



# HYBRID MTB LIGHT SUPPORT BUILT TO ADVANCE

1

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**EXECUTIVE  
SUMMARY**

P. 4

2

---

**HYBRID  
UPBUILT**

P. 9

3

---

**HYBRID  
MTB LS**

P. 11

4

---

**HYBRID MTB LS  
COMPONENTS**

P. 14

5

---

**THE LAB  
TESTING**

P. 23

6

---

**TESTIMONIALS  
EVOLUTION**

P. 29

7

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**THE RANGE  
BUILT TO  
ADVANCE**

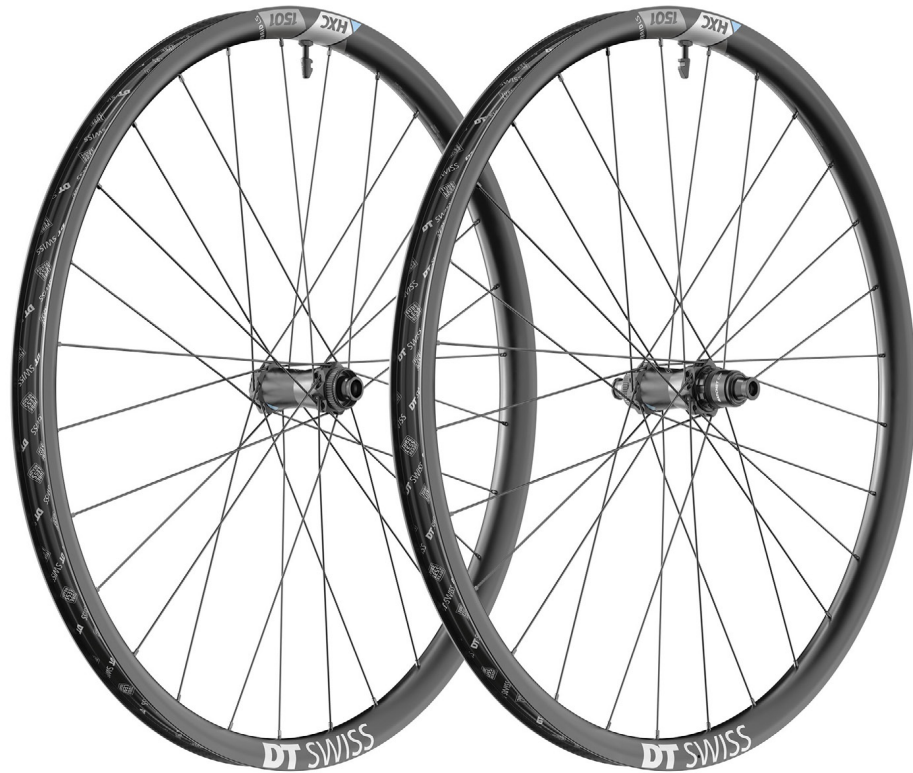
P. 33

8

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**APPENDIX**

P. 36



**HXC 1501 Spline® ONE LS**



**HX 1700 Spline® LS**

1

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# EXECUTIVE SUMMARY







**DT SWISS**

# ABSTRACT

The latest generation of light eMTBs aims for an advanced riding feel and therefore combines the agility of a MTB with the support of the classic eMTB. Smaller motors make for a light system weight.

To ensure the best possible performance, DT Swiss had a close look at the new light eMTB requirements and realized that the loads and torques still exceed the MTB ones, although the system weight remains almost the same.

The admission of a lower system weight opens up new possibilities for DT Swiss wheel engineers to combine the durability of our Hybrid MTB wheels with the well-known light weight of DT Swiss products.

The Hybrid MTB LS wheels are Built to Advance, featuring upgraded components specifically developed for motors with a lower average torque output, without compromising the weight and therefore the agility a lighter wheelset provides while riding.





# HXC 1501 SPLINE ONE LS FEATURES

## **BUILT TO ADVANCE**

The HXC 1501 SPLINE ONE LS wheels were developed to provide ultimate agility while riding light eMTBs, with an approved maximum system weight of 130 kg at ASTM F2043 Condition 4.

