

**Ingenieur- und Sachverständigenbüro
für Fahrradtechnik**

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Expert's Report

- **As to the reconstruction of an accident as described**

Our reference	653-p-16
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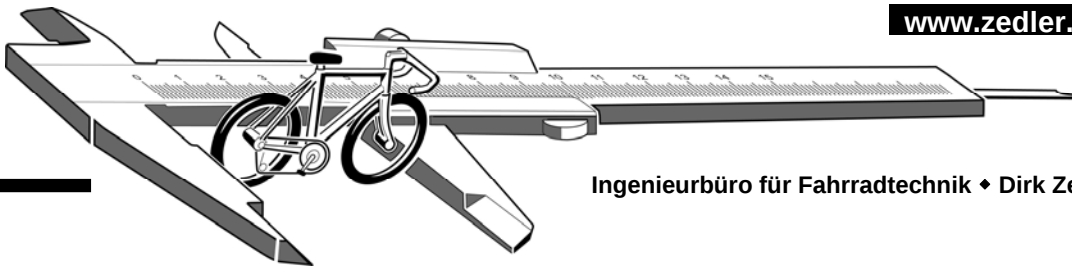
Report number	16 / 8810-1
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Principal	WFSGI - World Federation of Sporting Goods Industry
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Person in charge	Mr Yves Möri
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Note:

This report is the translation of the expert's report no. 16 / 8810 by graduate engineer Dirk Zedler dated May 12, 2016. In the event of any misunderstandings, the original German version shall be applicable.



Order details

Principal

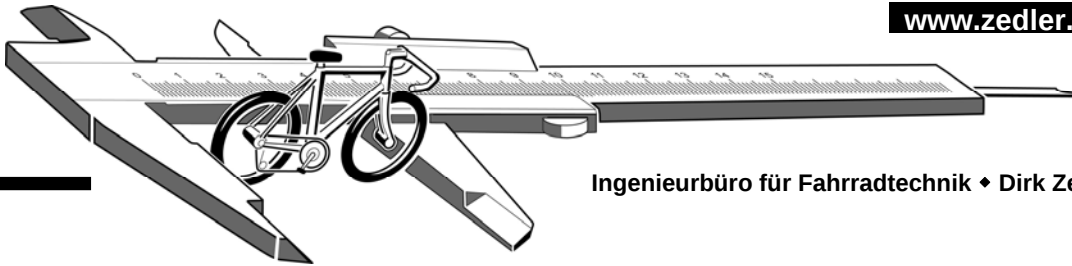
Principal	WFSGI - World Federation of Sporting Goods Industry	Person in charge	Mr Yves Möri
Address	Obere Zollgasse 75, P.O.Box 1664 3072 Ostermundigen/Bern SWITZERLAND	Phone	+41 31 939 60 61
		Fax	+41 31 939 60 69
		Email	ymoeri@wfsqi.org
		Date of loss	April 11, 2016
		Order placement	In writing
		Date of order	April 18, 2016
Last documents received on		April 18, 2016	
Miscellaneous	The expert opinion comprised accident reconstruction of the specific occurrences at 2016 Paris-Roubaix as well as a risk assessment of different brake systems. In this expert report, part 1, the accident was reconstructed. Risk assessment was undertaken subsequently, i.e. at a later point in time, in part 2 of the expert report.		

Documents made available

- Order
- Photographs and videos (links)
- Statement of the driver Francisco Ventoso
- Newspaper and online articles

Inspection details

Place of inspection	Zedler office, 71634 Ludwigsburg
Date of inspection	Inspection of documents only
Inspection time	Several dates
Expert	Dirk Zedler, graduate engineer
Attendees	Sebastian Martin, Bachelor of Science, team member of Sachverständigenbüro Zedler
Miscellaneous	./.



