

# Thermography of the hoof: Case Example Deshoeing

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## Thermography

Thermography is the graphic display of the surface temperature of an object. Inflamed or damaged tissue that have an increased metabolism and a increased blood circulation, can be detected as warmer areas, if the blood circulation is not obstructed. Decreased blood circulation and/or reduced metabolism results in lower surface temperatures.

The thermographic pictures were recorded with an infrared camera FLIR S65.

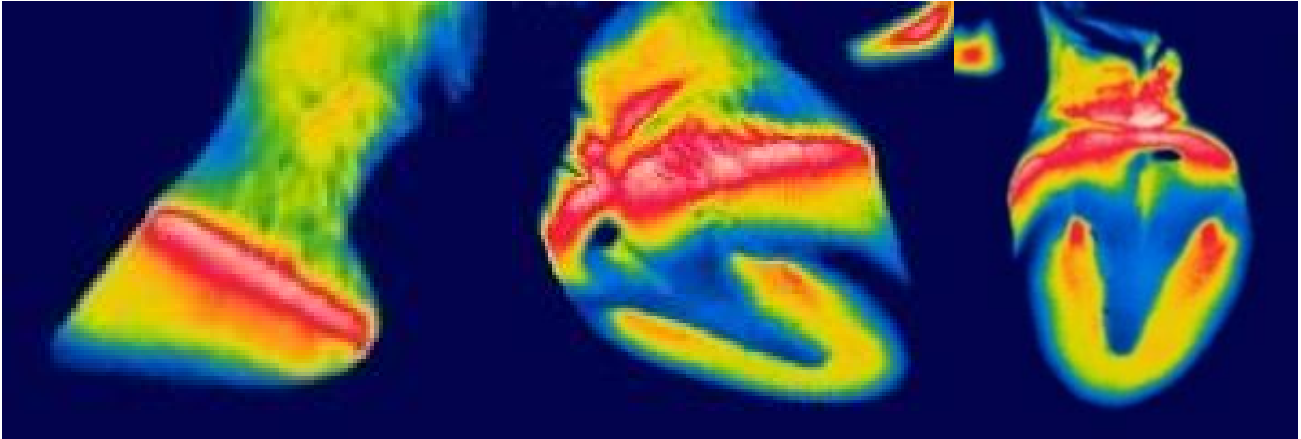


Fig. 1: Example for thermographic pattern of a healthy unshod hoof (camera FLIR E2)