## **AGILE CARBON RIM**

A combination between low weight and resistance, ready to go faster in the ups and the downs. Available in 29" and 27,5", both with 30 mm internal width.

## **REFINED HYBRID SPOKES**

The spoke development has also advanced; the HXC 1501 SPLINE ONE LS features resistant yet lightweight spokes with a specific shape (2.15/1.8/2.0).

## **LIGHTER HYBRID HUB**

The 240 Hybrid LS hub features the Ratchet EXP OS, optimized for the requirements of an eMTB, with a bigger threaded ring containing a bigger bearing.





**DT** SWISS

# HX 1700 SPLINE LS FEATURES

## **BUILT TO ADVANCE**

The HX 1700 SPLINE LS wheels are built to provide enhanced riding agility for light eMTBs. They are approved for a maximum system weight of 130 kg at ASTM F2043 Condition 4.

## **AGILITY FOCUSED ALUMINUM RIMS**

To enable agile riding, the HX 1700 SPLINE features light yet resistant aluminum rims.

## **LIGHT, REINFORCED HYBRID SPOKES**

New Hybrid-specific spokes for an advanced riding experience, combining resistance and lightweight (2.15/2.0/2.0).

## **LIGHTER HYBRID HUB**

Built with the 350 Hybrid LS hub for enhanced reliability and contained weight. The well-known Ratchet System makes the load distribution uniform, providing lasting durability.



2

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HYBRID  
**UPBUILT**



**DT** SWISS

# HYBRID UPBUILT

Electric bikes and their uses are evolving and diversifying. At high altitude in the mountains, between the tape on a trail, climbing a steep mountain road or weaving between cars with loaded bags in town, the bikes and their expectations are not the same.

This expansion in the e-bike category requires an adaptation of the components. DT Swiss, a pioneer in the diversification of hybrid components, has upbuilt its Hybrid range.

Hybrid Upbuilt answers the new demands of users concerning their electric bikes.



3

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HYBRID  
**MTB LS**



**DT SWISS**

# HYBRID MTB LS

## BUILT TO ADVANCE

Built to advance. The Hybrid MTB LS mission was to develop a line tailored to the new, lighter eMTBs. Designed for riders who want to boost their experience and energize their speed on climbs, without having to compromise lighter weight and agility on descents.

This range delivers the right resistance for those fast & technical trails, with a contained weight for tighter turns and longer airtime.





# DEVELOPMENT CHALLENGES

DT Swiss' mission to provide riders with wheels adapted to their practice has not changed. The needs and the bikes have changed, which requires updated components, in order to be in harmony with the new constraints.

The new, lighter eMTBs are close to the weight of the classic MTBs, while being equipped with motors, and therefore cause higher torques and loads. This new, more versatile category therefore requires more versatile components as well. The compromise in the development of these wheels was to be able to offer ambitious riders wheels that are light enough for agile and sharp handling, yet strong enough for the toughest trails.

The Hybrid MTB LS wheels were developed and tested to certify a maximum system weight of 130 kg at ASTM category 4, built with lighter rims, spokes with lightly reinforced 2.15 mm heads and specific Hybrid LS adapted hubs.

4

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# **HYBRID MTB LS** COMPONENTS



## CARBON RIMS

### **HXC 1501 SPLINE ONE LS**

The ultimate model of the Hybrid MTB LS range is equipped with carbon rims with an internal width of 30 mm. These wheels provide outstanding agility due to their low weight, while being strong enough to provide lasting trust on each trail. Their agility allows them to quickly climb fast technical uphill and come back down on demanding lines that require dynamism from the rider and their bike.



## ALUMINUM RIMS

### **HX 1700 SPLINE LS**

These wheels are equipped with light, welded aluminum rims to suit characteristics of light eMTBs: agility and reliability. The emphasis was put on the lightness of the rim to allow riders increased riding agility for those fast line changings on trails.

