



zedler-Institut
Technology and Passion for Bicycles

TESTING SERVICES
Performance



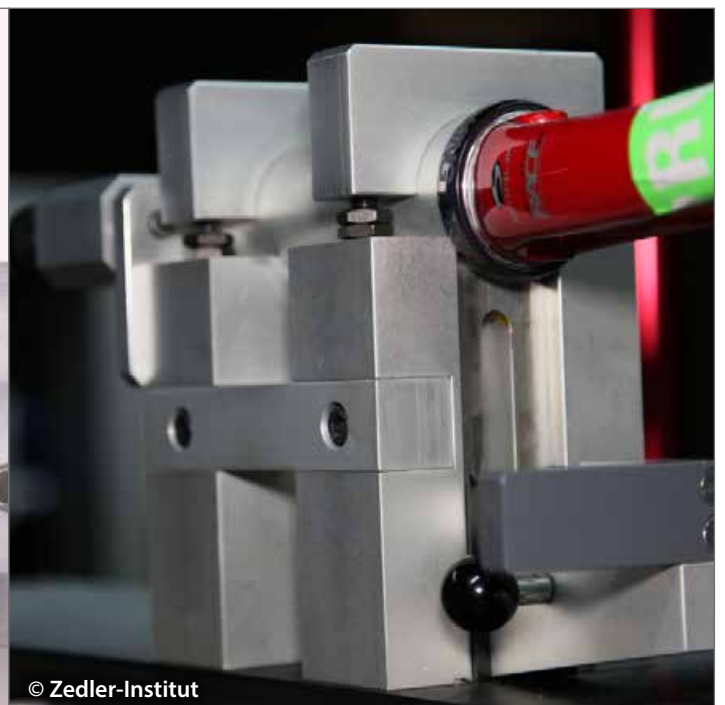
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**BICYCLE TESTING TECHNOLOGY
FOR MORE THAN 20 YEARS**

TESTING SERVICES | PORTFOLIO



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DEAR CUSTOMER,

Thanks a lot for your interest in Zedler testing services.

With precise, innovative and reliable testing systems we provide tailor-made solutions for nearly any testing tasks in state-of-the-art mechanical testing of bicycles and bicycle components. For many years, we have been one of the leading suppliers of testing services and systems that you can find in the testing laboratories of the trend-setting bicycle manufacturers and magazines.

The testings of our **PERFORMANCE series** are mainly designed to test bicycle frames, forks and components for **stiffness** and **geometry**. They allow **precise statements about the riding behaviour without time consuming assembly and test rides** in different terrains.

Measurement results of the **PERFORMANCE testing systems series** put into numbers riding characteristics of bicycles and their components. You cannot only measure the frameset's resistance to **dangerous wobbling during a fast ride or the swaying of trekking bikes under load**, but also the bottom bracket stiffness to entirely convert the **rider's power during strong pedalling into propulsion**. The **comfort** that characterizes the frame and the fork is measured in millimetres of the spring travel. The tests of the **lateral wheel and fork stiffness** not only indicate whether the brake pads of bicycles with rim brakes drag along the rim, but also whether the **front wheel directly responds to the rider's steering pulse**. Due to the faster moved e-bikes/pedelecs, the criteria of active driving safety, the bicycle performance, are increasingly important beyond the field of sports bicycles. With our stiffness measurements you are in a position to check whether the **quality of a fabrication batch** of carbon components fully complies with your specifications and to get an idea of the deviations.

The testings of the **PERFORMANCE series** deliver accurate and thus absolutely comparable **measurements that even Europe's leading bicycle magazines take as basis for evaluation**. We are proud to report that the values obtained on our machines are often taken as reference values.

I am absolutely confident that our testing results will be a valuable support in the development of your products and wish you good luck and success. I welcome your feedback. Feel free to send us your inquiries, improvement suggestions or criticism.



