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Robert Bosch GmbH
Postfach 10 60 50
70049 Stuttgart

Media und Public Relations
Leitung: Melita Delic
Presse-Forum:
www.bosch-presse.de

Kilometre by kilometre, the eBike learns more

AI-based features: Bosch presents intelligent route planning and navigation

July 2024

- ▶ Artificial intelligence makes eBikes more fun to ride with the smart system from Bosch
- ▶ Customised route planning and navigation – thanks to technical solutions that recognise user behaviour
- ▶ New “Range Control” function makes it possible to arrive with the desired battery level
- ▶ New Eco+ mode for an energy-saving riding experience and long ranges

Stuttgart/Reutlingen – AI solutions are increasingly being used to make a variety of everyday tasks easier. They impress with personalised applications by analysing individual needs and continuously learning from them. Thanks to Connected Biking, the physical riding experience merges with the digital world. Consequently, the eBike has long become an intelligent companion. Connected via the eBike Flow app, it forms part of a modern, digital lifestyle and always remains up-to-date. Bosch eBike Systems integrates AI-based solutions into the smart system, which recognise user behaviour, learn from it and enable, for example, smarter route planning and navigation.

“We’re confident that Connected Biking is the future. Only by merging the physical riding experience with the digital world can the full potential of our eBike systems be realised,” explains Gregor Dasbach, Vice President Digital Business at Bosch eBike Systems. “With the integration of AI, we are taking the next logical step in developing and creating priceless added value for eBikers: Kilometre by kilometre, the eBike learns more and unnoticed, becomes a smart and connected companion along the way.”

Range Control: AI ensures greater reliability when it comes to range on the eBike

The new, AI-based “**Range Control**” feature makes planning rides easier: eBikers no longer need to worry about their battery range. When you plan a route in the eBike Flow app, it immediately indicates the percent of battery

charge remaining when you reach your destination. To display the most accurate range possible, the smart system gathers various information, including the system weight, the elevation profile of the route and your personal riding behaviour during your recent rides. Its predictions become increasingly precise: once the first activities have been recorded, the system is able to determine the battery status on arrival much more accurately than on the first journey. The predicted battery level is also updated during the journey and the current riding style is taken into account. This means that riders can concentrate fully on their eBike experience.

To rule out every last worry about range during the journey, you can even set the desired minimum battery level at destination. The smart system takes care of the rest – extremely practical if, for example, charging isn't possible before the return journey or the next ride. If required, eBikers can enable this additional feature via a toggle button in the eBike Flow app. A slider can then be used to precisely set the desired battery level at destination. Depending on the selection, the app indicates whether the route can be travelled with full, low or very low support. During the journey, the smart system then adjusts the motor support as necessary. This ensures that you arrive with the predetermined battery level. With this new development, wondering whether the battery will last to the destination is now a thing of the past for eBikes with a smart system from Bosch.

Personalised arrival time and route planning

The smart system also uses other AI features for personalised planning. The expected arrival time, for example, can be calculated and displayed before a ride. An analysis of previous riding behaviour on similar routes helps here. eBikers also benefit from personalised route suggestions: The smart system knows, for example, which road types, which surfaces and which gradients and speeds are preferred, and makes a corresponding route recommendation.

Current charge level for easy planning and detailed maps for Kiox displays

Further new functions make navigation and planning even easier. With the **“current charge level” feature**, users can track the battery status live during the charging process on the eBike Flow app and view it anytime and anywhere. So you can plan your next tour or onward journey at home on the couch or in a cosy café. The **“extended navigation” feature** enhances the navigation display on the Kiox 300 and Kiox 500 displays. This no longer only shows the planned route and junctions, but also all side roads. These new, additional map details ensure the best possible orientation and intuitive navigation. “Extended navigation” and “current charge level” are part of the Flow+ subscription service.

New insights on completed journeys

Bosch also presents numerous innovations in terms of the **ride statistics**. This means that all riders who have a Bosch eBike ABS installed on their eBike can view the percentage of braking manoeuvres with and without ABS as a direct comparison in the eBike Flow app. During the ride, the number of braking manoeuvres where ABS was activated is also displayed.

The **“riding mode usage” display** is no longer only available during the ride, but also as a statistic afterwards. A clear pie chart shows the ratios of the riding modes used (including Off mode). The same applies to the **“power share” screen**. The “power share” screen provides insights into the average rider power compared to the average power of the drive unit, based on current activity and the selected riding mode. This information helps eBikers to improve their fitness level and optimise their training. Display of riding mode usage and power share after the ride are both part of Flow+.

New Eco+ mode enables long ranges

In addition to the digital features, Bosch is also introducing a new riding mode for the smart system. The new Eco+ mode blurs the boundaries between eBiking and normal cycling, saves energy and enables particularly long ranges. It is particularly suitable for eBikers who enjoy pedalling without support on flat terrain, but do not want to do without a motor on climbs or when overtaking, for example. Depending on the rider performance, the motor remains completely switched off until an activation threshold that can be customised in the eBike Flow app is exceeded. This is ideal for lightweight eBikes, but also for eSUVs and eTrekking bikes. When support is no longer required, the motor switches off automatically. This makes it easy to save energy and extend the range, making even lengthy tours possible without charging or replacing the battery. The Eco+ mode is available for all drive units with the smart system from Bosch eBike Systems and can be installed on your own eBike using the eBike Flow app.