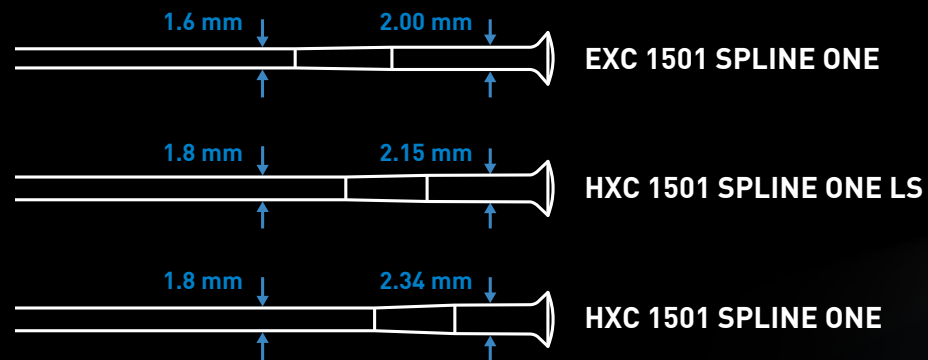


# BUILT TO ADVANCE LIGHTER SPOKES

With spokes thicker than those for MTBs, but thinner than those for eMTBs, the Hybrid MTB LS spokes ensure increased lateral and torsional stiffness compared to normal MTBs, without having a significant impact on the weight.

Increased lateral stiffness is better suited to the additional light eMTB loads, while the enhanced torsional stiffness enables more direct power transmission from the hub to the rim. Furthermore, each spoke is always loaded and unloaded during a wheel rotation.

The continuous loading and unloading leads to fatigue behavior of the spoke, which is improved by the thicker diameter.

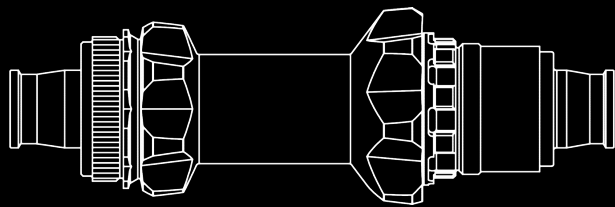
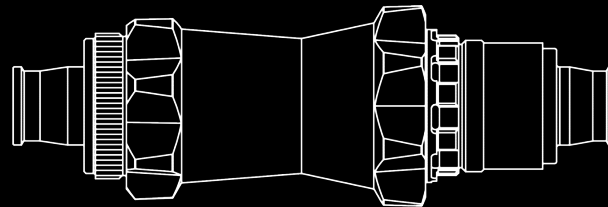
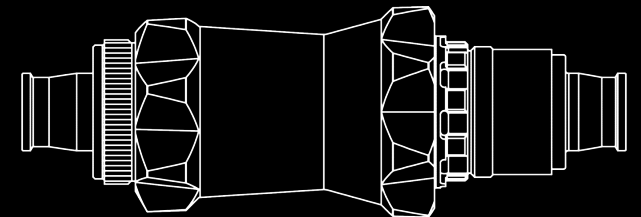




# BUILT TO ADVANCE ADAPTED HYBRID HUBS

Although the battery and motor are smaller, they still add extra weight compared to traditional MTBs. Lightweight eMTBs are often ridden the same way as traditional enduro bikes, adding extra loads to the components.

For these reasons, the hub body has been redesigned. It allows for increased resistance to higher drive torques from motors and heavier brakes torques from additional weight, increasing its reliability, without compromising its lightness.