Dirk Zedler, graduate engineer
Managing Director



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FRANK LEYRER | Head of Testing Systems

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NORMAN THALHEIMER | Test Engineer

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JULIUS WEIMANN | Test Engineer

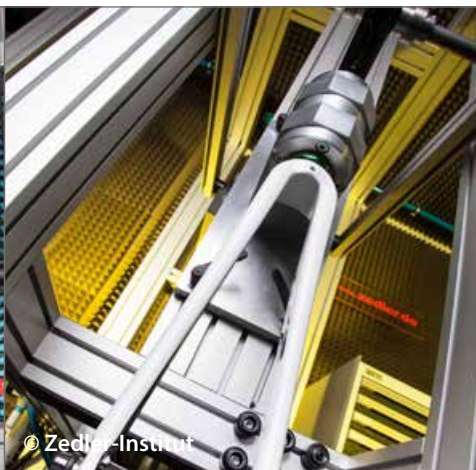
FURTHER TESTING SERVICES – SAFETY AND QUALITY:

Besides the PERFORMANCE tests we offer further testing services in our laboratory:

- ▶ Framesets, bicycle assemblies and individual components can be tested with regard to overload, impact strength as well as fatigue behaviour.
The newly developed bicycle testing systems simulate typical riding situations, special events and foreseeable inappropriate use and misuse in realistic clamping.
- ▶ To determine reasonable torque values and mounting specifications for assemblies instead of relying upon the instructions of the screw manufacturers, is a first, very important step towards the minimization of failures in service.
Further examinations and measurements comprise the entire field of “precision” and “bicycle fit” as well as coating tests and functional tests.

TESTING SYSTEMS – SALE:

We not only offer testing services in our company own testing laboratory in Ludwigsburg, but also supply the testing systems.



ZEDLER TESTING SERVICES | PERFORMANCE

The classical **Zedler-portfolio of PERFORMANCE testing** comprises several **static testing methods**.

These are to determine

- ▶ the **stiffnesses**
- ▶ the **geometry**
- ▶ the **stiffness-to-weight factor (STW)**

In addition, there are five **PERFORMANCE-packages for frames and framesets**

- ▶ PERFORMANCE-package mountain bike (frame, frameset)
- ▶ PERFORMANCE-package road bike frame
- ▶ PERFORMANCE-package road bike frameset
- ▶ PERFORMANCE-package trekking bike frame
- ▶ PERFORMANCE-package trekking bike frameset

01



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TESTING **LKS** | Head tube stiffness

02



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TESTING **STW** | Geometry

03



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TESTING **TLS II** | BB stiffness

04



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TESTING **KOM** | Comfort stiffness

05



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TESTING **GST** | Fork stiffness

06



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TESTING **KST** | Crank stiffness

07



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TESTING **LRS II** | Wheel

ZEDLER TESTING SERVICES | PERFORMANCE

In the past years the **Zedler institute** developed **NEW** static **PERFORMANCE** testing methods.
These are to determine

- ▶ the **stiffnesses** especially for e-bikes (pedelecs, EPAC) and full-suspension mountain bikes
- ▶ the **geometry and wheel-load distribution**
- ▶ the **spring characteristic curves**
- ▶ the **wheel trajectory curve**

In addition, there are two new **PERFORMANCE**-packages for frames and framesets

- ▶ **PERFORMANCE**-package frame full-suspension MTB
- ▶ **PERFORMANCE**-package frameset full-suspension MTB
- ▶ **PERFORMANCE**-package pedelec and S-pedelec



