CARBON WINNER

FASTER AND BETTER

Horseshoes made from carbon …

… faster and better

Equestrian and racehorses all over the world are currently shod with materials based on aluminium and/or iron. This procedure has been the tried-and-tested practice for centuries and no one has seriously considered optimising the horseshoe with regard to its mass and acceleration in combination with other qualitative considerations such as, reducing stress on joints, etc.
Winner AG took up this challenge, qualitatively investigating all relevant physical- and medical influencing factors. Our conclusion was that developing revolutionary new carbon horseshoes would deliver fundamental benefits. **“Faster and better”** is our goal.

“Faster” comes from the fact that if we reduce the weight of the horseshoes by using carbon in their production, the horse will need less energy during a race and as a result will ultimately be faster.

“Better” means that in contrast to conventional materials such as iron or aluminum horseshoes, there are major advantages for the horse from a medical point of view, i.e. the aspect of health is given high priority. The hoof mechanism and the strain placed on joints and tendons are the main reasons.

These are the two advantages that ultimately make a **“Winner”.**

Faster …

… a matter of physics

“Power is the ability to provide large amounts of energy in a short time to bring a mass (horse) to your destination in a specific time. If you want to increase the speed, then more power will be required. If, however, you want to increase the speed using the same amount of power, then the mass must be reduced.”

During a race a horse requires its energy for a number of purposes such as to accelerate and decelerate and to overcome air resistance and the friction between its hooves and the ground.

"The influence of mass on the hoof and hence energy consumption is 38 times greater than if it were located in the saddle area. The reason for this is the hoof speed (120 km/h), the square of which is incorporated into the equation for motion energy” (Newton's 2nd law, Isaac Newton, 1642 -1727).

A 50% reduction in the horseshoe’s weight (60 g instead 120 g) is equivalent to a **9-kg reduction in saddle weight.**

Comprehensive studies based on these model assumptions were carried out for this purpose:

Weights

Steel:	4 × 200 g = 800 g
Aluminum:	4 × 127 g = 508 g
Carbon:	4 × 65 g = 260 g

Model assumptions

Race course	2000 m
Mass of horse	450 kg
Mass of jockey	50 kg
Speed of the horse	16.7 m/s (60 km/h)
Speed of hoof	102 km/h
Distance of a galloping stride	6 m (333 jumps)

Energy expenditure

$$W = N\frac{m_{HB}}{2}\left(v_v^2 + v_r^2\right)$$

N : Number of jumps

m_{HB} : Mass of entire horseshoe

v_v, v_r : Relative velocity forwards and backwards

$$W = 500\frac{m_{HB}}{2}v_{SP}^2$$

v_{SP} : Center of velocity of the horse

$$W_{eff} = 500\eta\frac{m_{HB}}{2}v_{SP}^2$$

$1-\eta$: Amount of energy intermediately stored in the muscles, tendons, and ligaments

Steel horseshow (0.8 kg):	27.8 kJ
Aluminum horseshoe (0.508 kg):	17.6 kJ
Carbon horseshoe (0.26 kg):	9.0 kJ

Weight in the saddle

The conversion of energy expenditure into weight in the saddle is based on two model assumptions (2000 meters in racing distance):