Accident reconstruction

I. General facts

The cyclist injured during the cycle classic Paris-Roubaix states that he was allegedly not involved in the bulk crash during the race. It was only after a few metres further that he became aware of stabbing pains originating from an injury of the left shin bone. Subsequently, he pulled over.

The photos at hand prove a severe incision on the front left shin bone.

The injury is documented in photographic form and therefore a fact.

The available documentation does not prove anything else. Any further photos of the parties involved or documenting the direct course of the accident were not made available for the preparation and are not known of either.

Disc brakes are mounted to the left side of the bicycle. This also applies to road racing bicycles. If the details as to the remaining of the cyclist on the bicycle, i.e. the cyclist did not fall down, and as to the statement that the injury was caused by a brake disc, the left shin bone must have collided with the left side of a road racing bike riding in front of him (photo 1).

This will be analysed further in the course of the accident reconstruction.

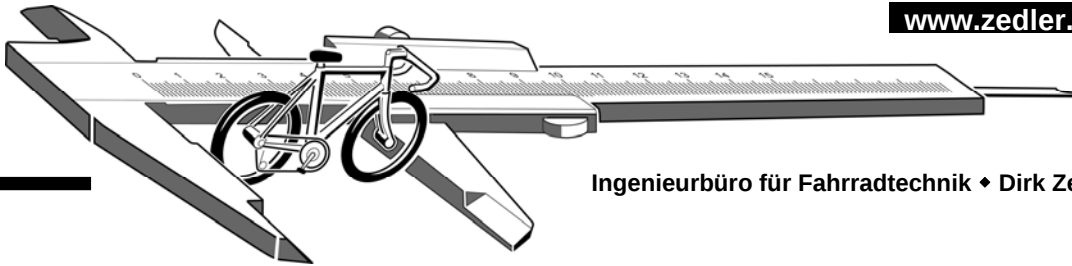
II. Details as to the shape of the injuries, as documented

What strikes first of all is the form as well as the position of the incision. They become particularly clear on the photo showing the cyclist lying on a surgery couch or the like before the stitching of the wound. The incision is at the front of the leg and (horizontally) across the shin bone. The incision's basic contour is circular, the top area being in sound condition. The form is comparable to that of a crescent which is open towards the knee.

The brake disc's direction of rotation is in direction of motion during the ride. In the case of two cyclists riding behind one another the directions of rotation of the brake discs and the direction of motion are parallel, i.e. they are oriented in the same direction.

On the basis of this fact already, it can be stated that the documented shape of the incision across the leg cannot have been caused by a brake disc during the ride.

Furthermore, the photo of the injury shows a very fine cut in the skin in the upper, external area. This cut has nearly completely closed and can only be identified because of a slight reddening due to the blood.



The thickness and/or material thickness of a conventional brake disc as used by the respective teams during the race, is around 1.75 mm in new condition.

If the rotating disc came in contact with the flexible, soft tissue, such a fine cut would be very unlikely.

What is more, the presence of these two different injuries already shows that it is impossible that only one individual “cutting” item like the brake disc in question was the origin for the cyclist’s injuries, as documented. Both the position and the shape of the injury are rather an indication for the spokes of the rear wheel and/or the cassette sprockets as origin. In rotating condition as a result of the rotational energy of the entire wheel these aero spokes may easily cause such kind of injuries in soft tissue.

Finding: The shape of the injury and its position on the cyclist’s lower leg speak against the course of the incident, as described.

III. Details as to the reconstruction and/or position of the injury

The centre of the rotational axis of the brake disc on a road racing bike is typically at a height of about 335 to 350 mm above ground. With a typical brake disc diameter of 160 mm the straight oriented brake disc is thus at a range of about 260 to 430 mm above ground during the ride (photo 2). As a matter of fact, the rear end of the brake disc is always at the height of the hub axle and thus at about 335 to 350 mm above ground (photo 3).

Depending on the design of the frame the brake disc is partly covered or completely free towards the rear.