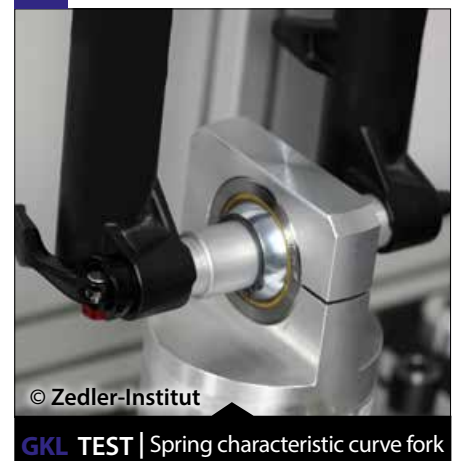
08



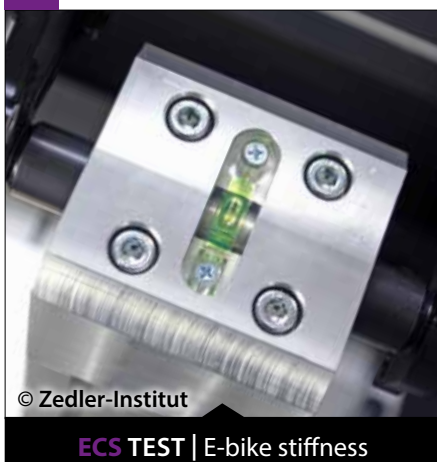
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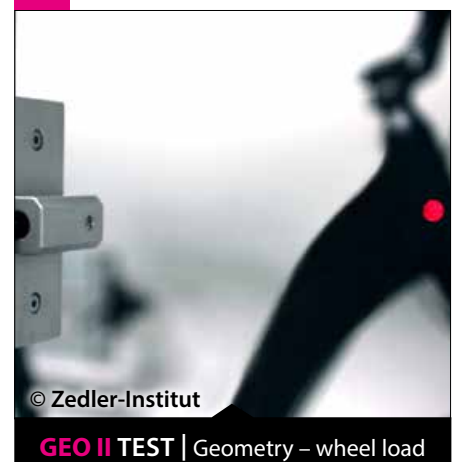
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12



13



TESTING SERVICES LKS | Head tube stiffness



TO DETERMINE

- ▶ the head tube stiffness of bicycle frames (riding stability) according to the standard of the German magazines BIKE, TOUR and Trekkingbike

COMPATIBILITY

- ▶ All bicycle frames of different wheel bases with all standard rear wheel axle systems (MTB, road bike, city/trekking and e-bike/pedelec)

PRECONDITIONS

- ▶ **Every** frame to be tested must be at standard height (in the case of road bike 57 cm, trekking bike 20" - 51 cm, mountain bike 19"). Headset, clamp mechanism, saddle clamp, derailleur hanger and front derailleur mount **must** be supplied.

TESTING SERVICES LKS



01

TESTING SERVICES STW | Stiffness-To-Weight Factor



TO DETERMINE

- ▶ the head tube stiffness of bicycle frames (riding stability) according to the standard of the German magazines BIKE, TOUR and Trekkingbike
- ▶ the STW-factor (stiffness-to-weight)
- ▶ the standardized weight

COMPATIBILITY

- ▶ All bicycle frames of different wheel bases with all standard rear wheel axle systems (MTB, road bike, city/trekking and e-bike/pedelec)

PRECONDITIONS

- ▶ **Every** frame to be tested must be at standard height (in the case of road bike 57 cm, trekking bike 20" - 51 cm, mountain bike 19"). Headset, clamp mechanism, saddle clamp, derailleur hanger and front derailleur mount **must** be supplied, as they are of major importance for the determination of the STW and the frameset weight, because they are included in the frameset weight.

TESTING SERVICES STW



02

TESTING SERVICES TLS II | BB stiffness



TO DETERMINE

- ▶ the bottom bracket stiffness of frame-sets (power transmission) according to the standard of the German magazine TOUR
- ▶ the system stiffness of frameset, cranks and bottom bracket

COMPATIBILITY

- ▶ All bicycle frames of different wheel bases with all standard rear wheel axle systems (MTB, road bike, city/trekking and e-bike/pedelec)

PRECONDITIONS

- ▶ **Every** frame with fork to be tested must be at standard height (in the case of road bike 57 cm, trekking bike 20" - 51 cm, mountain bike 19"). Headset, clamp mechanism, saddle clamp, derailleur hanger and front derailleur mount **must** be supplied.

TESTING SERVICES TLS II



TESTING SERVICES | Comfort stiffness



TO DETERMINE

- ▶ the comfort stiffness (frame comfort) of bicycle frames according to the standard of the German magazines BIKE, TOUR and Trekkingbike
- ▶ the influence of the seat post on the riding comfort

TO DETERMINE

- ▶ Bicycle frames of different wheel bases without suspension with all standard rear wheel axle systems (MTB, road bike, city/trekking and e-bike/pedelec)

TESTING SERVICES KOM



04

PRECONDITIONS

- ▶ **Every** frame with fork to be tested must be at standard height (in the case of road bike 57 cm, trekking bike 20" - 51 cm, mountain bike 19"). Headset, clamp mechanism, saddle clamp, derailleur hanger and front derailleur mount **must** be supplied.
- ▶ If a seat post is included in the delivery of the manufacturer, it should be supplied, because it has an influence on the measurement result. In case it is not supplied, a standard seat post will be used.

