



## Installation on underfloor heating

(applies as well for electric underfloor heating if the system is declared as "suitable for parquet flooring" by the manufacturer)

Bergland-Parkett is an especially suitable flooring for underfloor heating. Due to the 3-layered construction made up of the same solid wood in conjunction with the gross density of the hardwood, an improved thermal conductivity is achieved.

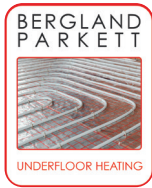
### Preparatory measures for the installation

Each floor that comes with a floor heating system requires careful planning and coordination with regard to the heating system, the screed and various floorings, to permanently ensure an optimal and intact functionality. Within these measures of such special flooring constructions, professional and standardized services are crucially important.

The processing measures have to meet the state of the art, the available information leaflet as well as the assembly and laying guidelines of the (respective) system provider.

### Screed, dryness, readiness for installation

After the completion and the appropriate resting period of the subsequently heated screed, the complete drying of the screed (readiness for installation) is an important prerequisite for the preparatory and laying measures of elastic, textile flooring as well as wooden flooring. This has to be considered because otherwise the humidity measurement within the inspection of the subfloor for heated construction is not reliable. The complete drying of the screed with the help of heating up and cooling down, with intervals between heating, has to take place before installing any type of flooring. For the drying of heated screeds, a technical, proper heating is recommended, see screed heating protocol Bergland-Parkett.



## Information leaflet for installation of wooden floors on underfloor heating

Wood and wooden materials have been proven in floor construction for many years and, in conjunction with underfloor heating, have stood the test. The following details are based on knowledge gathered during research conducted by Wood Research Austria and supported by the Federal Ministry of Construction and Technology. Additionally, our proficiency stems from long-term experience with various floor structures on underfloor heating systems.

### 1. Moisture barrier

When installing the floor in rooms without cellar and at ground level, above entrances, humidors, passageways, garages and the like, the whole floor construction has to take place on a permanently effective moisture and steam barrier. Due to ascending moisture from the underground, damages to wooden floors are not avoidable.

### 2. Suitable subfloors

On underfloor heating systems, both wet screeds (e.g. cement screed) and dry screeds (e.g. chipboards, cement-bonded chipboards) may be used. If dry systems are used, a lower thermal conductivity of the floor construction is to be expected due to the air layer between the heating tube and the lower edge of the screed. Residual moisture (measured according to the CM method) must not exceed 1,8 % in cement screeds and 0,3 % in anhydrite screeds.

### 3. Recommended heating systems

Low temperature underfloor heating systems are recommended (flow temperature until 55 °C in hot water underfloor heating systems). The surface temperature of the finished wooden floor must not exceed 29 °C, even in the border zones. Favourable values are 26 °C - 27 °C.

### 4. Distance of heating tubes

In order to limit the waviness of the surface due to the temperature (at a given maximum temperature, a smaller waviness leads to a higher average temperature and thus to a higher output of the heating system), the distance between the tubes of the hot water underfloor heating system should be between 100 mm and 200 mm.

### 5. Relation of the thermal resistance values

The thermal resistance values of the individual layers of the floor construction have to be coordinated with the required heating output according to ÖNORM EN 1264-3. It should be ensured that a reasonable relation between the thermal resistance values of the layers above the heating system (cement screed or dry screed and flooring) and below the heating system (thermal insulation) exists. The heat emission below the heating element should not exceed 20 W | m<sup>2</sup> or 25 % of the heat output. This means, that the thermal resistance value of the floor construction should not be too high.

The naturally given thermal resistance value of wood or wooden materials limits the waviness on the surface due to temperature and thus creates an even surface temperature. A high density of the wood is favourable for the heat conduction of the flooring. The heat conductivity of hardwood is 30 % above that of softwood.



6. Drying of floor screeds

Prior to the laying, the cement screeds have to be level, solid and sufficiently dry (see point 2). After the hardening of the screed (approx. four weeks), the underfloor heating system should be put into operation gradually (daily increase of the flow temperature by 5 °C). After accomplishing two thirds of the heating load, the screed must be heated constantly. Prior to laying the flooring, the temperature of the screed needs to be lowered accordingly (turn off the heating).

7. Suitable floorings

Basically, the chosen wooden floor has to meet the ÖNORM standards B3000, 1-11. All types of parquet may be used as surface flooring (with the exception of wood block flooring). Less suitable are crosscut flooring or particularly wide lamellae or single elements within the installation of the flooring. In order to reduce drying joints, sortings with a predominant proportion of closely positioned growth rings should be used. Wood types with unfavourable swelling and shrinking properties are not suitable or only conditionally suitable in a dimensional stabilized form. For the installation of wooden floorings, ÖNORM standard B 2218 is decisive. At the time of the installation, the wood moisture must range between 7 % and 9 %. As a wood moisture value of 5 % to 7 % is reached during the heating period, a low moisture level of the parquet is recommended at the time of laying. Due to appropriate air humidification, visible joint formation may be prevented. According to ÖNORM standard B 2242-7, the flooring has to be completely glued on the screed, a floating laying is not permitted. Prior to applying the glue, which must be resistant to permanent temperatures of 50 °C, the screed has to be coated with a primer. The wooden floor must not exceed a thickness of 24 mm.