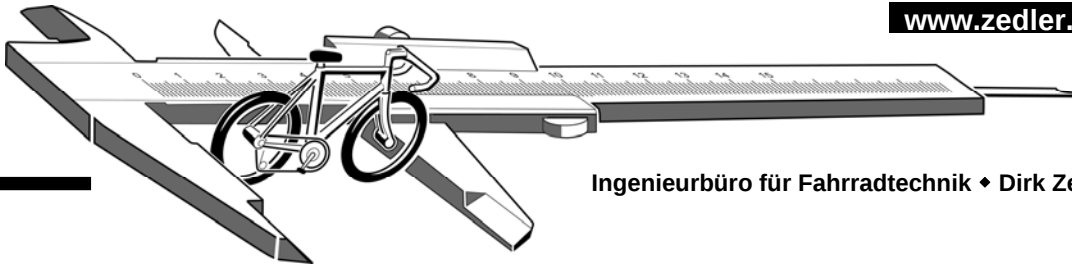
In the following various accident scenarios were simulated in the laboratory of the undersigned.

The first step is to distinguish between a cyclist seated as usual on the saddle and a cyclist in a difficult situation, for example slipped down on the top tube and seated on it.

The next step is to distinguish whether the cyclist’s click system cleat of the shoe was engaged with the step-in pedal or not.

All findings hereafter are based on the statement of the injured cyclist stating that he had allegedly not fallen.

Moreover, the cyclist riding in front had also tried to avoid bumping into the cyclists riding in front of him, i.e. the cyclist riding in front had also been on the moving bicycle.



Seated in the saddle / Cleat engaged with the pedal

It is conceivable that the cyclist following behind bumps into the road racing bicycle with disc brakes riding in front of him. If the colliding cyclist passes the bicycle in front of him on the left side, it will be impossible that the left leg collides with the brake disc mounted to the left side of the road racing bike riding in front of him.

This finding analogously applies to a cyclist with the cleats not engaged.

Finding: If the colliding cyclist passes the bicycle cycling in front of him on the left, a contact between the left lower leg and the brake disc will be impossible, no matter whether the shoe cleat is engaged with the step-in pedal or not.

Seated in the saddle / Cleat engaged with the pedal

In addition, it is conceivable that the cyclist following behind bumps straight from the rear into the road racing bike with disc brakes in front of him or passes it on the right side with his shoe engaged with the step-in pedal.

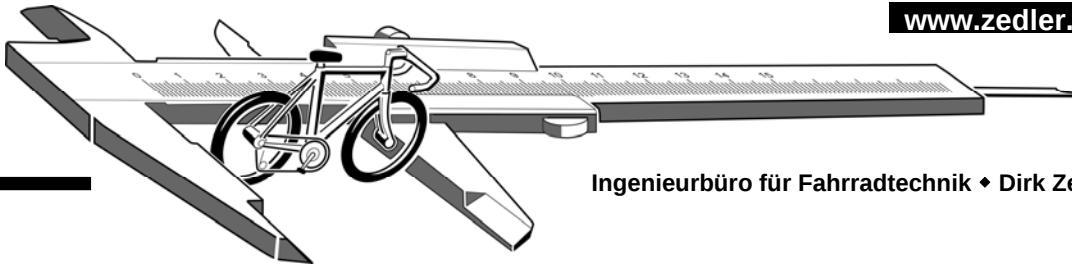
To get injured by a brake disc at the cyclist's lower leg during the ride as documented, the cyclist's foot ought have been either at its deepest pedal position or near this position. The pedal at a higher position along the circular path would not match the mounting height of the disc brake system (see above) and the position of the documented injury at the cyclist's shin bone. The cyclist's size which is 1.80 m according to the generally available information was taken as basis.