**MTB****HYBRID MTB LS****HYBRID MTB**

# PURPOSE-BUILT RATCHET EXP OS BEARINGS

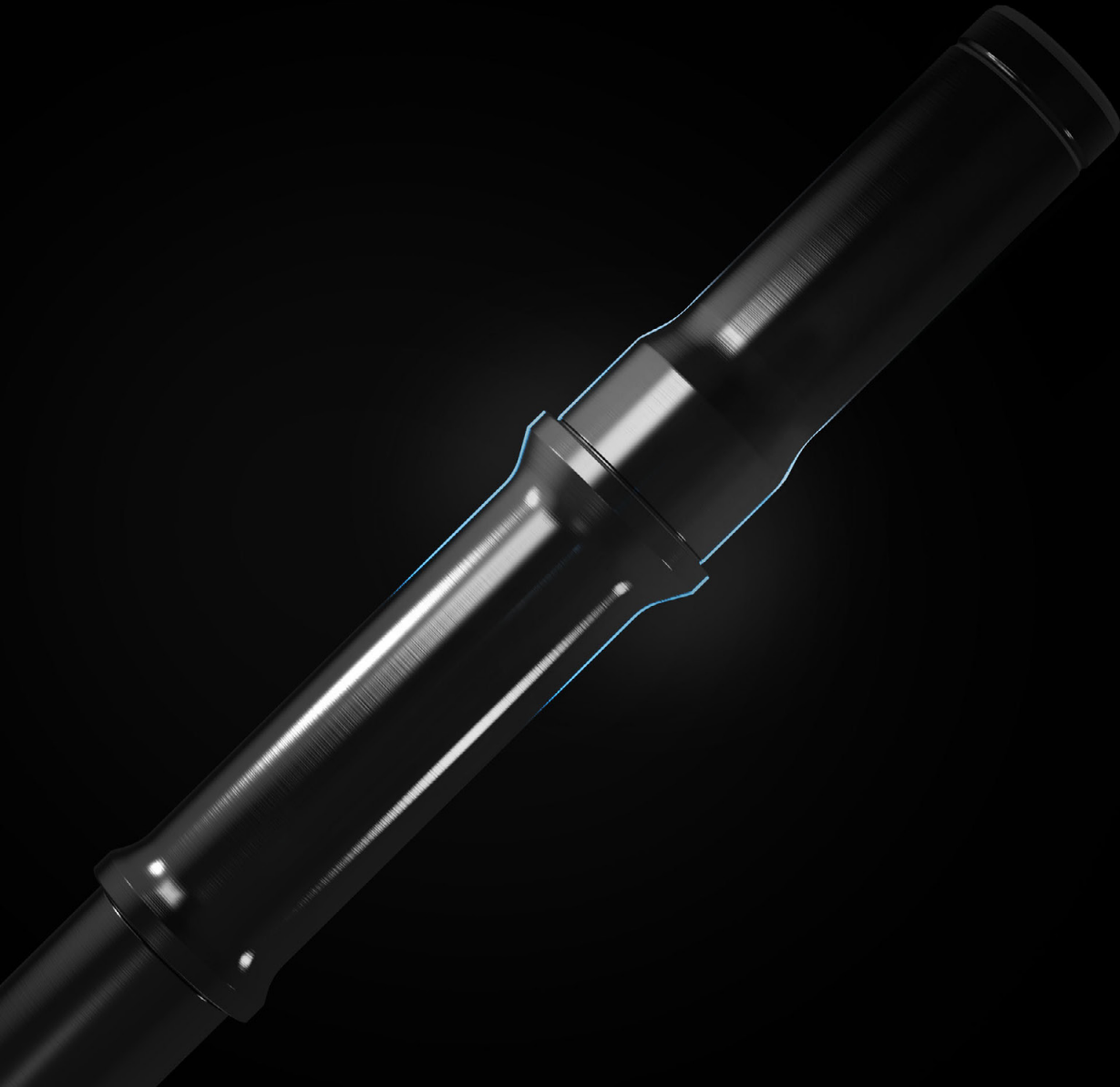
Grooved ball bearings are usually found in high-end bicycle hubs. These bearings are optimized to spin fast and absorb radial forces while still being able to take up a certain number of axial forces.

Bearing wear occurs when the forces on the balls or on the running surface are too high. The high local loads can lead to indentations in the running surface, which causes the balls to no longer run smoothly. Consequently, the wheel bearings will run roughly on the tread.

Excessive point loads can also lead to abrasion of the running surface, which can result in play.

To accommodate the higher loads, a 17x28x7 bearing is fitted instead of a 15x26x7 in the Ratchet EXP OS freehub system. These new bearings consist of more bearing balls which are also larger than the previous generation. These larger bearing balls distribute loads over a larger area of the running surface, whereby less wear occurs.