Even more customisation: display configuration on the Purion 200

The networking of components creates new possibilities for customisation. Like the Kiox 300 and Kiox 500 displays, the display of the Purion 200 control unit can now also be customised according to your own preferences: eBikers can sort, add or delete content in the eBike Flow app. You prefer the speed to be displayed on the left and always want the heart rate on the right? No problem, because two tiles per screen can be freely assigned. The screen order can also be redefined.

Features at a glance

Feature	Flow+	Release
Range Control		July 2024
Riding statistics: ABS		July 2024
Eco+ mode		July 2024
Purion 200: Display configuration		July 2024
Current charge level	x	August 2024
Extended navigation	x	August 2024
Additional statistics: Riding mode usage and power share	x	August 2024

Press photo 1:



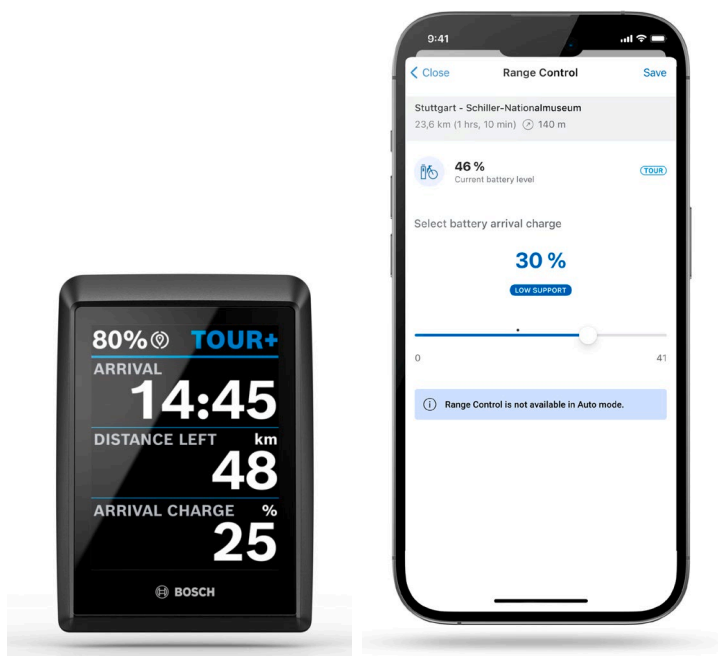
More riding fun thanks to AI-based features: eBikes with the smart system from Bosch learn kilometre by kilometre.

Press photo 2:



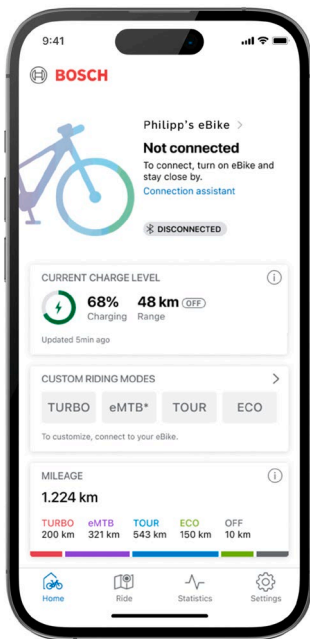
Thanks to Connected Biking, the physical eBike experience is merging with the digital world and has long become an intelligent companion in everyday life.

Press photo 3 + Press photo 4:



Know what battery level you will reach your destination with before your ride – or even set the desired minimum battery level at destination yourself: This can be done with the new “Range Control” feature.

Press photo 5:



With the “current charge level” feature, the battery level can be tracked live on the eBike Flow app during the charging process and viewed at any time and anywhere.

Press photo 6:



The new Eco+ mode blurs the boundaries between eBiking and normal cycling, saves energy and enables particularly long ranges.

Contact for journalists:

Robert Bosch GmbH

Tamara Winograd

Head of Marketing Communications Bosch eBike Systems

Tel.: +49 (0)7121 35-394 64

Tamara.Winograd@de.bosch.com

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More comfortable gear shifting for eBikes

July 2024

Bosch expands eShift portfolio in the smart system with TRP and Shimano gear shifting systems

- ▶ More comfort and riding fun, less material wear: integrated electronic eShift gear shifting solution improves eBike experience
- ▶ For additional application areas: Expansion of eShift portfolio in technological partnership with TRP and Shimano
- ▶ Smart system features eShift solutions for eBikes with derailleur system for the first time
- ▶ Auto downshift function can now be customised in the eBike Flow app

Stuttgart/Reutlingen – Focusing on eBiking, always shifting gears at the perfect time – or not having to think about shifting gears at all? Bosch eBike Systems presented the first eShift solutions for electronic shifting back in 2014 and has since further developed them together with shifting system partners. Bosch is now expanding its eShift portfolio in the smart system, providing more choice, more comfort and more riding fun. Depending on the system, electronic gear shifting offers two major advantages for eBikers: When shifting manually, eShift ensures optimal gear changes at the ideal time. Motor support is interrupted for fractions of a second in the process. The gear changes are rendered smooth and silent. A positive side effect here is that material wear on the drive is also reduced. Alternatively, eShift can change gears fully automatically: The shifting system then automatically adapts the gear to a pre-set cadence. This means that eBikers always ride in the correct gear ratio and the riding experience is much more relaxed and comfortable – wrong gear changes become a thing of the past.