If the colliding cyclist with the cleat engaged with the step-in pedal passes the bicycle in front of him by the right side, it will be impossible that the left leg and the engaged shoe collide with the brake disc mounted to the left side of the road racing bike cycling in front of him. Prior to that the handlebar of the bicycle bumping in from the rear collides with the saddle or the lower leg of the cyclist riding in front of him (photos 4 + 5). At the same time the front wheel collides with the rear derailleur and with the foot of the cyclist riding in front of him depending on the position of the foot. A collision of the foot of the cyclist bumping in from the rear with the rear tyre or in general with the rear wheel of the cyclist in front of him would be also very likely. This applies regardless of the crank arm's position along the circumference (photo 6).

In the case of this scenario, a fall of the bumping in cyclist would be nearly the imperative consequence due to the lateral force application into the area of the handlebar. This also applies in particular, as the front wheel would get stuck at the rear derailleur, thus resulting into a fall.

Finding: If the colliding cyclist passes the bicycle of the cyclist riding in front of him on the right side with his shoe engaged with the step-in pedal system, a contact between the left lower leg and the brake disc will be impossible.

In addition, this would nearly imperatively result in a fall of the colliding cyclist.



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Seated in the saddle / Cleat not engaged with the pedal

See above findings - if the colliding cyclist passes the bicycle in front of him by the left side, it will be impossible that the left leg collides with the brake disc mounted to the left side of the road racing bike riding in front of him.

It is also conceivable that the rear cyclist bumps straight into the road racing bike with disc brakes from the rear with the shoe disengaged from the step-in pedal system. If the colliding cyclist passes the bicycle in front of him on the right side with the cleat no longer engaged with the pedal, it will be impossible that the left leg and the disengaged shoe collide with the brake disc mounted to the left side of the road racing bike cycling in front of him.

The reconstruction with a cyclist of identical, bodily dimensions shows this very clearly. Prior to a contact of the shin bone with the brake disc of the cyclist riding in front, the handlebar of the colliding bicycle will collide with the saddle and/or lower leg of the cyclist riding in front of him. In addition, the collision of the front wheel with the rear derailleur would be nearly imperatively the consequence. Furthermore, in the case of a cyclist seated in the saddle it is impossible in terms of anatomy that the brake disc gets in contact with the respective area on the shin bone. The distance is much too great (photos 7 - 9).

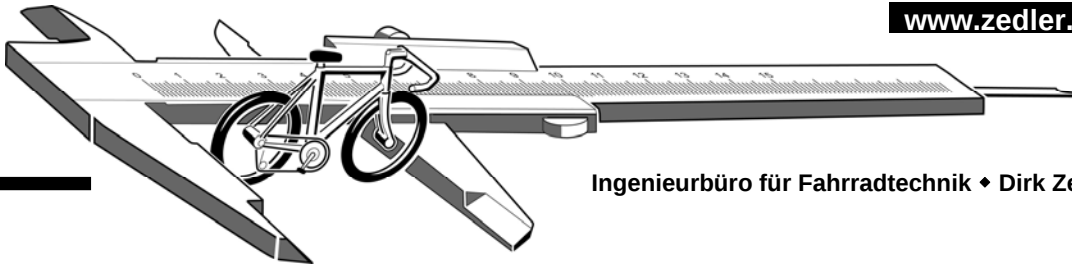
In the case of this scenario, a fall of the bumping in cyclist would also be the nearly imperative consequence due to the lateral force application into the steering area and the collision between rear derailleur and front wheel.

Finding: If the colliding cyclist passes the bicycle riding in front of him on the right side with the shoe disengaged from the pedal system, a contact between the documented injury on the left lower leg and the brake disc of the road bike riding in front of him is not possible either.

In addition, this would nearly imperatively result in a fall of the colliding cyclist.