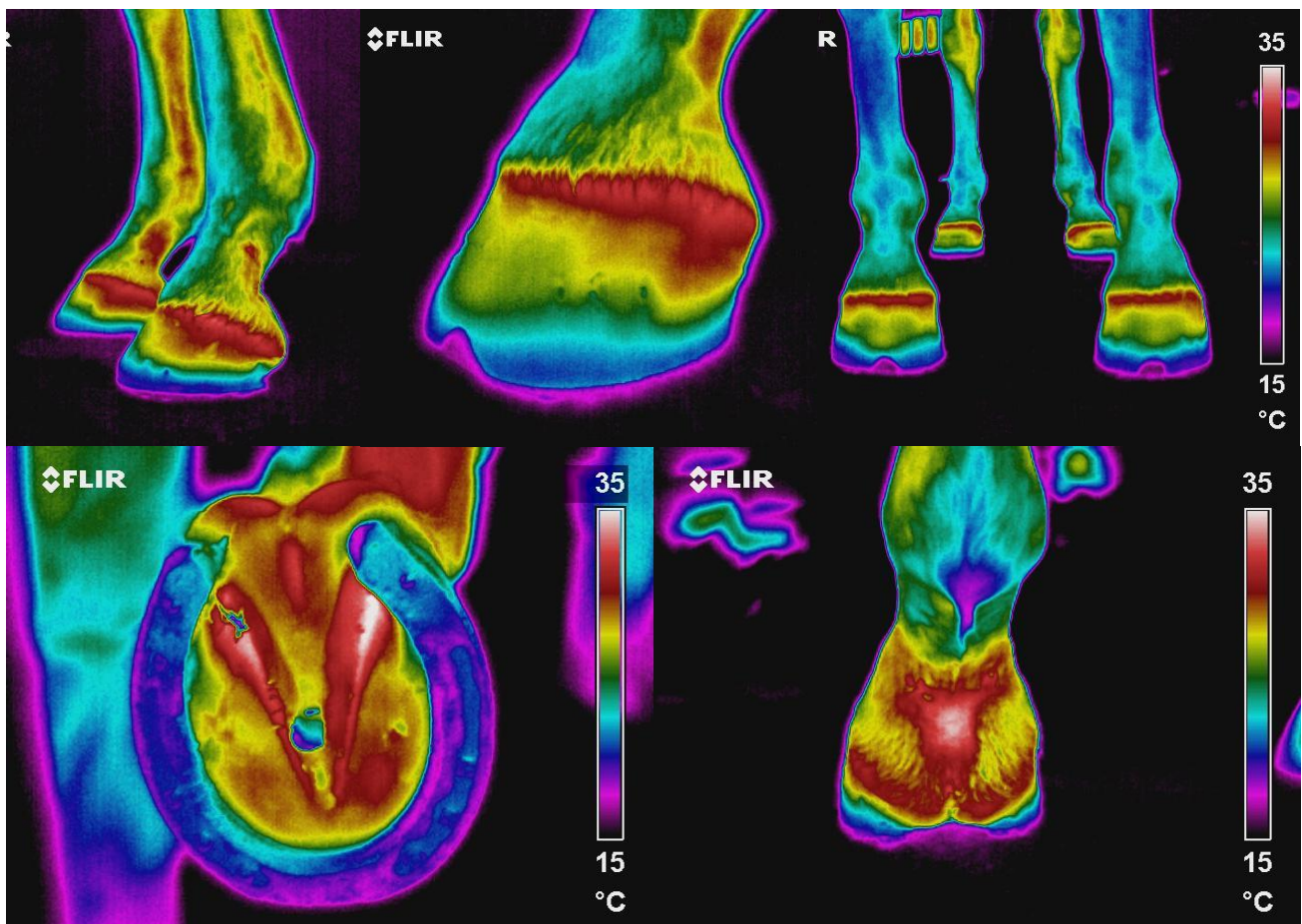
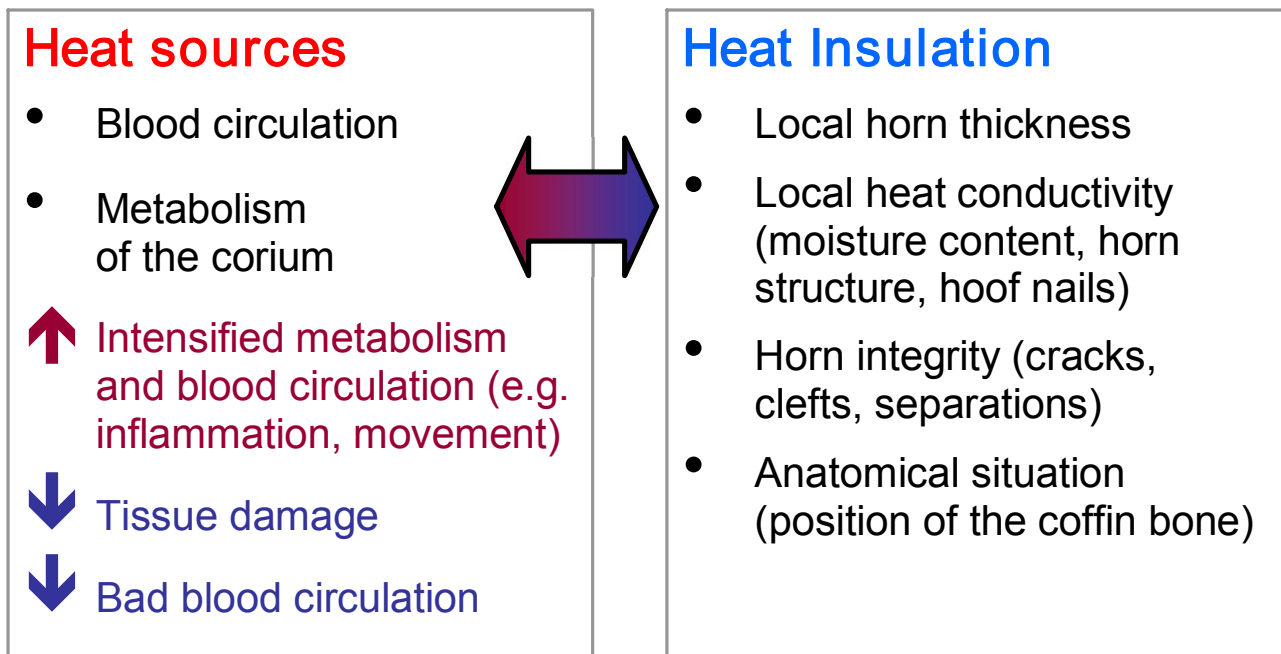


Fig. 2: Example for thermographic pattern of a shod hoof



**Fig. 3: Influence factors on the surface temperature of the hoof capsule**

With otherwise constant conditions for the heat loss (thermal conduction, convection, thermal radiation), the surface temperature of the hoof capsule is a result of the heat sources in the hoof and the insulation of the hoof capsule (Fig. 3). Therefore, the temperature is highest in places of thin horn and high activity of the corium, thus at the coronet. Above the coronet, the insulation is usually higher as a result of the coat, which is giving a increased, uneven isolation, thus the measured temperature is lower.