In addition to the previously available eShift solutions from Rohloff, 3X3 and enviolo, Bosch is now integrating new shifting systems from TRP and Shimano into the smart system. "Our electronic eShift gear shifting solution offers numerous advantages. More comfort, more riding fun and reduced material wear: eBikers benefit from this technology in a wide range of applications – on eMTBs as well as in the city. In collaboration with TRP and Shimano, we're expanding our portfolio and integrating derailleur solutions for eBikes into the

smart system for the first time," says Claus Fleischer, CEO of Bosch eBike Systems.

For sporty eBikers: automatic derailleur system now available in the smart system for the first time

Sporty riders have always appreciated the advantages of derailleur systems: They are lightweight and their fine gear ratio increments ensure efficient pedalling. eBikers can now benefit from the first automatic derailleur solution in the smart system. The TRP E.A.S.I. A12 has been specially designed for eMTBs and Gravel eBikes and is available as an eShift solution exclusively in conjunction with the Bosch Performance Line CX and Performance Line SX motors. During automatic gear shifting, the correct gear is automatically selected according to a previously defined individual cadence. This means less focus on the correct shifting torque and more fun on the road.

The "RollShift" feature also ensures additional flow: the rear derailleur automatically shifts to the appropriate gear when slowing down or accelerating during coasting phases without pedalling. This ensures a particularly smooth transition when stepping into the pedals again.

Those who prefer shifting gears themselves in certain riding situations can switch to manual mode at any time at the press of a button on the shifter while riding. The Kiox and Purion displays or the Ride screen on the phone indicate the current mode and the engaged gear at all times. The appropriate gear can also be engaged during the coasting phase before starting to pedal again when shifting manually. For a modern and sleek appearance, the shifter is wirelessly connected to the rear derailleur and the battery required is simple to replace.

For commuters and everyday riding: Shimano CUES Di2

With Shimano's new CUES Di2, Bosch is integrating a further eShift solution for derailleur solutions into the smart system. This makes gear changes particularly quiet, smooth and cuts down wear on the materials. This is made possible by reducing the motor support for a fraction of a second during gear changes. In the manual variant, the system provides a shift recommendation on the display or on the Ride screen in the eBike Flow app. Commuters benefit from this as they ride through the city, as do eBikers on trekking tours in the countryside.

For the city and on trekking tours: Shimano NEXUS Di2

The Shimano NEXUS Di2 hub gear system with eShift makes particularly smooth and comfortable gear changes possible when riding the eBike. The big advantage here is that eBike riders with hub gear systems normally have to stop pedalling to change gears. With the eShift solution, they can just keep on

pedalling. The solution assists with manual shifting and always changes gear at the ideal time, depending on the pedal position. A suitable shift recommendation is also indicated on the Kiox and Purion displays or on the Ride screen in the eBike Flow app. Moreover, riding off in an excessively hard gear is a thing of the past – because gear changes are possible even when stationary.

For riding off easily after a stop, auto-downshift can be customised in the eBike Flow app

The auto-downshift function automatically shifts to a lower gear when coming to a stop to make riding off easier. This helps eBikers on hills as well as riders of heavy Cargo eBikes at traffic lights. But which is the right gear? You can now set this individually for yourself in the eBike Flow app – according to your personal taste. This feature can now also be enabled or disabled as required. Auto-downshift will be available from autumn 2024 in conjunction with the already familiar eShift partner solutions from 3X3 and Rohloff.

Press photo 1:



Greater comfort and riding fun, less material wear: the integrated electronic eShift gear shifting solution improves the eBike experience in many ways.

Press photo 2:



The TRP E.A.S.I. A12 is the first derailleur solution featuring eShift in Bosch's smart system – sporty eBikers can choose between automatic shifting and manual operation.

Press photo 3:



Shimano's new CUES Di2 with eShift enables particularly quiet, smooth and reduce material wear during gear changing thanks to a reduction in motor support for fractions of a second during gear changes.

Press photo 4:



The Shimano NEXUS Di2 hub gear system with eShift supports manual shifting and always changes gears at the ideal time, depending on the pedal position.

Contact for journalists:

Robert Bosch GmbH

Tamara Winograd

Head of Marketing Communications Bosch eBike Systems

Tel.: +49 (0)7121 35-394 64

Tamara.Winograd@de.bosch.com

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Bosch eBike Systems expands digital offerings for eBike manufacturers

July 2024

Various app solutions, interfaces and services as the next step for the eBike experience of tomorrow

- ▶ eBike Flow app in the eBike manufacturer's look
- ▶ eBike SDK and Cloud APIs for own-brand solutions
- ▶ Further integration of third-party solutions conceivable in future

Stuttgart/Reutlingen – With the smart system and the associated eBike Flow app, Bosch eBike Systems is merging the physical and digital eBike experience for end customers. Now, eBike manufacturers have additional options to further expand their digital offering and thus address their customers even more individually with a customised variant of the eBike Flow app on the one hand, and with useful tools for manufacturers who offer their customers their own apps on the other. Bosch eBike Systems also offers further interfaces, enabling digital services and offerings from third-party providers to be seamlessly integrated into the brand ecosystem.

eBike Flow app as offered by Bosch or customised

The eBike Flow app is at the heart of the smart system and is offered together with the Bosch eBike system. eBike manufacturers can choose whether the app is displayed to their customers as a standard version or as a customised brand variant. Thanks to the digital services of Bosch eBike Systems, it is now possible to prominently place own-brand content there. Gregor Dasbach, Head of Digital Business at Bosch eBike Systems, explains: "Many manufacturers want to provide their customers with customised, brand-specific offers and interact directly with users. Our digital services offer various options that can be used to display specific content. Information on the respective connected eBike model can also be stored there."