TESTING SERVICES GST | Fork stiffness



TO DETERMINE

- ▶ the
 - brake stiffness,
 - lateral stiffness and
 - jump stiffness (comfort fork)as well as
- ▶ the standardized weight of the fork according to the standard of the German magazines BIKE, TOUR and Trekkingbike

COMPATIBILITY

- ▶ for steerer tube diameters
 - 1" - 1"
 - 1 1/8" - 1 1/8"
 - 1 1/8" - 1 1/4"
 - 1 1/8" - 1.5"
 - 1.5" - 1.5"as well as special dimensions

TESTING SERVICES GST



05

PRECONDITIONS

- ▶ A fork to be tested must have a fork steerer length of 225 mm at least. For the test the steerer tube should be cut to a length of 225 mm.
- ▶ In addition, we need the serial-production expander/the adjustment device including cap.

TESTING SERVICES KST | Crank stiffness



TO DETERMINE

- ▶ the crank and BB stiffness (cranks with bearings at all lengths) according to the standard of the German magazines BIKE, TOUR and Trekkingbike

COMPATIBILITY

- ▶ BB standards BSC/BSA and BB30

PRECONDITIONS

- ▶ The crankset to be tested must include the chainrings and the BB (with BSC/BSA thread or BB-30 standard) that are intended to be assembled together; the indication of the torque values for the bearing cups and the crank bolts is also necessary.

TESTING SERVICES KST



TESTING SERVICES LRS II | Wheel



TO DETERMINE

- ▶ the wheel stiffnesses at the wheel contact point and on top
- ▶ the wheel overload behaviour
- ▶ the wheel strength according to EN 15194 (pedelec) or according to ISO 4210 (road, city/trekking, mountain bike) and ISO 8098 (children's bicycles)

COMPATIBILITY

- ▶ Wheels with quick-release or 10-mm-axle with mounting widths from 95 to 140 mm and ETRTO wheel sizes from 540 mm (24") to 622/630 mm (28", 27" and 29")
- ▶ Wheels with thru-axle systems of all standards in the front and rear
- ▶ Wheels for e-bike and pedelec systems

PRECONDITIONS

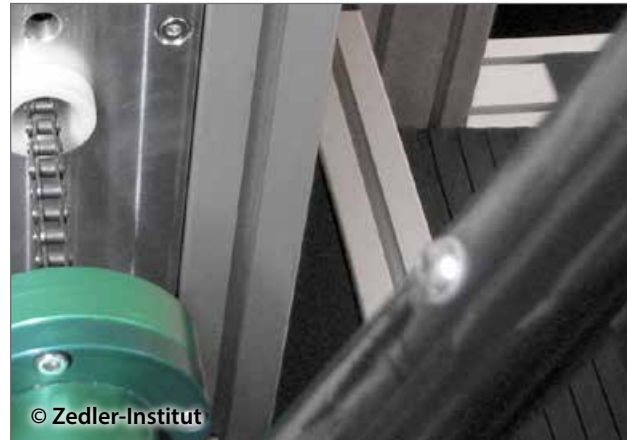
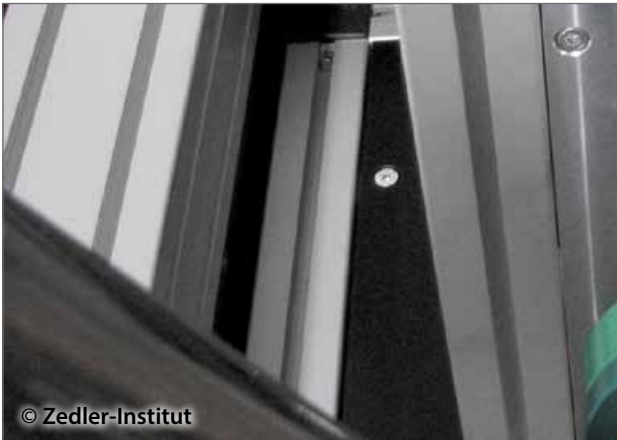
- ▶ It is recommended that the rear wheel is supplied, as it is more critical in general. Exception: Front wheels with radial lacing, disc brake wheels.