## PURPOSE-BUILT RATCHET EXP OS REINFORCED AXLE

For the redesign of the freehub system, the finite element method (FEM) was used to analyze the stress distribution on the axle during eMTB riding. Based on this analysis, the axle wall thickness was increased in the ball bearing area in order to cope with the higher bending loads. Following the FEM analysis, laboratory tests confirmed the expected improvements.

FEM makes it possible to optimize components by simulating the overall behavior of the structure under a specific load case. The result of the optimization is more uniform stress distribution and lower tension peaks under loads.

As a result of the adjustments, the axle is 18% stiffer compared to the previous Hybrid MTB axle, allowing for better resistance.

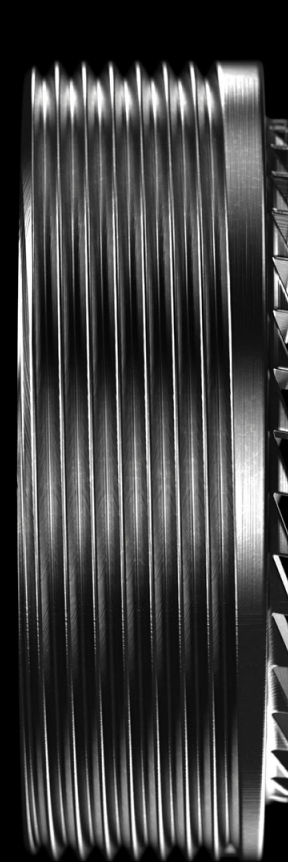


# PURPOSE-BUILT RATCHET EXP OS LARGER THREAD

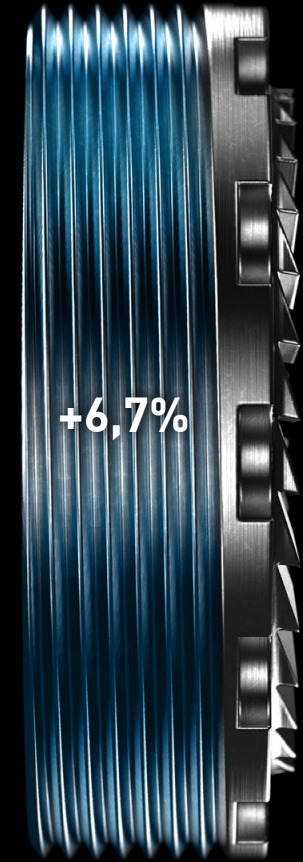
While the Ratchet EXP uses a M30 threaded ring, the Ratchet EXP OS features a M32 threaded ring. The threaded ring transmits the force coming from the freehub body to the hub shell. The diameter of the Ratchet EXP OS thread is 6.7% larger than the regular Ratchet EXP system thread, whereby the loads are distributed on a larger surface. This reduces the load peaks, which contributes to the longevity of the system and allows more torque to be transmitted.

Like the Ratchet EXP, the thread of the Ratchet EXP OS is double threaded. This means that the thread has two starts and two threads.

Due to the higher lead angle of the thread, the resistance to loosening is lower than with single-start threads. This simplifies maintenance when compared to single-start threads.



