



INSTALLATION MANUAL

for CALEO
floor- and ceiling heating systems

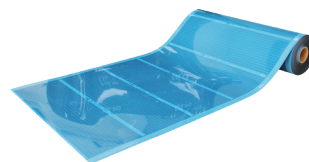


INTRODUCTION

Application

The guarantee of top quality CALEO heating systems is the professional design and installation services. In order to ensure long-term and reliable operation of the system, installation of the heating films may only be performed by professional electric personnel qualified by BVF Heating Solutions Ltd.

As a first step, detailed information shall be gathered from the client regarding the horizontal and vertical building structures, openings, floor finishing materials and desired use of the premise. Having all necessary data for heat loss calculation and geometrical features of the building, our colleagues send detailed quotation to the Clients, highlighting the necessary tasks to perform before installation by the Client as well as details of the system planned (areas covered, installed heating and necessary electric capacities, controlling etc.)



How to design

While designing our heating systems, we strongly recommend to take into account the following factors:

- technical parameters of the building structures
- client's demand
- Define if primary or comfort heating is required
- Type and thickness of the planned floor finish material in case of floor heating
- Available free height in case of ceiling heating

The appropriate heating capacity is determined - in case of planning primary heating - on the basis of the energetic and heat insulation properties of the building. Heat insulation values of the horizontal, vertical structures, openings, climatic location and desired function determines the actual heat loss values and required heating capacities of the units.

The following table illustrates the suitability of certain capacity CALEO film heaters at different energy loss classified buildings.

CALEO	Primary heating			Comfort heating	
	A+ – B category	B – D category	worse than cat. E	B – A+ category	worse than cat. B
80 W/m ²	✓	✗	✗	✓	✓
130 W/m ²	✓	✓	✗	✓	✓
160 W/m ²	✓	✗	✗	✓	✓



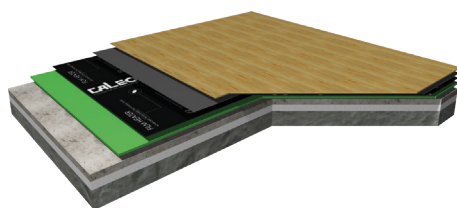
	Floor heating	Ceiling heating
CALEO	REG	DIRECT
80 W/m ²	✓	✗
130 W/m ²	✓	✗
160 W/m ²	✗	✓

Low capacity film heaters are used for floor heating only. Never use the 160W/m² and 210W/m² film heaters in floor structures.

Model	Rated input power	Width (mm)	Rated voltage	Rated input frequency
Caleo_EU080030KR	80 W/m ²	300	230 V	50 Hz
Caleo_EU080040KR	80 W/m ²	400	230 V	50 Hz
Caleo_EU080050KR	80 W/m ²	500	230 V	50 Hz
Caleo_EU080060KR	80 W/m ²	600	230 V	50 Hz
Caleo_EU080080KR	80 W/m ²	800	230 V	50 Hz
Caleo_EU080100KR	80 W/m ²	1000	230 V	50 Hz
Caleo_EU130030KR	130 W/m ²	300	230 V	50 Hz
Caleo_EU130040KR	130 W/m ²	400	230 V	50 Hz
Caleo_EU130050KR	130 W/m ²	500	230 V	50 Hz
Caleo_EU130060KR	130 W/m ²	600	230 V	50 Hz
Caleo_EU130080KR	130 W/m ²	800	230 V	50 Hz
Caleo_EU130100KR	130 W/m ²	1000	230 V	50 Hz
Caleo_EU160030KR	160 W/m ²	300	230 V	50 Hz
Caleo_EU160040KR	160 W/m ²	400	230 V	50 Hz
Caleo_EU160050KR	160 W/m ²	500	230 V	50 Hz
Caleo_EU160060KR	160 W/m ²	600	230 V	50 Hz
Caleo_EU160080KR	160 W/m ²	800	230 V	50 Hz
Caleo_EU160100KR	160 W/m ²	1000	230 V	50 Hz

CHOOSING SYSTEM TYPE

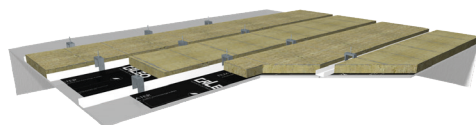
CALEO heating systems are installed in compliance with the users' demands and matching the technical parameters of each building. Certain finishing layers define the system type. The following system types are used as follows:



CALEO REG

Film heater for laminated floors

- Existing leveled base (as primary heating must be on interim slab or insulated base slab)
- XPS foam boards of 4-6mm fixed with power tape on whole surface
- **CALEO film heater** fixed with power tape
- Connecting cables, electric insulation, temperature limiting sensor embedded in XPS foam board
- Moisture barrier of PE cover throughout the whole surface with thickness of 0,15-0,2mm
- Click-type laminated floor 4-14mm suitable for floor heating



CALEO DIRECT

Any ceiling with minimum free height of 100mm

- Moisture barrier of PE cover throughout the whole surface with thickness of 0,15mm
- Non-flammable rock wool insulation of 2-5 cm, installed within plaster board profiles
- **CALEO film heater** fixed with power tape parallel to plaster board profiles
- Connecting cables, electric insulation, temperature limiting sensor on film heater's surface fixed with power tape to structure
- Non-flammable plasterboard coating with surface treatment of plastic mesh for reinforcement



Please gather information about structures and inform the Client about the required preparation works prior the installation. CALEO REG floor heating system requires minimal thickness. Installation is easy and fast.

BASE

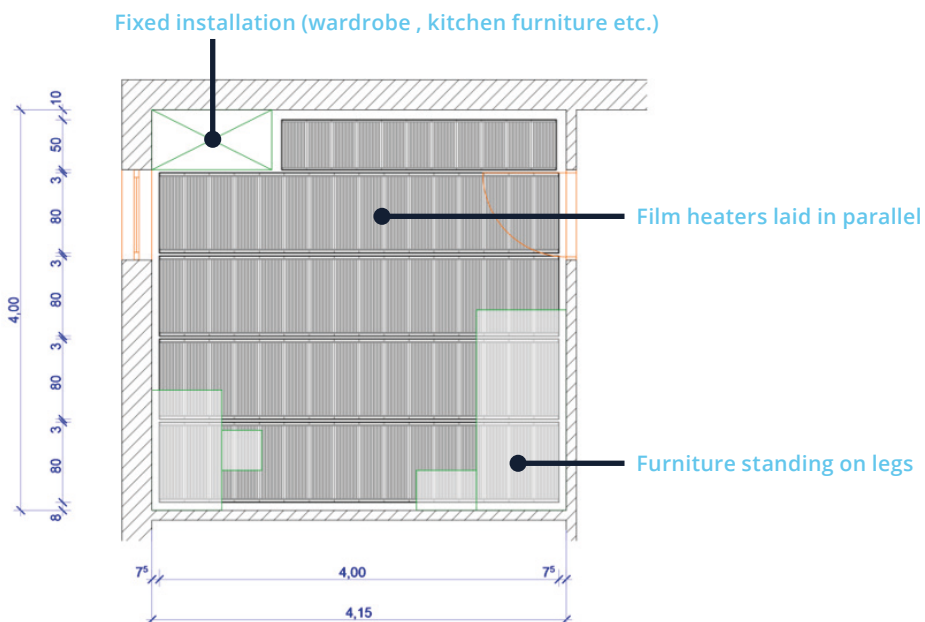
- CALEO Reg can be installed as primary heating system on the base slab with sufficient primary heat insulation below, or on interim slab with heated area below
- Primary isolation layer is not obligatory in the base slab if only comfort heating is installed
- Base must be dry, dust free, leveled

FLOOR FINISH

- The coating can be laminated floor or strip parquet not exceeding the thickness of 14 mm. **Never use CALEO FILM HEATER under ceramic floor tiles or carpet.**

FILM HEATER

- Depending on required heating capacity the film types appropriate for the CALEO Reg system: 80W/m² or 130W/m² capacity with 50cm or 80 cm width
- Always use the design program provided by BVF to determine minimum heating surface and capacities
- In case of primary heating system the minimum film heater coverage must exceed 80%, ideal at 90%
- Try to avoid using different capacities in one room. If possible, do not mix different film widths within the room



Film heaters shall be laid at maximum of 5 cm gap in case of Caleo REG floor heating (it is recommended to keep a distance of 1-3 cm), 10-15 cm distance is allowed from the walls.

The area occupied by fixed furniture shall be deducted from heated area. Any other furniture is recommended to stay on legs. Final layout of the film heaters shall be adjusted on site to actual parameters if necessary.



System 2

CALEO DIRECT

ceiling heating system

CALEO DIRECT system is recommended for buildings when installation of floor heating is not possible (lack of floor isolation or non-replaceable floor covers) We also suggest equipping the rooms with CALEO DIRECT system when floor surface is small to transmit sufficient heating capacity (eg. bedroom).

Depending on capacity sizing the CALEO DIRECT system is perfect for primary as well as for comfort heating.