TESTING SERVICES LRS II



07

TESTING SERVICES BCS | Central stiffness



TO DETERMINE

- ▶ the central stiffness of full-suspension bicycle frames (riding stability and steering precision)

COMPATIBILITY

- ▶ All bicycle frames of different wheel bases with all standard rear wheel axle systems (MTB, road bike, city/trekking and e-bike/pedelec)

PRECONDITIONS

- ▶ **The** frame to be tested must be at standard height (in the case of road bike 57 cm, trekking bike 20" - 51 cm, mountain bike 19"). Headset, clamp mechanism, saddle clamp, derailleur hanger, front derailleur mount and thru axles **must** be supplied.
- ▶ If you want the fork to be tested, as well, please make it available including the thru axle or the quick-release.
- ▶ If you want various wheels to be tested, as well, please make them available.

TESTING SERVICES BCS



08



08



TO DETERMINE

- ▶ the spring characteristic curve of the frame and
- ▶ the wheel trajectory curve of full-suspension bicycle frames

COMPATIBILITY

- ▶ All full-suspension bicycle frames of different wheel bases with all standard rear wheel axle systems (MTB, city/trekking and e-bike/pedelec)

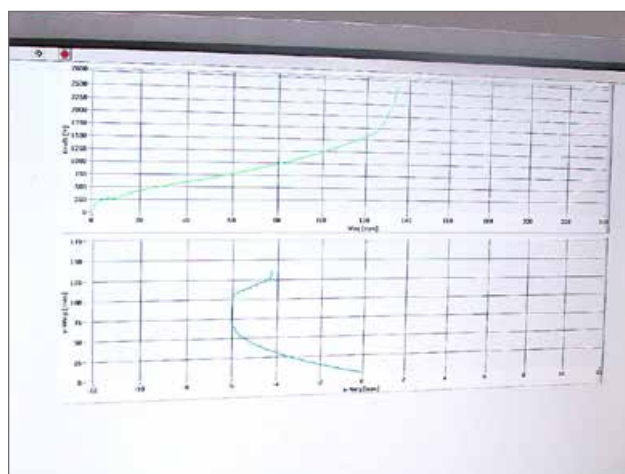
PRECONDITIONS

- ▶ **The** frame to be tested must be at standard height (mountain bike 19", e-bike, trekking bike 20" - 51 cm). Headset, clamp mechanism, saddle clamp, derailleur hanger and front derailleur mount **must** be supplied.

TESTING SERVICES FKL



09



09

TESTING SERVICES GKL | Spring characteristic curve fork



TO DETERMINE

- ▶ the spring characteristic curve of suspension forks

COMPATIBILITY

- ▶ All bicycle suspension forks

PRECONDITIONS

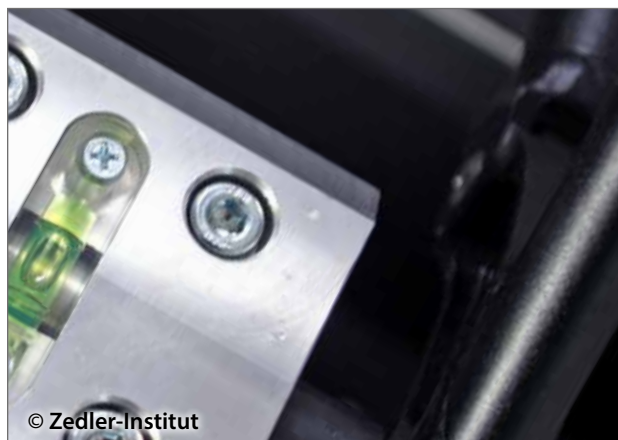
- ▶ The test requires the suspension fork including thru axle and pump.

TESTING SERVICES GKL



10

TESTING SERVICES ECS | E-bike stiffness



TO DETERMINE

- ▶ the central stiffness of pedelec and S-pedelec framesets (riding stability)

COMPATIBILITY

- ▶ All bicycle frames with forks of different wheel bases with all standard rear wheel axle systems (e-bike/pedelec, S-pedelec)

PRECONDITIONS

- ▶ The test requires the fully assembled bicycle at standard height (pedelec, S-pedelec 20"/51cm).