What does the customised Flow app include? Design elements can be used to modify the user interface of the app and thus integrate the manufacturer's own brand. Images or videos – with **branding**, manufacturers can bring the user experience to life for end customers in a variety of ways. With the **Content Card**,

they can create their own content with little effort and communicate directly with their customers, who then receive customised content.

Other services available in both the standard version and the customised eBike Flow app include the **eBike Specs**, i.e. the exact specifications of the bike, and also the digital operating instructions (**eBike Manuals**), which can be viewed via the Help Center. The services help eBike manufacturers to increase the visibility of their own brand and enhance customer loyalty. End users have all relevant data on their eBikes clearly stored in the eBike Flow app.

Construction kit for digital applications from eBike manufacturers

With the eBike SDK (Software Development Kit) and Cloud APIs (Application Programming Interface), Bosch eBike Systems provides manufacturers with digital tools that they can use to create their own apps and broaden their digital footprint. They also generate real added value for users thanks to the eBike data available from Bosch. This is made possible with the **eBike SDK**, which allows manufacturers to read out data such as speed or range thanks to the intelligence of the smart system (LED Remote, System Controller) and integrate it into their apps. The development tools it contains, such as the eBike simulator app for macOS, are also useful for manufacturers. Developers can use this to simulate eBike values such as speed, cadence and motor power, without having to physically ride an eBike. This allows them to work efficiently with the data.

Using **Cloud APIs**, manufacturers can access Bosch data sets and integrate them into their own mobile apps. This provides them with valuable information, such as eBike profiles or rider activities, which they can use in their own app and make available to end customers.

In technical terms, Cloud APIs are the interfaces that allow data to flow between Bosch hardware, such as the ConnectModule (BCM) and the DiagnosticTool, or Bosch software, such as the eBike Flow app, and eBike manufacturers' own applications.

What does this mean in practice? eBike master data and usage-related data, for example, can be called up in the "eBike profiles" data set. This allows manufacturers to integrate bike profiles, maintenance, etc. into their own app. A further option is the "Activity Records" data set, which can be used to call up detailed rider activities. eBike manufacturers, for instance, receive a variety of information relating to rider activities, such as location or battery status, for their own mobile app via Cloud APIs.

Both the eBike SDK and the data sets that can be accessed via the Cloud APIs and are being successively developed further to offer manufacturers a wide

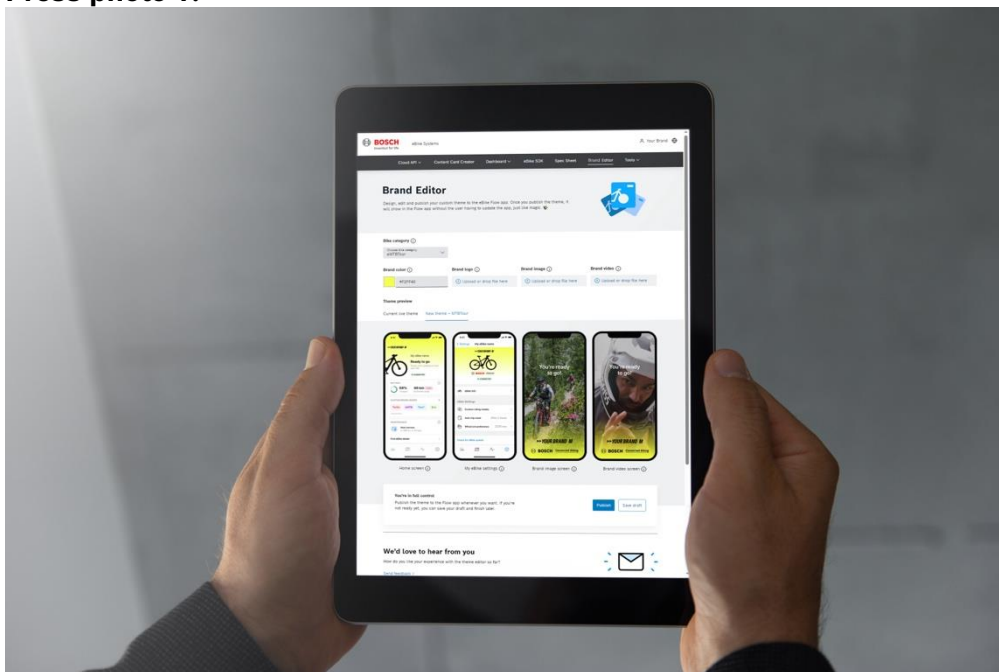
range of digital options – always in the interests of the optimum eBike experience.

Prepared for the eBike experience of tomorrow

The smart system transmits eBike data via the eBike Flow app to a digital platform, the Bosch eBike Cloud, provided users give their consent. eBike manufacturers can now access this digital platform and use the corresponding services for the benefit of eBike riders. This allows them to tailor their digital offerings more closely to the needs of end customers, further develop their own solutions and be ready for the eBike experience of tomorrow.