Seated on the top tube / Cleat disengaged from the pedal

It is conceivable that the rear cyclist bumps straight into the road racing bike with disc brakes in front of him with the shoe disengaged from the pedal system. If the cyclist riding at the back passes the bicycle in front of him on the right side while seated on the top tube with the cleat disengaged from the pedal, it is impossible due to the geometry of a road racing bike, in particular due to the gap between the brake disc and the spokes of the rear wheel, that the injured area on the left leg of the colliding cyclist gets in contact with the brake disc of the road racing bike in front (photos 10 + 11). The reconstruction showed very clearly that this could have led, if at all, to an injury on the inner side of the lower leg (photo 12). This applies even in case of the cyclist sliding right to the fork steerer tube on the top tube.



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But before this could happen the handlebar of the colliding bicycle ought to collide with the saddle and/or the lower leg of the cyclist in front of him.

In the case of this scenario, a fall of the bumping in cyclist would also be the nearly imperative consequence due to the lateral force application into the steering area and the collision between the front wheel and the rear derailleur.

Finding: If the colliding cyclist passes with the shoe disengaged from the pedal system on the right side of the bicycle riding in front, a contact between the documented injury on the left lower leg and the brake disc of the road bike in front of him will nevertheless not be possible either.

In addition, this would nearly imperatively result in a fall of the colliding cyclist.

Seated on the top tube / Cleat disengaged from the pedal

It is also conceivable that the rear cyclist with the shoe disengaged from the pedal system bumps straight into the road racing bike with disc brakes standing crosswise in front of him. However, due to the geometric dimensions, i.e. the distance between disc brake and spokes of the rear wheel, and in consideration of the human anatomy, it is impossible in this case, as well, that the injured area on the left leg of the colliding cyclist gets in contact with the disc brake of the road racing bike in front without a fall as a consequence (photos 13 + 14).

Finding: If the colliding cyclist, with the shoe disengaged from the pedal system, bumps into the bicycle standing crosswise in front of him, a contact between the documented injury on the left lower leg and the brake disc of the road racer cycling in front of him is nevertheless not possible without resulting in a fall.

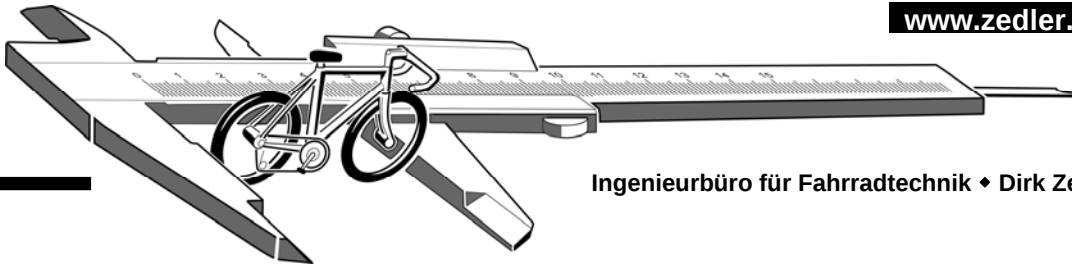
Seated in the saddle / Cleat engaged with the pedal

It is also conceivable that due to the course of accident as described, the cyclist riding in front turns by 180 degrees, thus standing shortly in the opposite direction of motion. A contact of the shin bone with the brake disc would require both handlebars and/or brake/shifter units to interlock (photos 15 + 16).

A fall of the colliding cyclist would be the imperative consequence, also due to the speed and ground, as documented.

Finding: If the colliding cyclist bumps into the bicycle in front which has turned by 180 degrees, a contact with the location of the documented injury on the left lower leg will not be impossible.

This would in addition result in a fall of the colliding cyclist due to the unavoidable interlocking in the area of both handlebars.



Conclusion: The reconstruction of the most different accident scenarios has not shown any evidence suggesting how an injury could have occurred on the cyclist's leg in the area and shape, as documented, without a fall of the colliding cyclist. This applies to the injury's nature as well as to its position on the lower leg.