TESTING SERVICES ECS



11



11

TESTING SERVICES CST | Pannier rack stiffness



TO DETERMINE

- ▶ the stiffness of the pannier rack separately or mounted to the bicycle frame (riding stability)

COMPATIBILITY

- ▶ All bicycle frames of different wheel bases with pannier rack with all standard rear wheel axle systems (city/trekking bike and e-bike/pedelec)

PRECONDITIONS

- ▶ The test requires either the frame including mounted pannier rack or the pannier rack with all add-on parts.

TESTING SERVICES CST



12

TESTING SERVICES GEO II | Geometry – wheel load



TO DETERMINE

- ▶ the wheel loads without and with rider
- ▶ the centre of gravity position of the rechargeable battery
- ▶ the geometry of the wheel

COMPATIBILITY

- ▶ almost without limitations (excl. tandems)

PRECONDITIONS

- ▶ The test requires a pedelec or bicycle ready-for-use.

TESTING SERVICES GEO II



13

PERFORMANCE-PACKAGE | Mountain bike frame



TO DETERMINE

- ▶ the head tube and the BB stiffness, the comfort and the STW of the frame according to the standard of the German magazine BIKE – DAS MOUNTAINBIKE-MAGAZIN EUROPAS NR. 1

COMPATIBILITY

- ▶ MTB hardtail frames of different wheel bases with all standard rear wheel axle systems
- ▶ Full-suspension frames only LKS + TLS II possible

PRECONDITIONS

- ▶ **Every** frame with fork to be tested must be at standard height (MTB 19"). Head-set, clamp mechanism, saddle clamp and derailleur hanger **must** be supplied.
- ▶ If a seat post is included in the delivery of the manufacturer, it should be supplied, because it has an influence on the measurement result. In case it is not supplied, a standard seat post will be used.

PERFORMANCE-PACKAGE | Full-suspension frameset



TO DETERMINE

- ▶ the head tube and the BCS-stiffness,
- ▶ the spring characteristic curve of the rear frame and
- ▶ the wheel trajectory curve

COMPATIBILITY

- ▶ MTB full-suspension frames of different wheel bases with all standard rear wheel axle systems and kinematics

PRECONDITIONS

- ▶ **The** frame with fork to be tested must be at standard height (MTB 19"). Head-set, clamp mechanism, saddle clamp, derailleur hanger and thru axles **must** be supplied.

PERFORMANCE-PACKAGE | Full-suspension frameset



TO DETERMINE

- ▶ the head tube and the BCS-stiffness,
- ▶ the spring characteristic curve of the suspension fork and the rear frame and
- ▶ the wheel trajectory curve.

COMPATIBILITY

- ▶ MTB full-suspension frame including suspension fork of different wheel bases with all standard axle systems and kinematics

PRECONDITIONS

- ▶ **Every** frame with fork to be tested must be at standard height (MTB 19"). Head-set, clamp mechanism, saddle clamp, derailleur hanger and thru axle **must** be supplied.
- ▶ The test requires a suitable fork.
- ▶ In addition, we need the serial-production expander/the adjustment device including cap.

PERFORMANCE-PACKAGE | Road bike frame



TO DETERMINE

- ▶ the head tube and the BB stiffness, the comfort and the STW of the frame according to the standard of the German magazine TOUR - EUROPAS RENN RAD MAGAZIN NR. 1

COMPATIBILITY

- ▶ Bicycle frames of different wheel bases (cross bike, road bike, triathlon/time trial bike)

PRECONDITIONS

- ▶ **Every** frame with fork to be tested must be at standard height (in the case of road bike 57 cm, cross bike 57 cm, in the case of triathlon/time trial bike accordingly). Headset, clamp mechanism, saddle clamp, derailleur hanger and front derailleur mount **must** be supplied.
- ▶ If a seat post is included in the delivery of the manufacturer, it should be supplied, because it has an influence on the measurement result. In case it is not supplied, a standard seat post will be used.