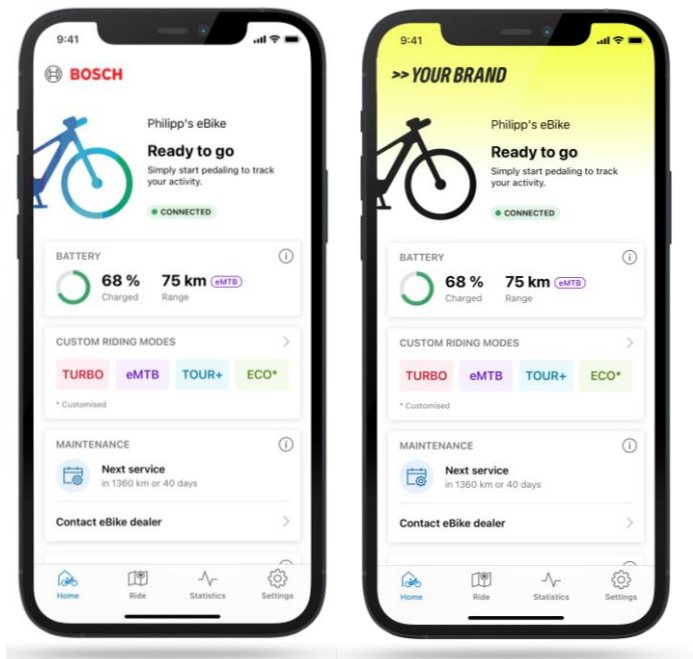
Gregor Dasbach comments: "Our platform offers a wide range of digital services for manufacturers. This also includes solutions from third-party providers. Partnerships with insurance companies are already in place in selected countries. In future, it is conceivable that leasing providers, fleets, cities and aftermarket services can also be integrated. We are looking forward to seeing what potential there will be beyond the bicycle industry in the future."

Press photo 1:



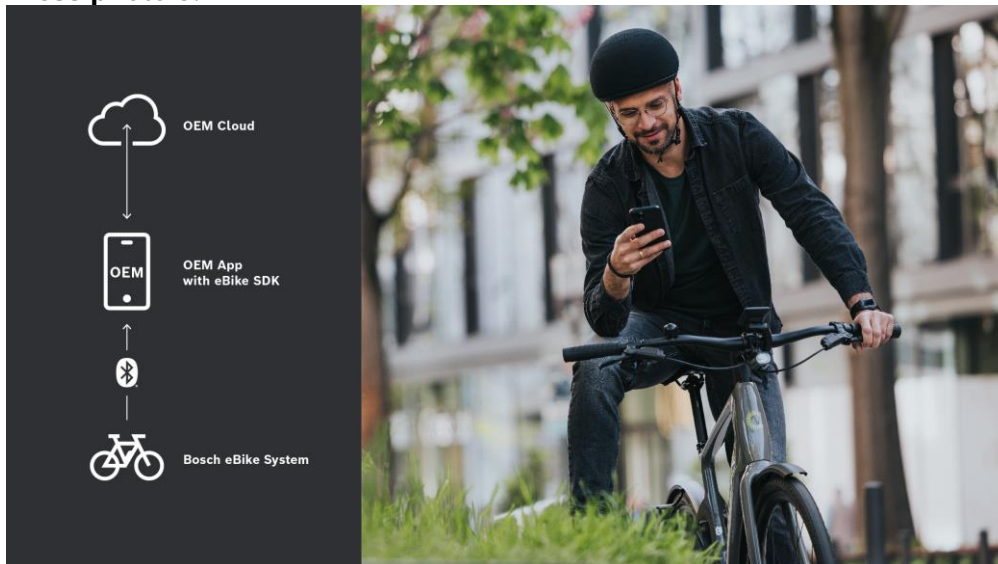
Bosch eBike Systems now gives eBike manufacturers additional options to further expand their digital offering and thus address their customers even more individually.

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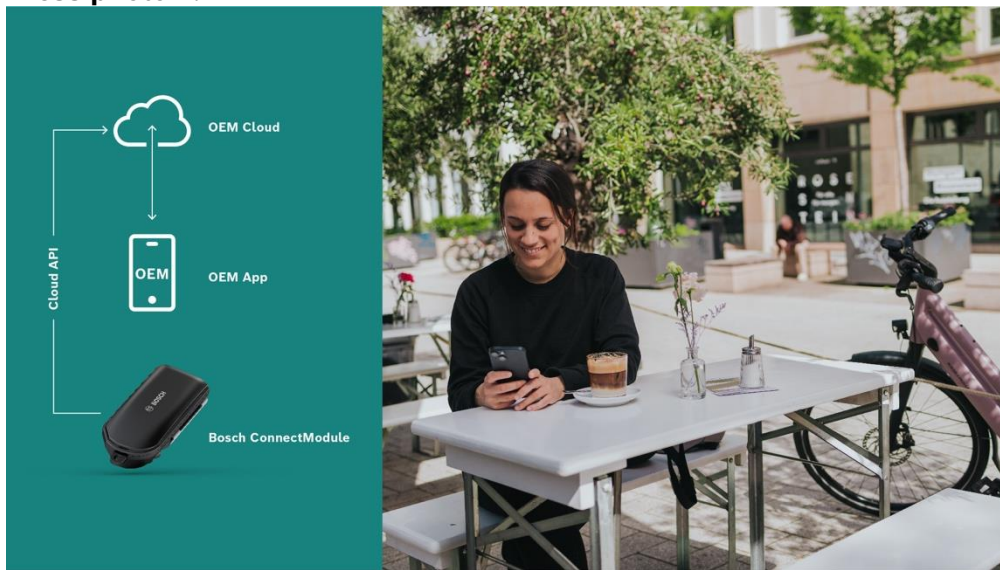
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Press photo 3:



Using the eBike SDK from Bosch eBike Systems, eBike manufacturers can read out data from the smart system, such as speed or range, and integrate it into their own apps.

