest Heating Element Technology product portfolios in the world including completely integrated thermal assemblies with sensors, connectors, enclosures, etc.
- Benefit from Zoppas Industries global presence through design and manufacturing facilities across Europe, North America, South America and Asia - lowering your Total Cost of Ownership (TCO) including reduced logistics, design, communication and support costs.
- Access Zoppas Industries' in-house design, development and R&D capabilities, such as CAD 3D design, FEA, DOE, FMEA.
- Benefit from Zoppas Industries products third-party certification, such as UL and VDE: marking applied on customer's request.

We at ZOPPAS INDUSTRIES put you in the front seat of internationalization - sourcing your local needs globally.

COMPANY CERTIFICATIONS

FM 11235 · 9191.IRCR · 9196.IRC8 · IT-75.12-6975 12/054P IND EN 15085-2 · IT-75.12-6975 12/055P IND ISO 3834-3

PRODUCT TRADEMARKS

Compliance with the mark of each specific product must be properly reviewed with our Sales Department.

cod. 690944096 - 0918

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Heating Element Technologies

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