### ***Case example: Removal of horseshoes:***

The following investigation was accomplished on a 3-year Oldenburger gelding shod at the front hooves. During the investigation period, the horse was in an ample box under relatively constant temperature conditions. The thermographic recordings were made before deshoeing as well as after 2, 18 and 21 h.

At the represented front hooves, no further treatment of hooves took place, i.e. neither trimming nor correction, in the first 2 hours after the deshoeing.

In each case, the temperature gradient was plotted along a line from the coronet down to the bottom edge of the hoof capsule with the software Thermacam Researcher. One line was positioned dorsal laterally at the position of the hoof nails, the other line dorsal in the center of the toe (Fig. 4 and Fig. 5).

The outside temperature of the hoof capsule decreases constantly from the coronet to the bottom edge.

- 2 hours after deshoeing, the temperature had risen dorsal laterally at the coronet in relation to the shod condition by approx. 2°C and above the nail holes by approx. 5°C.
- Next morning - 18 hours after iron acceptance - the hoof temperature was approx. 9°C lower than 2 h after iron acceptance. The horse was in a box with lack of movement.
- 21 hours after dehoeing, the surface temperature was at the same level as 2 hours after deshoeing.
- At the coronet at the center of the toe, no temperature difference between the shod and unshod front hooves showed up 2 hours after deshoeing. Further down towards the bottom edge, the temperature increased however by around 2-3°C.