CEILING STRUCTURE

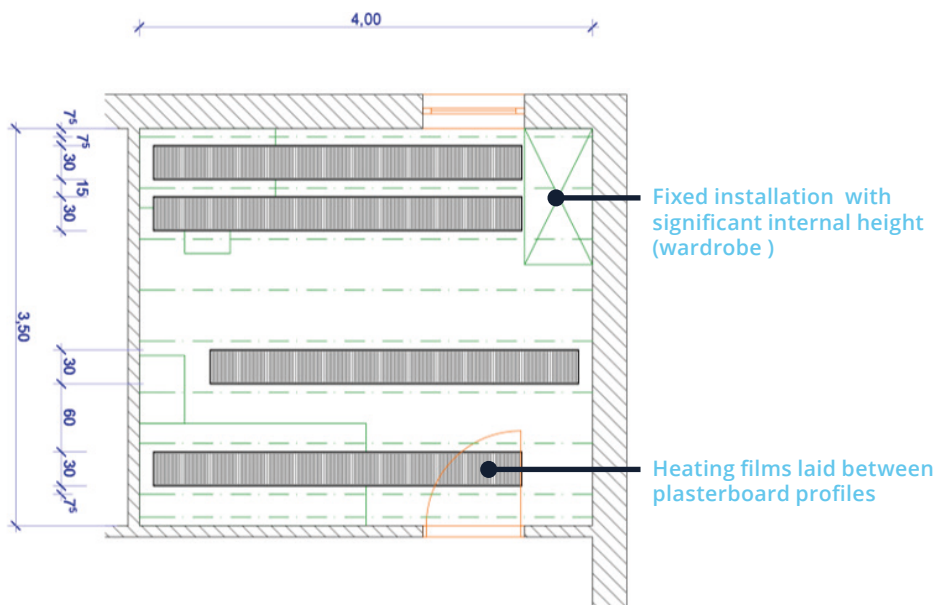
- The wall- or ceiling structure must be dry and capable to bear the load of suspended plasterboard system
- The system requires at least 100mm of free internal height. Please also check openings when defining available free height of the rooms

PLASTERBOARD

- Profiles of the suspended ceiling shall be installed parallel with a distance of 40 cm. For isolation use non flammable rock wool between the profiles with thickness of min. 20mm, ideal from 50mm or above

FILM HEATER

- We recommend only elements of 160W/m² capacity film heater at 30 cm width for CALEO DIRECT system
- Always use the design program provided by BVF to determine minimum heating surface and capacities
- Minimal film heater coverage must exceed shall always match to the actual calculated capacities. Please pay attention to even distribution of film heater lines in the ceiling structure
- In case of comfort heating concentrate the capacities to the comfort zones of stay



In case of comfort heating Caleo DIRECT system can be installed irrespective of the furniture positions, however it is recommended to place the heating elements above the comfort zone (e.g. bed, table or couch) and concentrate on the areas with higher heat loss (main walls, external openings). Please pay attention to the positions of lighting during installation.

Final layout of the film heaters shall be adjusted on site to actual parameters if necessary.





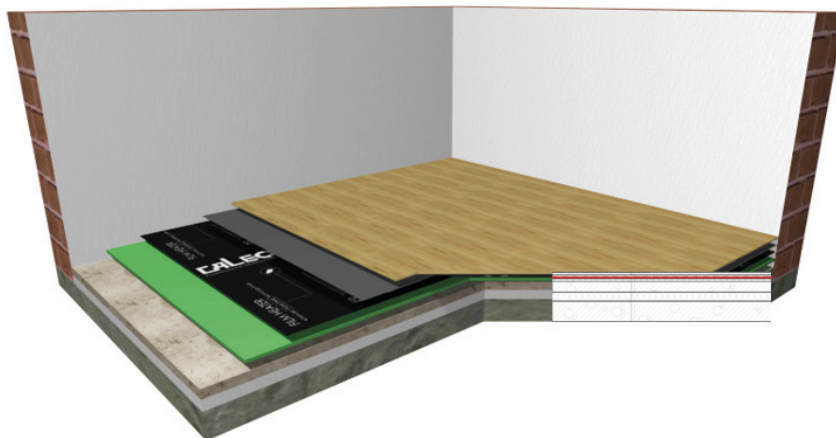
SUGGESTED ORDER OF LAYERS





Floor heating under laminate and other floating floors

- Floated floor (laminate floor)
- PE foil
- CALEO heating film
- XPS insulation board
- Insulated concrete base