Press photo 4:



With Cloud APIs, eBike manufacturers can access Bosch data sets and integrate them into their own mobile apps.

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The journey to a more sustainable future

July 2024

How Bosch eBike Systems is committed to a lower-emission supply chain and a sensible circular economy

- ▶ Joint CO₂ analysis with TÜV Rheinland: Potential for greater sustainability in eBike system development and production identified
- ▶ Taking responsibility: Transparency and emissions reduction as selection criteria in the purchasing process
- ▶ Circular economy: Expansion of the remanufacturing portfolio for drive units and global commitment to battery recycling

Stuttgart/Reutlingen – The eBike is an important building block for the mobility revolution. It helps to reduce traffic and its impact on the environment, takes up little space and does not cause noise or local emissions¹. Compared to cars, eBikes are not only cheaper, but also more environmentally friendly, space-saving and often faster in city traffic. They offer an important alternative to the car, especially for short distances of up to around 5 to 10 kilometers². In an international study conducted by Bosch eBike Systems this year, 49 percent of eBike users surveyed stated that half of the journeys they used to make by car are now made by eBike³. This active form of mobility not only helps to reduce CO₂ emissions in cities, but also benefits each and every individual: Travelling by bike or eBike is good for your health and is also fun!

As an evaluation by the Federal Environment Agency shows, the eBike is one of the lowest-emission means of transport. When using an eBike, the electricity consumption results in average CO₂ emissions of 3 g CO₂/person-kilometer (pkm), depending on the electricity mix. In comparison, a motor vehicle with an internal combustion engine emits about 166 g CO₂/pkm, while public transport

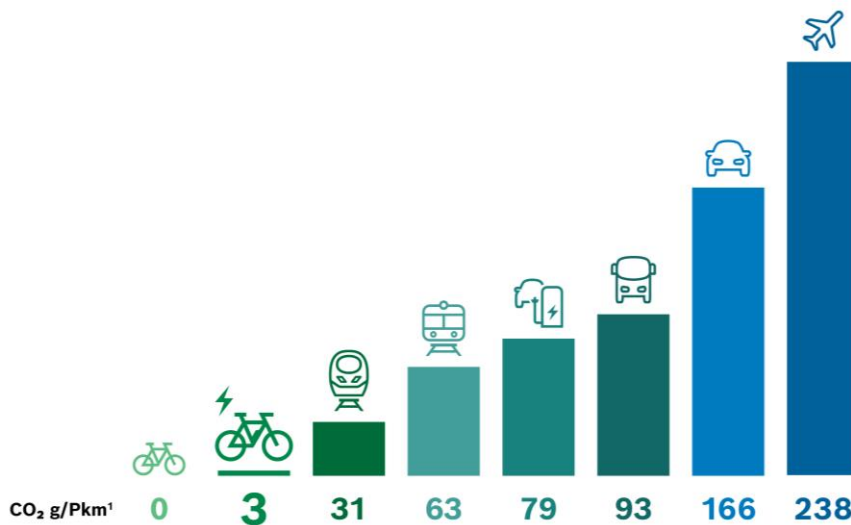
¹ World Health Organization (2022): "Walking and cycling: latest evidence to support policy-making and practice", p. 1, <https://apps.who.int/iris/rest/bitstreams/1426622/retrieve> (retrieved on 30 May 2024).

² Federal Environment Agency (2023): "Welche Umwelttipps Sie bei Elektrofahrrädern beachten sollten" (Environmental tips to consider when using electric bikes), <https://www.umweltbundesamt.de/umwelttipps-fuer-den-alltag/mobilitaet-reisen/e-bike-pedelec#gewusst-wie> (retrieved on 30 April 2024).

³ Bosch eBike Systems, n= 4,200, countries: Denmark, Netherlands, USA, UK, Poland, Switzerland, Germany, Austria, Italy, field time: 30 November 2023 – 29 December 2023

emits between 58 and 93 g CO₂/pkm⁴. eBikers using the smart system from Bosch can now view their CO₂ savings compared to a car after every ride via the activity tracking function of the eBike Flow app⁵.

CO₂ emissions during the use of different means of transport



¹ g/Pkm = grams per passenger kilometre

The chart is shown in ascending order: Bicycle, eBike, long-distance rail transport, tram and urban and underground railway, electric car, public transport bus, car (all drives), domestic aircraft.

Source: Own representation based on Federal Environment Agency figures (2022): "Vergleich der durchschnittlichen Emissionen einzelner Verkehrsmittel des Linien- und Individualverkehrs im Personenverkehr in Deutschland 2022" (Comparison of the average emissions of individual means of regular and private passenger transport in Germany in 2022); <https://www.umweltbundesamt.de/bild/vergleich-der-durchschnittlichen-emissionen-0> (accessed on 24/4/2024). Our TÜV analysis, calculated using the German electricity mix, confirms the eBike value.