1. One kilogram in the saddle gives an average racehorse running on good ground an advantage of a 2.5-meter lead.

2. The energy expenditure for a 2000-meter race course is 1200 kJ (10 kW / 13.6 PS).

The result of research …

… the basis of success for trainers and farriers

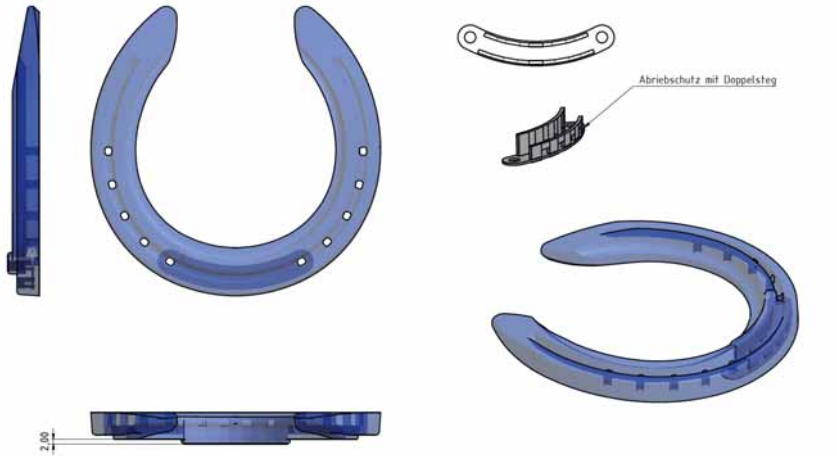
“Faster and better”. An area investigated by highly qualified scientists at the University of Zurich’s physics, veterinary medicine and material technology departments.

The result of this research is a horseshoe that is a world’s first in this area. The horseshoe is reinforced by carbon-Kevlar fibers throughout and is also made from composite materials (an epoxy-resin matrix), manufactured in a hot-pressing process. The design is in line with the new findings in the field of ergonomics and the rolling mechanism.

The horseshoe can boast the following main technical advantages in comparison with other products:

- 50% reduction in weight due to the use of carbon and Kevlar.
- The highest wear-and-tear resistance and breaking strength, even when exposed to high loads and centrifugal forces, thanks to innovative material technology and composite materials.
- Improved ability to slide and slippage due to the design, e.g. the elevation of the inner edge on the bottom of the hoof.
- Increase in the cushioning effect due to the material properties, which places less strain on the horse’s tendons and joints. No change in the function of the hoof mechanism.
- Better elasticity for the proper motion of the hoof (roaming motion) due to the reduced mass (weight). This reduces leg fractures and injuries.
- The horse consumes less energy due to the lower inertial mass. The motion sequence of the horse is optimized and energy-efficient.
- Simple application when shoeing the horse.

Product specifications



Composition of the hoof side of the shoe

- The grooved surface is used to attach alternative artificial horn fastenings (for horseshoes that do not need nails).
- A slight inclination on the inside of the horseshoe ensures that less strain is placed on the sole of the hoof.

Composition of the bottom side of the shoe

- The 2-mm elevation of the inner edge improves stability and the “slippage” on grass tracks.
- The special profile provides greater grip and reduces the risk of falling.
- An abrasion protection made of steel with a double web reduces abrasion and increases the service life.

Nail holes

- The nail holes have a diameter of 4 mm.
- Most of the horseshoe nails available on the market can be used to fix the shoe in place.

Material specifications

Weight:	61 g (e.g. size 6)
Material:	reinforced with carbon and Kevlar fibers (throughout the shoe)
Process:	Hot-pressing process with an epoxy-resin matrix
Sizes:	5 sizes for the front and back hooves (as per the size table)
Service life:	4-5 weeks

Product range / sizes

Size	Front hoof		Back hoof	
	Width (mm)	Length (mm)	Width (mm)	Length (mm)
4	120	120	120	120
5	125	125	125	125
6	130	130	130	130
7	135	135	135	135
8	140	140	140	140

Shoeing procedure

The shoes are fitted using the “cold-shoeing” method. The basic forms (as per the size chart above) are designed for natural hoof shapes. For this reason, deformation is not necessary and is also not possible due to the carbon material used.

Corrections can be made using a grinding belt. Hammers and anvils may not be used.

Scope of delivery

Starter combo set: 1 packaging unit contains 2 front horseshoes and 2 back horseshoes (2+2), each of which are available in sizes 4, 5, 6, 7 and 8.

Standard set: 1 packaging unit contain 4 carbon horseshoes. These can be used as either front horseshoes or back horseshoes and come in sizes 4, 5, 6, 7 and 8.

Ordering

All items can be ordered via our online shop (www.cwinner.ch/shop). The items will be delivered within 48 hours worldwide. Our Delivery Conditions as well as the General Terms and Conditions of Business shall apply.

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