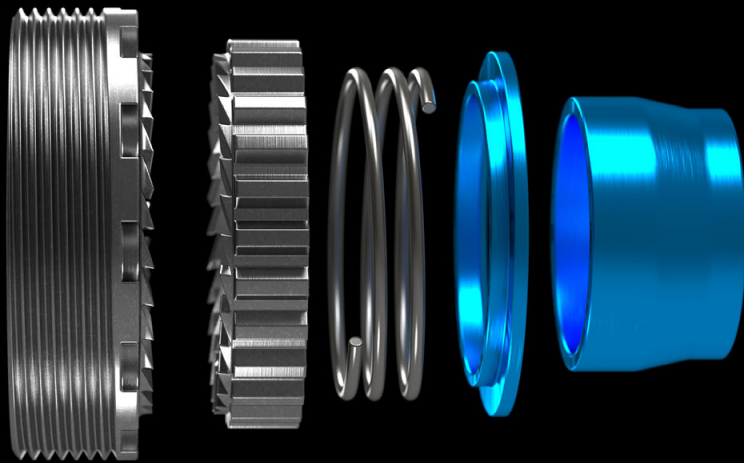
**RATCHET EXP**  
M30



**RATCHET EXP OS**  
M32

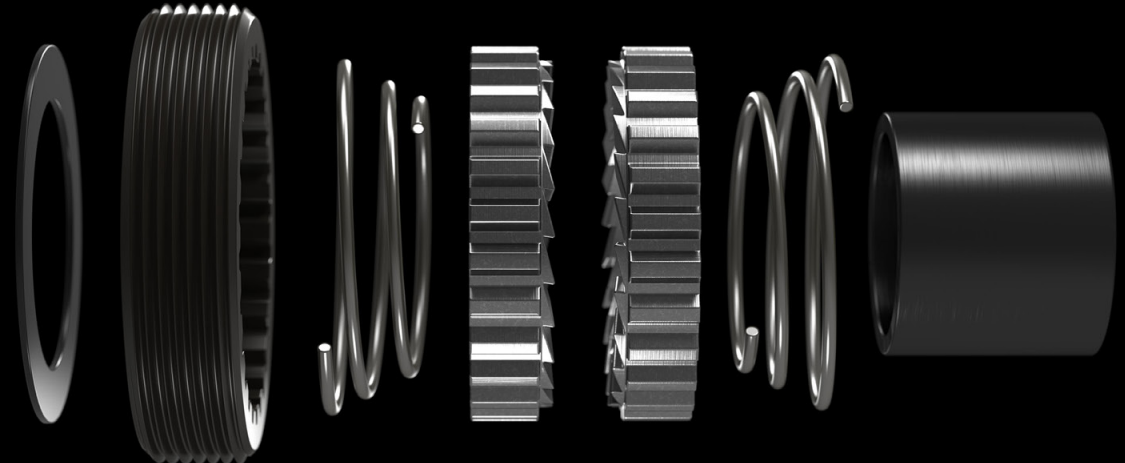
# HYBRID MTB LS RATCHET SYSTEMS

**HXC 1501** SPLINE ONE LS



**RATCHET** EXP OS

**HX 1700** SPLINE LS



**RATCHET**

5

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# THE LAB TESTING





**DT SWISS**

# EXTENDED TESTING CONFIDENT RIDING

With many years of experience, DT Swiss has great testing know-how.

Through a global network of specialists, DT Swiss has the ability to produce a large number of prototypes resulting in a clear advantage when it comes to laboratory testing.

These tests are conducted to replicate as closely as possible what the wheels will have to endure once in the field and in a whole life cycle.

Our testing facilities and methods reflect cutting edge technologies and are the key to ensure high safety and performance of our products. In addition, numerous long field tests are necessary to investigate the products under real world conditions.



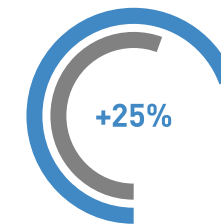
# EXTENDED TESTING WHEELS

Loads on light eMTBs tend to be higher as the system weight is generally higher than on a classic, non-motorized MTB. Additionally, these light eMTBs can allow riders to strongly accelerate without compromising downhill handling and therefore ride these bikes in a sporty manner, resulting in higher torques. Accordingly, DT Swiss has developed Hybrid-specific test requirements for a system weight of 130kg and ASTM F 2043 Condition 4.

The DT Swiss Hybrid MTB LS wheels must pass several tests, which are specified in the DT Swiss internal test standard. The applied test methods reflect higher loads and an increased quantity of load cycles compared to other wheels, in order to ensure sufficient strength and durability under demanding riding conditions.



**TEST WEIGHT ON  
HYBRID MTB LS WHEELS\***



**TEST DISTANCE FOR  
HYBRID MTB LS WHEELS\***

\*Compared to MTB testing



**DT SWISS**

# EXTENDED TESTING HUBS

Faster acceleration through the added motor causes higher driving torques. To slow down the higher system weight, braking results in higher brake torques.  
The increased mileage also leads to a higher amount of load cycles acting on the hub.

The new HYBRID MTB LS hubs are optimized for these specific requirements.