CO₂ equivalents indicate the climate impact of the different greenhouse gases. We have considered the effects of CO₂ as well as other greenhouse gases and climate-relevant substances, insofar as these are relevant to the analysis. In order to compare the impact on the climate of the various greenhouse gases and climate-relevant substances, they are shown as CO₂ equivalents. For ease of reading, we use CO₂ synonymously with CO₂ equivalents.

"Bosch eBike systems are already driving a society in which people are travelling more sustainably. With our products and solutions, we make a contribution to future-proof mobility. It is also important to us to continue to improve our eBike systems in terms of sustainability throughout the entire product life cycle," explains Claus Fleischer, CEO of Bosch eBike Systems. "Because sustainability is not an additional task, but an integral part of our corporate culture."

⁴ Federal Environment Agency (2022): "Vergleich der durchschnittlichen Emissionen einzelner Verkehrsmittel des Linien- und Individualverkehrs im Personenverkehr in Deutschland 2022" (Comparison of the average emissions of individual means of regular and private passenger transport in Germany in 2022), <https://www.umweltbundesamt.de/bild/vergleich-der-durchschnittlichen-emissionen-0> (retrieved on 30 April 2024)

⁵ The emissions saved relate to the use phase. The calculation is based on the Federal Environment Agency's assumption (2022): Car = 166 g CO₂/pkm, eBike = 3 g CO₂/pkm

From vision to realisation: Bosch eBike Systems focuses on three pillars of sustainability

Bosch eBike Systems has defined three pillars of sustainability and firmly anchored them in its strategy:

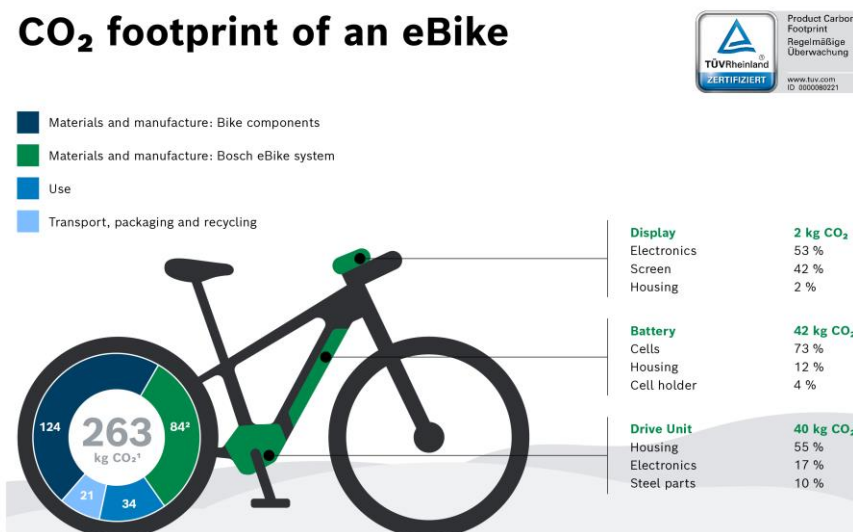
- The "Carbon footprint" pillar aims to measure, identify and reduce CO₂ emissions at company, product and material level.
- The "Responsibility in the supply chain" pillar defines measures to ensure that all materials and primary products are selected sustainably and responsibly and that social standards are adhered to.
- The "Circular economy" pillar is concerned with the goal of extending the service life of products, i.e. reusing raw materials and further increasing recycling efficiency, for example.

For Bosch eBike Systems, the pillars are strategic guard rails that contribute to a common goal: to make eBike systems even more future-proof. To achieve this goal, the company derives specific measures that are implemented both internally and externally in collaboration with partners and suppliers.

CO₂ analysis focusing on savings potential

To intensify efforts to reduce emissions, Bosch eBike Systems, together with TÜV Rheinland, conducted a holistic analysis of the eBike's carbon footprint in 2022 and refined and updated it in 2024. Using the results of the analysis, the company has calculated the carbon footprint for each product in its portfolio. The aim of the analysis was to identify and evaluate the greatest CO₂ savings potential that can be found both in the system components and in the entire supply chain.

CO₂ footprint of an eBike



1 CO₂ equivalents indicate the climate impact of the different greenhouse gases. We have considered the effects of CO₂, as well as other greenhouse gases and climate-relevant substances, insofar as these are relevant to the analysis. In order to compare the impact on the climate of the various greenhouse gases and climate-relevant substances, they are shown as CO₂ equivalents. For ease of reading, we use CO₂ synonymously with CO₂ equivalents.
2 The CO₂ footprint of the eBike system shown here as an example is made up of the rounded footprint of the net weights of the display (Kiox 300), battery (PowerTube 500) and drive unit (Performance Line CX) materials. The basis is a Trekking eBike with a mileage of 11,000 km. The use phase was calculated on the basis of the German electricity mix. The calculation was carried out by TÜV Rheinland (as at April 2024).

Around 79 percent of an eBike's CO₂ emissions are caused by the materials used and in production, and 13 percent through use. The remaining eight percent is accounted for by transport, packaging and recycling.

Overall, an eBike has an average carbon footprint of 263 kg of CO₂ equivalents over its entire life cycle. If the eBike components are considered individually with approximately 84 kg of CO₂ equivalents, approx. 50 percent of the emissions are attributable to the battery, 48 percent to the drive unit and 2 percent to the display. If you ride around 515 kilometers on an eBike instead of using a motor vehicle with an internal combustion engine, the Bosch eBike system will have already paid for itself in terms of CO₂ consumption.