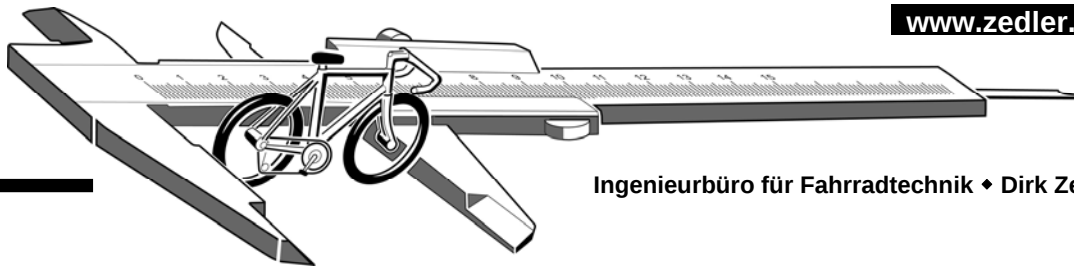
IV. Details as to the experiences with disc brakes

Disc brakes are common in other types of sport i.e. they have been standard for years now, namely in all mountain bike categories and increasingly in cyclo-cross races, as well.

Common knowledge to date are burns originating from the contact of a calf or the hand with a hot brake disc. This does, however, not apply to incisions of similar nature.

Comparable are mainly cross-country-races and marathon events, as cyclists are riding very close to one another and sometimes also in larger groups. In particular during the start, often many hundreds of cyclists set off.

Findings: Incisions caused by disc brakes have not been an issue in cycling in the past 10 years.



Summary

The cyclist injured during the cycle classic Paris-Roubaix states that he was allegedly not involved in the bulk crash during the race. Moreover, the cyclist riding in front had also tried to avoid bumping into the cyclists riding in front of him, i.e. the cyclist riding in front had also been on the moving bicycle.

The injury is documented in photographically and therefore a fact. The available documentation does not prove anything else.

The photos at hand prove a severe incision on the left shin bone. The incision is (horizontally) across on the front. In the bottom area the crescent-shaped incision is open, in the top area the tissue is in sound condition.

The shape of the injury and its position on the cyclist's lower leg already speak against the course of the incident, as described.

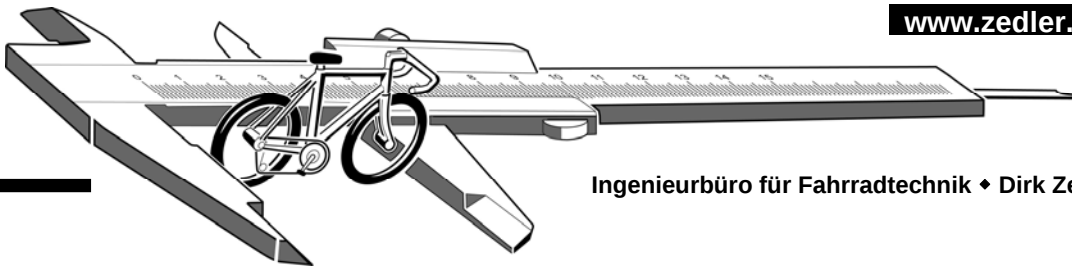
In the case of road racing bikes of the peloton, disc brakes are mounted to the left side of the bicycle. For reconstruction of the incident it has to be distinguished between a cyclist seated on the saddle as usual and a cyclist in a difficult situation for example slipped onto the top tube and seated there. In addition, it has to be considered whether the cyclist's click system cleat of the shoe was engaged with the step-in pedal or not.

The reconstruction of the most different accident scenarios documented by pictures has not shown any evidence suggesting how an injury on the cyclist's leg could have occurred in the area and shape, as documented, without a fall of the colliding cyclist (as reported).