**BRAKE TORQUE FOR  
HYBRID MTB LS HUBS\***

\*Compared to MTB testing

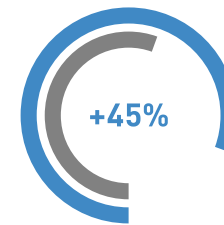


# EXTENDED TESTING SPOKES

A bicycle wheel in motion faces different load cases. For the spokes, the most common load is a tensile force. This force may vary from case to case, for example, for a single rotation of a wheel in use, each spoke will face different and changing tensile forces.

These increased loads on the spokes primarily occur due to higher radial forces on the wheel and higher drive and brake torques.

To face the specific higher requirements of a Hybrid wheel, the DT Swiss Hybrid spokes are reinforced at their head, resulting in a up to 45 % stronger tensile force resistant spoke compared to a classic MTB spoke.



**MAXIMUM SPOKE  
TENSILE FORCE\***

\*Compared to DT Competition Race



6

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# TESTIMONIALS

## EVOLUTION



## RIDER TESTIMONIAL

«The Hybrid MTB LS wheels are perfectly matched to the Light Hybrid requirements. They act, by the lower weight compared to full hybrid wheels, more agile and safer compared to ordinary wheels. This balance is reflected in the performance in jumps and off-road and conveys a handling like a classic enduro bike.

Technical trails turn out to be very grippy when up / downhill. This allows a precise line selection and great directional stability.»

**NICOLAS OMLIN**  
MTB RIDER

**DT SWISS**

# THE HYBRID REVOLUTION

«A few years have passed since the presentation of the first range of wheels for electric mountain bikes. Just like the bikes, the components have also evolved to more accurately match the new practices that emerge from this evolution. At DT Swiss, since day one our passion for eMTBs has been the driving force behind the technological advancements, aiming to adapt all users' wheels to their practice. Today, eMTB riding can be even more demanding for components than before. These new light eMTBs can provide downhill sensations close to classic mountain bikes due to their reduced weight, while still shortening the climbing time. The new Hybrid MTB LS wheels are designed for these new e-bikes, bringing high performance with lightness, agility and resistance to the higher eMTB loads.»

**DANIEL BERGER**  
CHIEF PRODUCT OFFICER







## THE HYBRID EVOLUTION

«Based on the already well-established high torque eMTB Hybrid wheels, we have taken into account the current development and diversification that is emerging in the eMTB sector. The exciting and, in our view, long-lasting trend of increasingly weight-reduced, light support eMTBs has played a significant role in the development of our latest eMTB wheels.

While our previous Hybrid MTB line is particularly focused on reliability under extremely high loads, Hybrid Light Support focuses on the interplay between agility and reliability, considering the increased torque by the additional motor.

The new range of hybrid MTB components brings quality, reliability and high performance to a new level, tailored to the needs of users, the different terrains and the eMTBs they use.»

### **NILS VERHOEVEN**

HEAD OF PRODUCT MANAGEMENT  
WHEELS & COMPONENTS

7

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**THE RANGE**  
BUILT TO  
ADVANCE

# HXC 1501 SPLINE® ONE LS

WHEELSIZE	27.5" / 650B & 29" / 700C
AXLE SYSTEM	15 x 110 mm Boost 12 x 148 mm Boost
HUB TYPE	240 HYBRID Straightpull hub with Ratchet EXP OS System
BRAKE INTERFACE	Center Lock
RIM	Carbon, tubeless ready
INNER WIDTH	30 mm
SPOKE NUMBER	28
SPOKES	DT hybrid 4 straightpull
NIPPLES	DT ProLock Squorx ProHead alu
WEIGHT	From 1691 g
MAX SYSTEMWEIGHT	130 kg
ASTM CLASS	4
PRICE	From 1668.80 € / 1446.20 \$



**PRODUCT PAGE** [available from July 13th, 2022]

[www.dtswiss.com/en/wheels/wheels-mtb/hybrid-mtb-light-support/hxc-1501-spline-one-ls](http://www.dtswiss.com/en/wheels/wheels-mtb/hybrid-mtb-light-support/hxc-1501-spline-one-ls)

