DESIGN GUIDELINES



Calculation of power

The following information will assist in the design of elements and rough calculation of data. Optimum power and temperature conditions for specific applications are usually determinated experimentally.

The following formula can be used to determine approximately the required rating P (Power) to heat a given material.

P= Weight of material (g) x Spec.heat (Ws/g $^{\circ}$ C) x temp. rise $^{\circ}$ C W

Time sec

Technical specification

Spec. heat and density of common materials:

Material	Spec. heat Ws/g	Density g/cm ³)
Aluminum	0.90	2.7
Copper	0.39	8.9
Stainless steel	0.50	8.0
Iron	0.46	7.8
Water	4.18	1.0

Temperature control

In conjunction with CALESCO foil heating elements it is usually necessary to arrange some form of control to ensure that the desired temperature is maintained.

This can be achieved with electromechanical thermostats of bimetallic type where temperatures and surface ratings are low, while electronic thermostats are prefered where temperatures and surface loads are high.

We can fit thermostats, temperature fuses and sensors of the thermoelement type, thermistors and resistance sensors directly to element in accordance with customer specifications.

Electrical insulation and leakage current

When a foil element is fitted on or in contact with a metal, surface leakage current must be taken into account. The basic standard for heating appliances is laid down in the rules IEC 335-1, on which various national standards are based.

The maximum level of leakage current for Class I (earthed) appliances is 0.75 mA/kW while for Class II (double-insulated) appliances it is 0.25 mA/kW. Medical appliances are subjected to special leakage current restrictions as per IEC 601.



Product photo





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Temperature curves and required power

The diagrams below show temperature rise as a function of time for certain applications and various types of element with different surface rating. Surface rating is defined as the total power divided by the effective area of one side of the element.

Optimum power and temperature conditions for specific applications are usually determinated experimentally.



0.05 0.10 0.20 0.30 0.50

105 160

Temperature rise for element mounted on aluminium



Foil element, 210x150 mm, suspended horizontally in free air.

Foil element mounted on an aluminium plate, 215x155x5 mm, with adhesive and suspended horizontally in free air.

25

45 80

Benefits

- Space saver

Watt density W/cm²

Final temp. rise °C

- Optimized heat distribution
- High/Low wattage
- Custom design
- Cost efficient

°C