The top flooring may only be installed after the screed has been dried according to the standards.

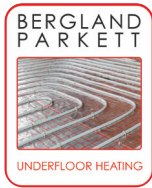
8. General information

In order to avoid damages to the parquet flooring and an increase in heating costs, no carpets should be placed on parquet floors if underfloor heating systems are installed.

9. Technological parameters of some types of wood

The differential rate of shrinkage (dimensional changes per percent wood moisture change) is listed in the table for the individual grain directions. When using sortings with a predominant proportion of closely positioned growth rings (e.g. Rift - Half Rift), swelling and shrinking properties will be favourable, as the radial rate of shrinking is decisive when it comes to changes in the width of the parquet elements (low level of joint formation).

Types of wood	Differential rate of shrinkage (%)		
	radial	tangential	average
Maple european	0,10 - 0,20	0,22 - 0,30	0,21
Beech steamed	0,19 - 0,22	0,38 - 0,44	0,31
Birch	0,18 - 0,24	0,26 - 0,31	0,25
Pear	0,15 - 0,16	0,30 - 0,36	0,24
Oak european	0,18 - 0,22	0,28 - 0,35	0,26
Ash	0,17 - 0,21	0,27 - 0,38	0,26
Cherry	0,16 - 0,18	0,26 - 0,30	0,23
Black Walnut	0,18 - 0,23	0,25 - 0,30	0,24
Elm	0,17 - 0,20	0,27 - 0,29	0,23



## Installation

The overall thermal resistance for floorings should not exceed 0,20 W | mK. When gluing the parquet, joints and cracks in the screed have to be filled thoroughly. This is done by filling them with a two-component artificial resin. Expansion joints in the screed, which are mandatory inserted by the manufacturer, need to be picked up in the parquet surface.

Basically, the rules of the customary standards for the installation of cement screeds do apply. These requirements have to be met as a minimum level prior to the installation of parquet floors (see measures protocol).

### A summary of essential standards and factory specifications

1. The heating of the screed may only start after it is fully hardened  
Cement screed - 21 days  
Anhydrite screed - 10 days
2. Slow and gradual heating in designated time intervals (according to the standards) is required. In order to avoid screed damages, the maximum temperature increase should be 5 °C per day (see measures protocol 5.7.).
3. The maximum flow temperature during the heating of the screed needs to be kept constant for at least 7 days. A heat reduction period of four days follows, where the temperature should be decreased by 5 °C every day, down to 25 °C (see measures protocol). The heating system should be switched off for 7 days, subsequently the temperature is increased to 45 °C for another 7 days and on the 49th day the temperature is reduced again to 25 °C.

This schedule contains the minimum amount of required heating days. Each additional day is beneficial for reducing moisture and increases safety. During this procedure, the temperature needs no longer to be increased or reduced gradually. The beginn for the installation of the floor is the 51st day. At the time of the installation, the surface temperature of the heated screed should not drop below 12 °C or exceed 20 °C (standard), relative humidity should be 50 - 60 %. Now the floor may be installed.

4. The residual moisture content must not exceed 1,8 % (cement screed) or 0,3 % (anhydrite screed) respectively (measured with the CM method).
5. **Please Note**  
According to our factory specifications, parquet floors of the wood type Beech natural must not be installed over underfloor heating systems.
6. Screed humidity measuring points are to be registered systematically and have to be marked on the floor to avoid damaging of pipes, etc.
7. To increase safety, we recommend to conduct more measurements than stated in the standards (e.g. DIN, three measurements | 200 m<sup>2</sup>). The results have to be recorded and the screed may only be worked on once the results are below the required values.



8. According to ÖNORM standard 2242-7, Bergland-Parkett parquet flooring needs to be glued completely when installed over an underfloor heating system. In doing so, the measures stated in the chapter „Gluing of Bergland-Parkett floorings“ have to be carried out accurately.
9. At the time of laying, the wood moisture of the parquet flooring should be  $8\% \pm 2\%$  residual moisture.
10. **Heated screed - security seal**

Usually, underfloor heating systems are operated at a flow temperature of 36 - 70 °C. This results in a surface temperature of approx. 26 - 27 °C. If this temperature is increased significantly, the screed expands considerably, which leads to damages in both the screed layer and the parquet flooring. For everyone to be on the safe side, we recommend to possibly install an Security-Seal made of metal on the screed. The seal should be installed in the presence of a witness. In order to be able to find the seal as quickly as possible, the manufacturer suggests the following procedure:



Viewing direction main window front, 500 mm away from the wall, this is the uniform placement of the security seal. An installation protocol should be set up additionally. The fitting of the seal happens by removing the protective film and gluing the seal on the primed screed. The seal must not be covered with glue. The measurement is implemented by 5 measuring points with reaction resin, which prove the overheating of the screed by turning from white into black - an incontrovertible piece of evidence.