Ceiling or wall heating in plasterboard

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INSTALLATION



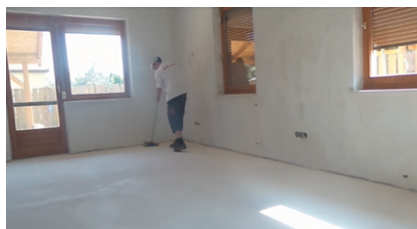
SAFETY INSTRUCTIONS



FOLLOW THE STEPS FOR THE SAFE INSTALLATION

1. Preparation Before Installation

- A. Confirm the electric capacity of the installation location.
It should be enough to accommodate the total output of the film.
- B. Be sure the subfloor is clean, rigid, flat, level, free of cracks and objects that can damage the film.
- C. Determine how many thermostats should be needed and the location of each thermostat.
- D. Drill or cut hole for electrical junction box.
- E. Make groove for the path of wires (power & sensor)



IMPORTANT SAFETY NOTICE



WARNING: Shock and fire hazard!

- If the CALEO System is damaged or not installed properly, fire or shock hazard could occur resulting in serious personal injuries or damage to property. You must carefully follow the warnings and instructions contained in this manual.
- Use controllers only designed for electric floor heating systems.
- It is important that this equipment is installed only by qualified electricians who are familiar with the proper sizing, installation, construction and operation of floor warming systems and the hazards involved. The installation must comply with all national and local electrical codes. If you are unfamiliar with these requirements, contact an electrician.
- The CALEO System is designed for under floor and ceiling heating purposes only. Be sure that the floor is not penetrated by nails, screws, or similar devices that can cause damage on first installation or during subsequent floor repairs in the future.
- If the CALEO System is damaged, it must be replaced. Do not attempt to splice or repair any part of the system.
- CALEO is a heating element, not a full-ready plug in heating device.
- Installer must decide whether he uses "earthing" solution or not.
- Please follow an official local electrical protocol of "earthing" to use CALEO system.
- The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- Children being supervised not to play with appliance.



2. Safety Guidelines

The safety and reliability of any floor heating system depends on proper design, installation, and testing. Incorrect installation or mishandling of the product can cause damage to the heating cable, system components and property, and can create a risk of fire or shock. The guidelines and instructions contained in this guide are important. Follow them carefully to minimize these risks and to ensure that the CALEO system performs reliably.

Pay special attention to the following notices:

- Instructions marked Important
- Safety warnings identified as WARNING

3. Remember to measure resistance

The resistance should be measured between the two conductors. Compare this resistance reading to the resistance specified. The value should be within -10% to +10%. If you get a different reading, contact to the distributor. Also, measure the resistance between the wiring cables. Both should read infinity. If you get a different reading, contact to the distributor.

Important: measure the resistance four times during the installation

Remember to always measure, verify and record the actual resistance throughout the installation process.

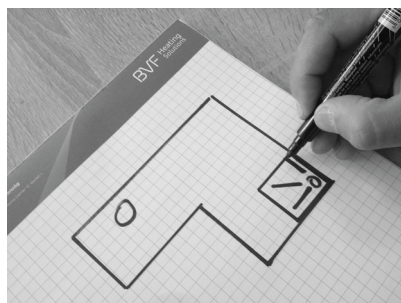
INSTALLATION



FOLLOW THE STEPS FOR THE SAFE INSTALLATION

You will require the following items to install and test the floor heating system:

- Scissors
- Utility knife
- Wire strippers
- Tape measure
- Screwdriver
- Multimeter
- CALEO connectors
- CALEO Bit. Tape



Plan layout

Make a sketch layout or a floor plan of the room; include all permanent furnishings such as toilets, bathtubs, appliances, cabinetry, etc. Indicate all dimensions required to determine the available floor area and the position of the thermostat.

STEP 1

Place the XPS insulation board on 100% of the total area. Make sure the surface is even, dry and properly fixed with tape.