PERFORMANCE-PACKAGE | Road bike frameset



TO DETERMINE

- ▶ the head tube and the BB stiffness, the comfort and the STW of the frame according to the standard of the German magazine TOUR - EUROPAS RENN RAD MAGAZIN NR. 1
- ▶ the brake and the jump stiffness (comfort) and the lateral stiffness of the fork according to the standard of the German magazine TOUR - EUROPAS RENN RAD MAGAZIN NR. 1

COMPATIBILITY

- ▶ Bicycle frames of different wheel bases (cross bike, road bike, triathlon/time trial bike)
- ▶ for steerer tube diameters
 - 1" - 1"
 - 1 1/8" - 1 1/8"
 - 1 1/8" - 1 1/4"
 - 1 1/8" - 1.5"
 - 1.5" - 1.5"
- as well as special dimensions

PRECONDITIONS

- ▶ **Every** frame with fork to be tested must be at standard height (in the case of road bike 57 cm, cross bike 57 cm, in the case of triathlon/time trial bike accordingly). Headset, clamp mechanism, saddle clamp, derailleur hanger and front derailleur mount **must** be supplied.
- ▶ If a seat post is included in the delivery of the manufacturer, it should be supplied, because it has an influence on the measurement result. In case it is not supplied, a standard seat post will be used.
- ▶ A fork to be tested must have a fork steerer length of 225 mm at least.
- ▶ In addition, we need the serial-production expander/the adjustment device including cap. For the test the steerer tube length should be cut to a length of 225 mm.

PERFORMANCE-PACKAGE | Trekking bike frame



TO DETERMINE

- ▶ the head tube and the BB stiffness, the comfort and the STW of the frame according to the standard of the German magazine Trekkingbike – DAS FAHR-RADMAGAZIN

COMPATIBILITY

- ▶ Bicycle frames of different wheel bases with all standard rear wheel axle systems (city and trekking bike and e-bike/pedelec)

PRECONDITIONS

- ▶ **Every** frame with fork to be tested must be at standard height (city and trekking bike, e-bike/pedelec 20" - 51 cm). Headset, clamp mechanism, saddle clamp and derailleur hanger **must** be supplied.
- ▶ If a seat post is included in the delivery of the manufacturer, it should be supplied, because it has an influence on the measurement result. In case it is not supplied, a standard seat post will be used.

PERFORMANCE-PACKAGE | Trekking bike frameset



TO DETERMINE

- ▶ the head tube and the BB stiffness, the comfort and the STW of the frame according to the standard of the German magazine Trekkingbike – DAS FAHR-RADMAGAZIN
- ▶ the brake and the jump stiffness (comfort) and the lateral stiffness of the fork according to the standard of the German magazine Trekkingbike - DAS FAHRRADMAGAZIN

COMPATIBILITY

- ▶ Bicycle frames of different wheel bases with all standard rear wheel axle systems (city/trekking bike and e-bike/pedelec)
- ▶ for steerer tube diameters
 - 1" - 1"
 - 1 1/8" - 1 1/8"
 - 1 1/8" - 1 1/4"
 - 1 1/8" - 1.5"
 - 1.5" - 1.5"
- as well as special dimensions

PRECONDITIONS

- ▶ **Every** frame with fork to be tested must be at standard height (city and trekking bike, e-bike/pedelec 20" - 51 cm). Headset, clamp mechanism, saddle clamp and derailleur hanger **must** be supplied.
- ▶ If a seat post is included in the delivery of the manufacturer, it should be supplied, because it has an influence on the measurement result. In case it is not supplied, a standard seat post will be used.
- ▶ A fork to be tested must have a fork steerer length of 225 mm at least. In addition, we need the serial-production expander/the adjustment device including cap. For the test the steerer tube length should be cut to a length of 225 mm.

PERFORMANCE-PACKAGE | Pedelec frameset



TO DETERMINE

- ▶ the head tube stiffness
- ▶ the central stiffness
- ▶ the pannier rack stiffness
- ▶ the wheel load
- ▶ the centre of gravity of the rechargeable battery

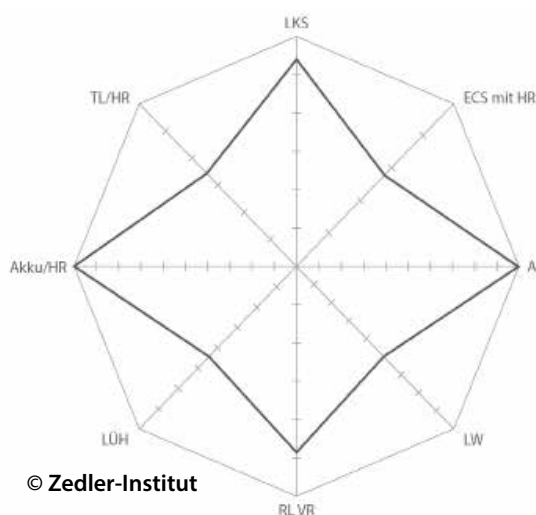
COMPATIBILITY

- ▶ Complete pedelecs and S-pedelecs of different wheel bases with all standard axle systems (city/trekking bike, e-bike/pedelec)