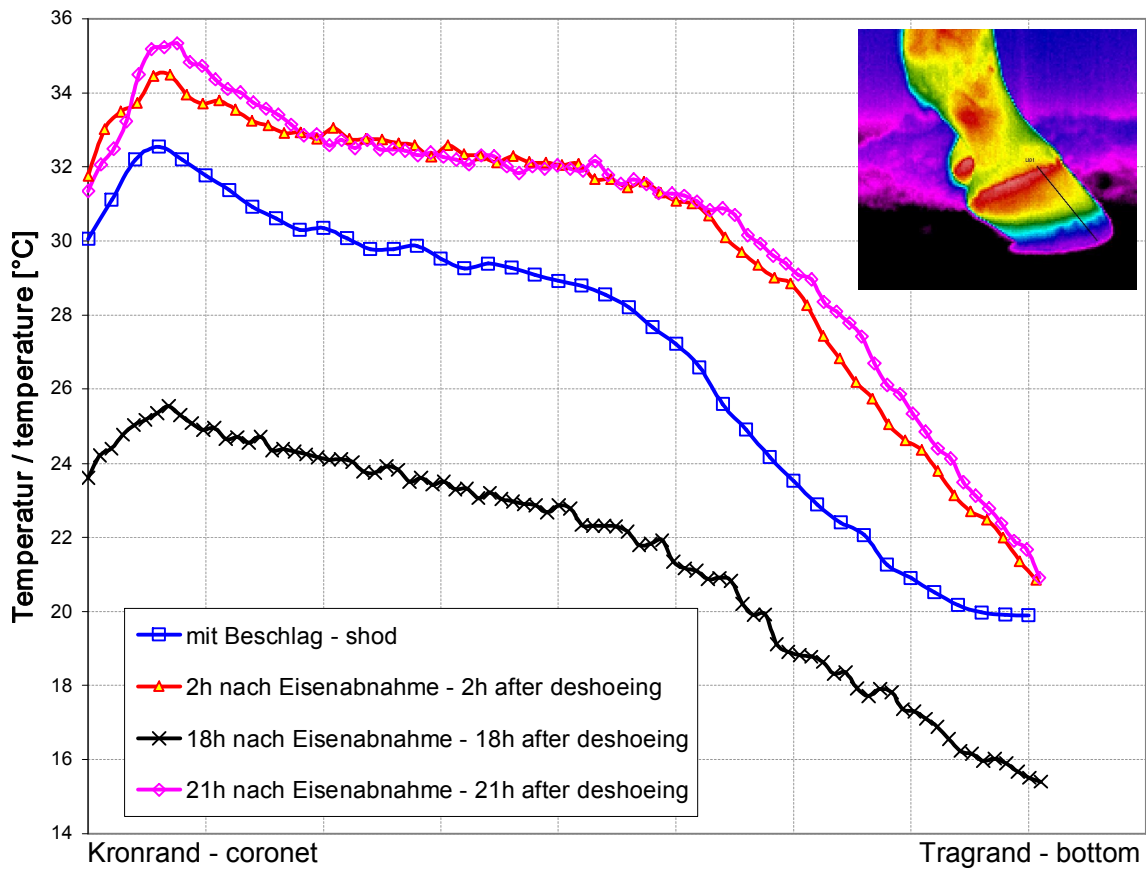


Fig. 4: Temperature gradient from coronet to the bottom hoof edge at the hoof nails

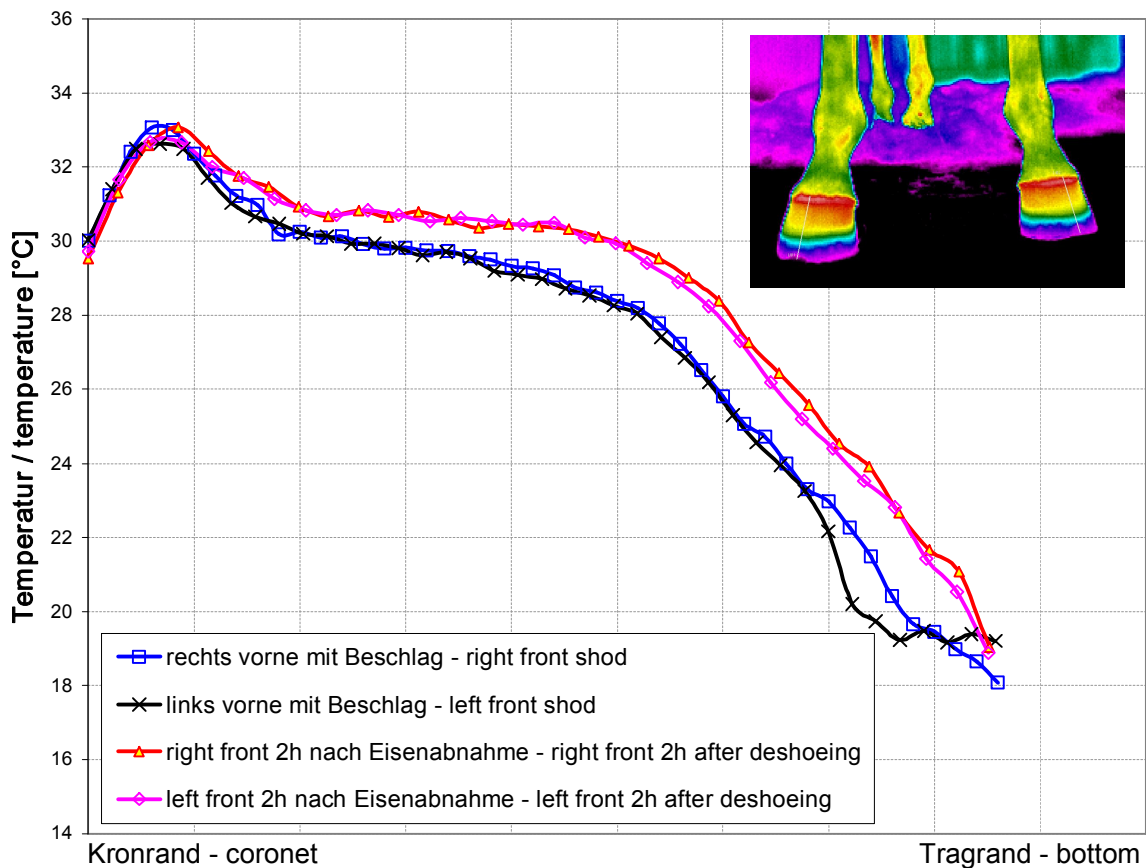


Fig. 5: Temperature gradient from coronet to the bottom hoof edge in the center of the toe