STEP 2

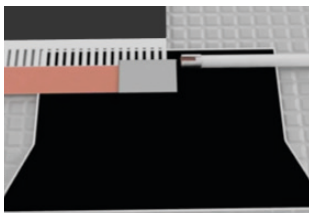
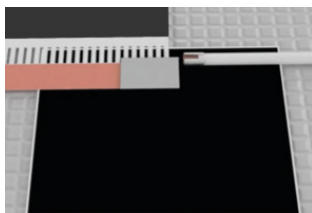
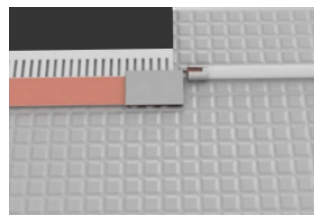
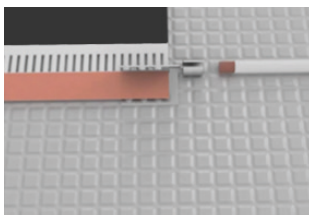
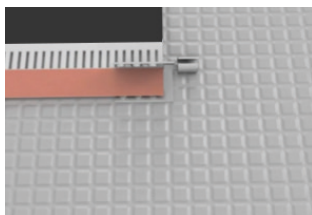
Cut to size and place the heating film according to the pre-designed layout. Make sure that heating film will not be installed under fixed furnitures. You can see the cutting-line only on the backside of the film. Never cut or damage the carbon part. Never leave or place any tools on the film heater.



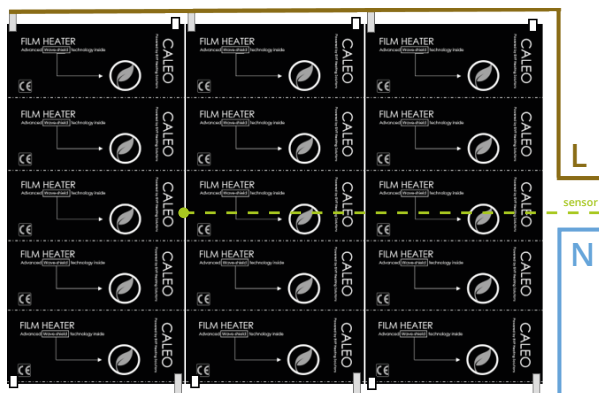
STEP 3

Wiring. Do the wiring according to the scheme below. Always check the connector is fixed properly and the bitumenous tape is flattened.

⚠ Never forget to cut a tunnel in the insulation board to hide the connection and cables.



INSTALLATION



Install floor sensor

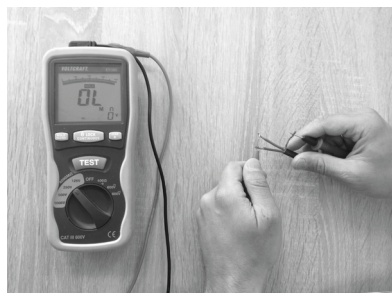
If using a floor temperature sensing thermostat, install the sensor now, preferably in conduit tube, or directly to the subfloor. It is recommended that the sensor be installed in conduit tube. This will allow the sensor to be easily replaced in the unlikely event of failure. The sensor and/or tube needs to be installed between the thermostat wall box and the sensor position. The conduit tube must be partially countersunk into the subfloor.

STEP 4

Insulation resistance test

This test ensures that the insulating materials of the film heater are not damaged.

1. Make sure the meter reads "open" or "infinity". If you get a different reading, contact to the distributor.
2. Record these readings on the warranty card.



Heating film resistance test

This test measures the resistance of the CALEO Heating Film and is used to determine circuit integrity.

1. Set your multi meter to the 200 or 2000 ohm range
2. Connect the multi meter leads cold lead wires.
3. Compare this resistance reading to the resistance specified in the Product Selection. The value should be within -10% to +10%. If you get a different reading, contact to the distributor.
4. Record these readings on the warranty card.

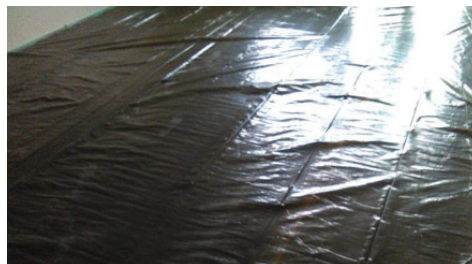
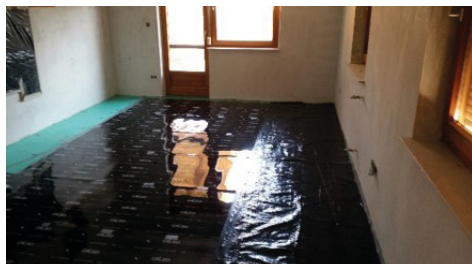




STEP 5

Water barrier foil

Make sure all cables and connection points are fit in the tunnel and under the insulation material level. Than place the water barrier PE foil on the total area of the room. Than the heatings system is ready for handover.



STEP 6

Thermostat settings

Make all necessary parameter and program settings according to the user manual of the thermostat.

Floor limit temp. Never exceed the 29-31°C

In ceiling heating mode the limit temp. Should be between 40-50°C



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