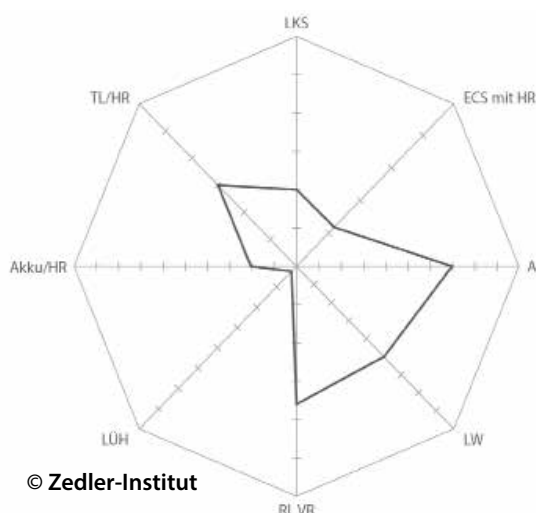
PRECONDITIONS

- ▶ The test requires the fully assembled and ready-for-use pedelec at standard height (e-bike/pedelec, 20"/51cm).

STABLE PEDELEC



SEVERELY WOBBLING PEDELEC



ZEDLER TESTING SERVICES | PERFORMANCE

TEST PROCEDURE

The tests are performed in the elastic range and therefore non destructive. The products can be reused after the test.

DURATION OF THE TESTING SERVICES

In general, PERFORMANCE tests will be performed within five working days. Please place your testing order in good time.

Rush orders including delivery of the results within 48 hours, will be invoiced at an extra charge of **25 %**.

Instant orders of PERFORMANCE testings, when the component is supplied and collected directly, will be invoiced at an extra charge of **50 %**. In these cases the results will be supplied by email directly following the measurements.

Please get in touch with us to discuss the details!

PRICING

The prices mentioned for the individual testings and PERFORMANCE-packages are inclusive of expendable items, however exclusive of VAT, in case of collection by the customer.

If delivered within Germany, we permit ourselves to charge dispatch costs at € 15.00 per package. For deliveries abroad please get in touch with us.

Further counselling interviews which go beyond the standard tests and aim e.g. at a product optimization are charged at an hourly rate of € 125.00 for an engineer and € 250.00 for the managing director.

We permit ourselves to charge customers we have no current business relation with an advance payment in full.

VOLUME DISCOUNTS

Please note our sales-related quantity discount for the PERFORMANCE, SAFETY and QUALITY testing services:

As soon as the tests ordered by you per calendar year exceed the below-mentioned amount for all three testing service fields, a volume discount on the total amount achieved shall be granted retrospectively. That means the price for the next test order in the subsequent year will be reduced by this discount.

From a test volume of

- 5,000.00 Euro net we allow a 5 % discount
- 10,000.00 Euro net we allow a 10 % discount
- 15,000.00 Euro net we allow a 15 % discount
- 20,000.00 Euro net we allow a 20 % discount
- 25,000.00 Euro net we allow a 25 % discount
- 30,000.00 Euro net we allow a discount as agreed.

The prices are valid from 06/2020.

All testing orders are settled according to the enclosed General Terms and Order Conditions of Zedler – Institut für Fahrradtechnik und -Sicherheit GmbH.

WHAT HAPPENS TO THE TEST PIECES

In principle, all units under test are returned to the customer.

The customer is obliged to store or file the respective test piece after it has been returned by Zedler Institut GmbH for a period of time of **eleven years** at least in view or preserving evidence. All disadvantages that arise from the infringement of the obligation to store shall be at the expense of the principal.

YOUR TEAM OF

Zedler – Institut für Fahrradtechnik und -Sicherheit GmbH



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DIRK ZEDLER | Geschäftsführer

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zedler-Institut
Technology and Passion for Bicycles