Total number of pages of this expert's report	17
Number of pages with photos	8
Number of original photos included	16
Enclosures.....	0

Ludwigsburg, May 19, 2016

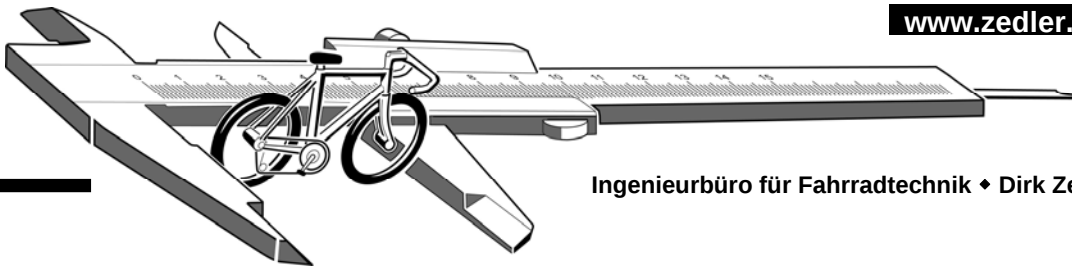
Dirk Zedler, graduate engineer



Photos 1 + 2



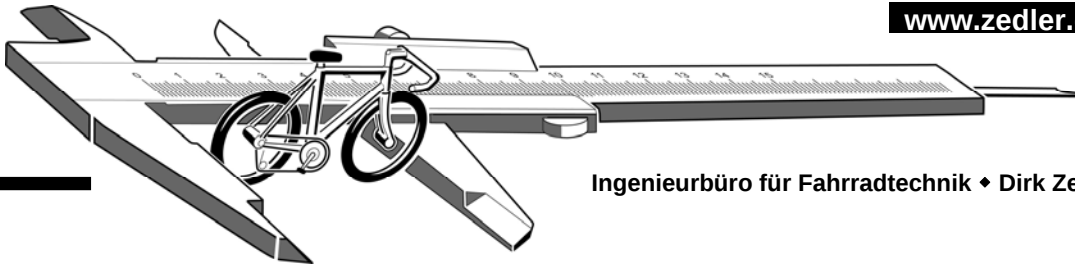
Note: The photos were taken with a digital camera. To achieve a better printing result, the photographs were adjusted, where needed, in terms of size, contrast, brightness and compression, before being printed.



Photos 3 + 4



Note: The photos were taken with a digital camera. To achieve a better printing result, the photographs were adjusted, where needed, in terms of size, contrast, brightness and compression, before being printed.

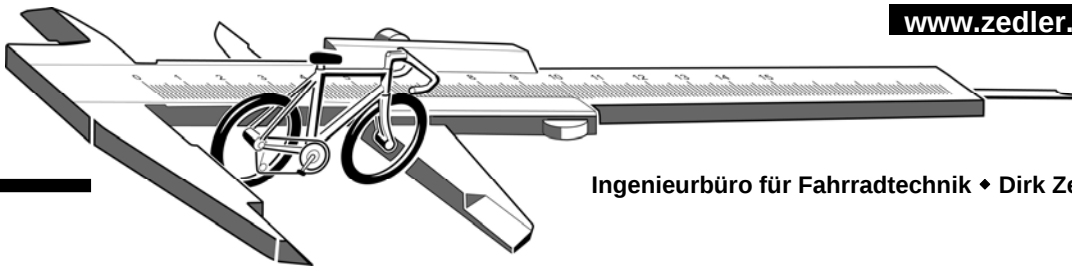


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Photos 5 + 6



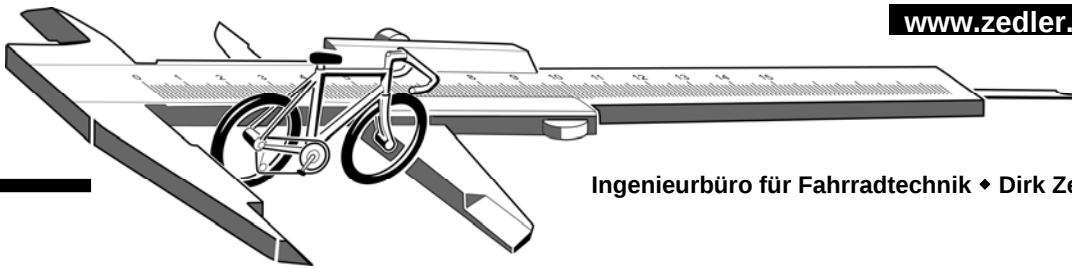
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Photos 7 + 8