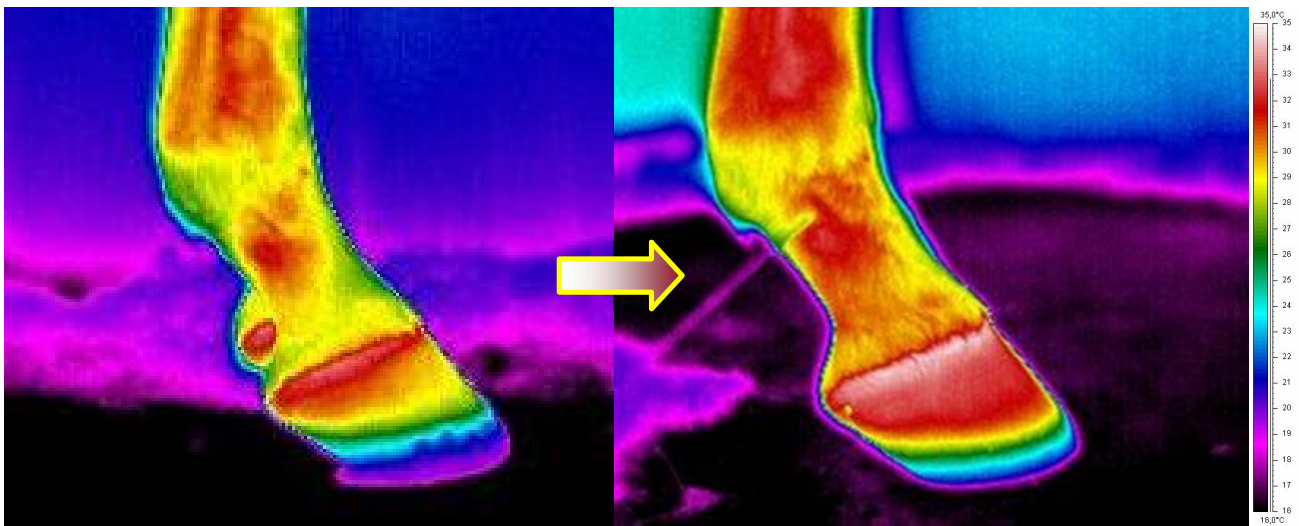


Fig. 6: Side view of the right front hoof: Shod (left) and 2 h after deshoeing (right)

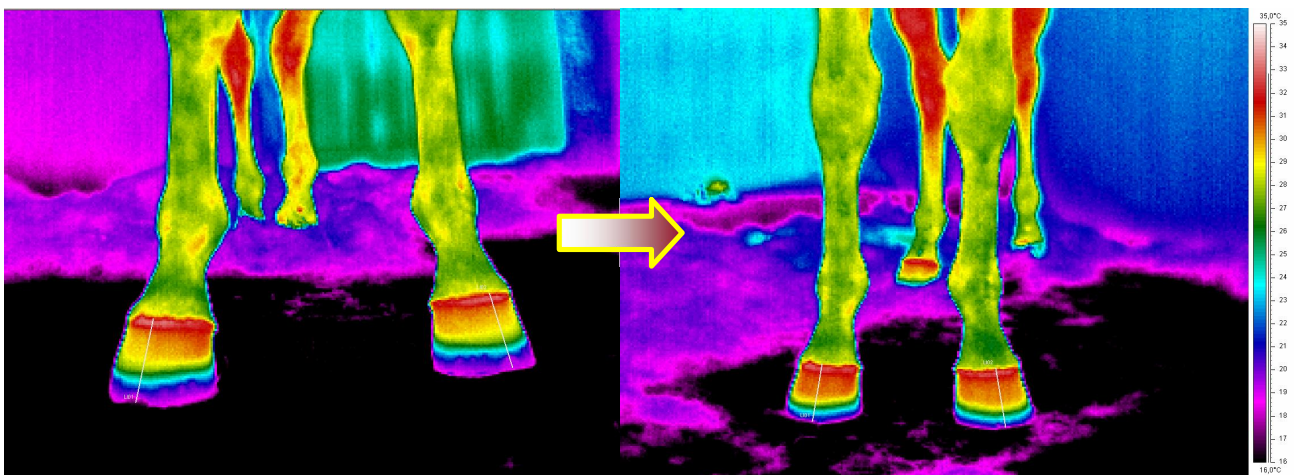


Fig. 7: Front view: Shod (left) and 2 h after deshoeing (right)

### Summary

Within 2 hours, removing the shoes on the front hooves of a 3-year Oldenburger gelding led to a significant rise in surface temperature of the hoof capsule. The increase in temperature was highest at the lateral front, above the hoof nails with up to 5°C and smallest at the coronet. In the center of the toe, no temperature difference could be recognized at the coronet.

After spending the night in a box (18 h after deshoeing), the temperature of the hoof was approx. 9°C lower, compared to the afternoon before and 3 hours later.

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