**Source of supply:**

Holzindustrie Amashauffer GmbH  
 Bergland-Parkett  
 A-3254 Bergland, Kendl 6  
 Tel. +43 7416 | 55506-0

11. The **climate during laying** should be kept constant over 5 days. After laying the parquet flooring, the temperature of the underfloor heating system may be gradually adjusted over the course of a week to a maximum parquet surface temperature of 26 °C, as recommended by Bergland-Parkett (factory specification).
12. Whenever underfloor heating systems are combined with parquet floorings, both **the room temperature and the relative humidity** are of essential importance when it comes to the durability of the floor. In terms of a healthy room climate for man and wood, the purchase of a hygrometer would be a reasonable investment. The surface temperature of the parquet floor should be **max. 26 °C when correctly used**.
13. Due to indoor climate conditions during the **heating season**, it cannot be ruled out that marginally joints do occur. This, however, is not a product defect. This effect may be minimized or prevented by keeping a constant room climate of  $20\text{ °C} \pm 2$  and 50 - 60 % relative humidity.



## Thermal resistance values for pre-finished parquet flooring

These values refer to the thermal conductivity according to DIN 4108 in W | mK

Thickness: 15 mm in W | mK

### Types of wood

### Thermal conductivity

### Overall thermal resistance

MAPLE european
BIRCH
PEAR steamed
BEECH steamed
OAK european
SMOKED OAK european
SMOKED ZIRNOAK european
ALDER steamed
ASH
CHERRY steamed
BLACK WALNUT steamed
ELM steamed

0,14
0,14
0,20
0,20
0,20
0,20
0,20
0,14
0,17
0,17
0,14
0,17

0,107
0,107
0,075
0,075
0,075
0,075
0,075
0,107
0,088
0,088
0,107
0,088

Thickness: 10,7 mm in W | mK

### Types of wood

### Thermal conductivity

### Overall thermal resistance

MAPLE european
BEECH steamed
OAK european
ASH

0,14
0,20
0,20
0,17

0,076
0,054
0,054
0,063



# Underfloor heating - measures protocol

Object \_\_\_\_\_

Floor (1st, 2nd, etc.) \_\_\_\_\_

Screed laying was finished on \_\_\_\_\_

Type of screed \_\_\_\_\_

The mean screed thickness is \_\_\_\_\_ cm

01 - 21. day	Rest period of the screed without heating is 21 days	yes   no
22. day	Flow temperature increased to +25 °C	yes   no
23. day	Flow temperature increased to +30 °C	yes   no
24. day	Flow temperature increased to +35 °C	yes   no
25. day	Flow temperature increased to +40 °C	yes   no
26. day	Flow temperature increased to +45 °C	yes   no
27 - 33. day	Heated without interruption with a temperature of +45 °C	yes   no
34 - 37. day	Reduce underfloor heating by 5 °C every day, until +25 °C are reached on day 37	yes   no
38 - 44. day	Heating system is switched off completely	yes   no
45. day	Flow temperature increased to +30 °C	yes   no
46. day	Flow temperature increased to +35 °C	yes   no
47. day	Flow temperature increased to +40 °C	yes   no
48. day	Flow temperature increased to +45 °C	yes   no
49. day	Flow temperature decreased to +35 °C	yes   no
50. day	Flow temperature decreased to +25 °C	yes   no
from 51. day	Laying may start with a flow temperature of +25 °C	yes   no

## These details refer to screed layers up to a thickness of 70 mm.

During the periods of increasing and reducing the temperature, the rooms were aerated and draughts were avoided. The heated floor area was free of building material and other coverage. After the installation of the parquet is finished, the underfloor heating system is kept in operation at a flow temperature of +25 °C. After another five days, the underfloor heating system may be set to normal operation. When using the room, pay attention to a room temperature of 20 °C ± 2 °C and relative humidity of 50 - 60 %. These aforementioned values do have a great impact on the swelling and shrinkage properties of parquet floorings. A warranty can only be granted if the heating protocol is signed and filled out completely. Basically, our special laying instructions should be observed for floating and glued laying.

Place | Date \_\_\_\_\_

\_\_\_\_\_  
Signature (executing firm)

\_\_\_\_\_  
Signature (builder-owner | architect | property developers)