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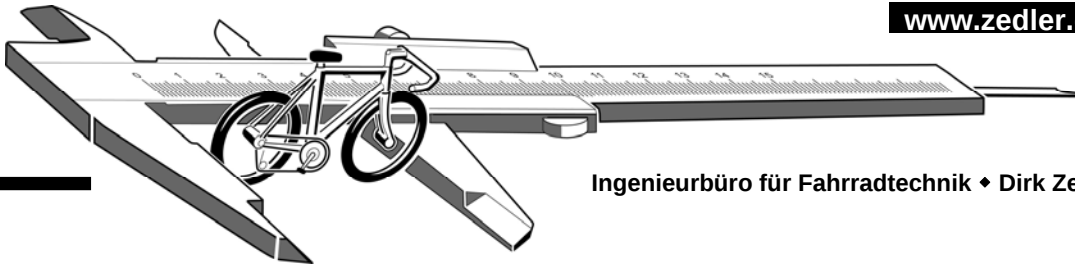


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Photos 9 + 10



Note: The photos were taken with a digital camera. To achieve a better printing result, the photographs were adjusted, where needed, in terms of size, contrast, brightness and compression, before being printed.

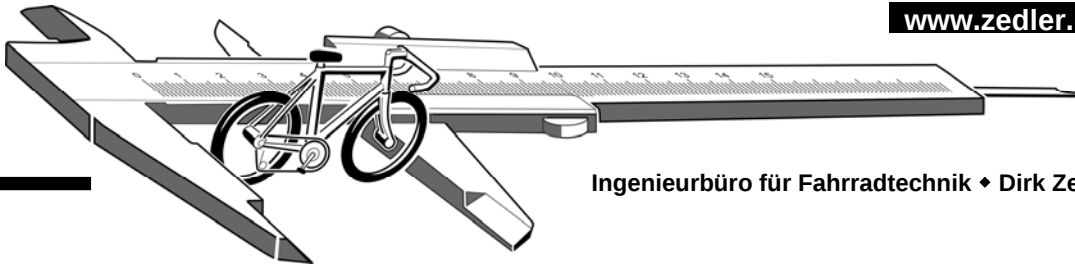


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Photos 11 + 12



Note: The photos were taken with a digital camera. To achieve a better printing result, the photographs were adjusted, where needed, in terms of size, contrast, brightness and compression, before being printed.

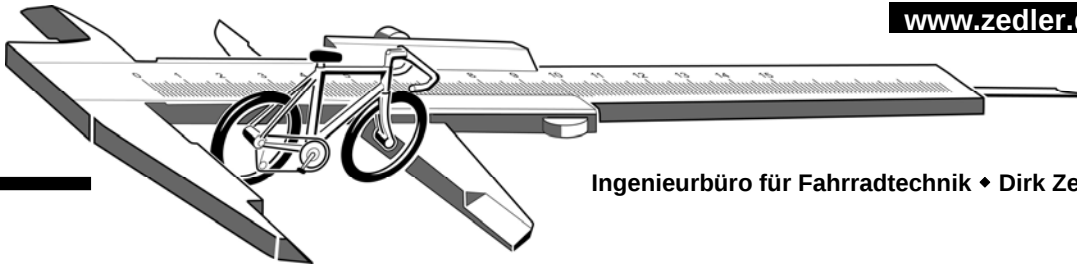


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Photos 13 + 14



Note: The photos were taken with a digital camera. To achieve a better printing result, the photographs were adjusted, where needed, in terms of size, contrast, brightness and compression, before being printed.



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Photos 15 + 16



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