# HX 1700 SPLINE<sup>®</sup> LS

WHEELSIZE	27.5" / 650B & 29" / 700C
AXLE SYSTEM	15 x 110 mm Boost 12 x 148 mm Boost
HUB TYPE	350 HYBRID Straightpull hub with Ratchet System
BRAKE INTERFACE	Center Lock
RIM	Aluminum, tubeless ready
INNER WIDTH	30 mm
SPOKE NUMBER	28
SPOKES	DT hybrid 3 straightpull
NIPPLES	DT ProLock Squorx ProHead alu
WEIGHT	From 1894 g
MAX SYSTEMWEIGHT	130 kg
ASTM CLASS	4
PRICE	From 798.80 € / 692.10 \$



**PRODUCT PAGE** [available from July 13th, 2022]

[www.dtswiss.com/en/wheels/wheels-mtb/hybrid-mtb-light-support/hx-1700-spline-ls](http://www.dtswiss.com/en/wheels/wheels-mtb/hybrid-mtb-light-support/hx-1700-spline-ls)

# 8

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# APPENDIX



# TECHNOLOGIES



**RATCHET**  
TECHNOLOGIES

[More information →](#)



**PRO LOCK**  
TECHNOLOGY

[More information →](#)



**BEARING**  
TECHNOLOGY

[More information →](#)



**TUBELESS**  
TECHNOLOGY

[More Information →](#)



**ENGAGEMENT ANGLE**  
TECHNOLOGY

[More information →](#)



**HAND-BUILT**  
TECHNOLOGY

[More information →](#)

# PRODUCT PRESENTATION INTERVIEW

Friso Lorscheider and Julian Schmidt introduce the new Hybrid MTB LS range. Check out their talk on our YouTube channel.

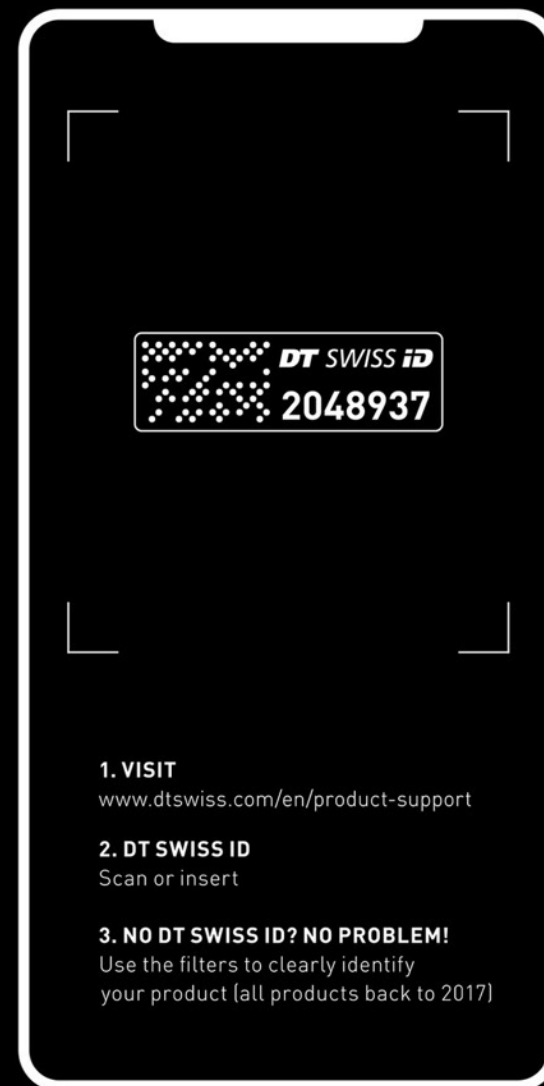
[Click here to watch the video](#)



# PRODUCT SUPPORT TOOL

Find manuals, how-to videos and spare parts compatible with your DT Swiss products.

[Click for more information](#)







## DT SWISS DREAM BUILD

Discover the HXC 1501 SPLINE ONE dream build in the DT Swiss factory, assembled to equip a light eMTB.

[Click here to watch the video](#)







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