The CO₂ savings potential identified in the display are the electronic components (53 percent) and the screen (41 percent). In the drive unit, the housing accounts for the largest share of CO₂ at 55 percent, followed by the electronic components at 17 percent. In the battery, the greatest savings potential comes from the cells, which account for 73 percent of the CO₂ emissions, followed by the housing at 12 percent and the cell holder at four percent.

Reducing emissions along the entire supply chain

In the purchasing process, the carbon footprint is an important decision-making criterion when it comes to supplier selection, alongside other sustainability criteria. For this purpose, the CO₂ emissions of the materials used and purchased parts are requested from suppliers.

Claus Fleischer emphasises: "The joint analysis with TÜV Rheinland has shown us which areas we can and will prioritise to further reduce the carbon footprint of our eBike systems. Our measures focus on optimising materials and reducing emissions in production and the supply chain. Together with our partners and suppliers, we are making enormous efforts here, which are gradually paying off."

In the production of the new Bosch CompactTube 400, for example, the company uses alternative materials for the cell holders, which make up the largest plastic parts within the PowerTubes, in order to reduce the carbon footprint. For this purpose, a plastic is used whose emission factor is 64 percent lower than that of the plastic previously used. This material change will in future become the standard for all Bosch eBike Systems batteries integrated within the frame.

Beyond material and product level, Bosch eBike Systems also focuses on the corporate carbon footprint of its direct suppliers and makes this an important decision-making criterion in the purchasing process. By participating in the global

system for the disclosure of environmental data provided by the non-profit organisation CDP, the company can record and assess the efforts of its direct suppliers to take climate protection measures. The aim is to make climate protection the standard: Suppliers that have a low CDP ranking and do not commit to the goals of the Paris Climate Agreement through an SBTi voluntary commitment⁶ will be given a lower rating in the purchasing process. Suppliers that disclose via the CDP currently account for 97 percent of the purchasing volume of Bosch eBike Systems – this figure is set to rise to 100 percent by 2025.

An important factor for reducing CO₂ is the use of green electricity. Bosch eBike Systems expects its suppliers to switch their production to electricity from renewable sources in order to reduce their emissions.

Responsibility and transparency as selection criteria in the purchasing process

Bosch eBike Systems places great value on the transparency and traceability of its supply chain, particularly with regard to batteries. In doing so, Bosch eBike Systems goes beyond the legal obligations stipulated by the Supply Chain Act and not only checks and qualifies its direct suppliers, but also endeavours to understand the entire supply chain in order to avoid potential risks in the procurement of raw materials. This applies in particular to the raw materials in the battery cells, which are comprehensively traced back to the mines. This approach will also be extended to the drive unit and displays in the future.

With regard to environmental protection, Bosch eBike Systems expects its suppliers to set up and develop an environmental management system in accordance with ISO 14001. As of this year, 100 percent of our direct suppliers have appropriate certification.

Circular economy: Remanufacturing & recycling at the end of the product life cycle

For Bosch eBike Systems, the high quality, safety and long service life of its products are paramount. The useful life of an eBike and the number of journeys with other modes of transport it replaces make a significant contribution to reducing the impact on the environment. Nevertheless, it is inevitable that the products will reach the end of their lifetime at some point.

This is where the circular strategy comes in, with which Bosch eBike Systems aims to improve the sustainability of products throughout their entire life cycle.

⁶ The SBTi voluntary commitment allows companies to set science-based targets for reducing greenhouse gas emissions. Through this voluntary commitment, companies demonstrate their willingness to actively contribute to climate protection and align their business practices with the goals of the Paris Agreement.

This includes the procurement, production, utilisation, return, reprocessing and recycling of materials.

Since 2014, Bosch eBike Systems has been investing specifically in the recycling of its drive units through remanufacturing. Defective Bosch eBike drive units that qualify after testing are subjected to a detailed reconditioning process. They undergo a complete technical overhaul and are made available to dealers with full functionality after a final test.

"With our commitment to remanufacturing, we are sending a clear signal of our commitment to protecting the environment and promoting sustainable mobility – and have been doing so for over 10 years now," says Claus Fleischer. Further drive units will be added to the remanufacturing portfolio this year.

To be able to reuse valuable raw materials at the end of their lifetime, batteries need to be recycled properly. Bosch eBike Systems supports new and sustainable recycling methods worldwide. The efficiency of recovery depends on the recycling process. In the processes used by the German GRS industry solution, almost 71 percent of many valuable raw materials can be recovered⁷ and can be reused for new products.

In future, Bosch eBike Systems will increasingly focus on the use of recyclates in its circular economy.

Recover resources through recycling



Source: Own representation based on Gemeinsames Rücknahmesystem Servicegesellschaft mbH (2023): "Increasing sustainability by taking back used batteries from eBikes and other small electric vehicles", presented at Eurobike 2023.

In all sales countries where it is legally possible, Bosch eBike Systems voluntarily assumes responsibility for recycling obligations and the associated costs through local service partners. In countries where recycling solutions are

⁷ Source: Gemeinsames Rücknahmesystem Servicegesellschaft mbH (2023): "Nachhaltigkeit durch Rücknahme von Altbatterien aus E-Bikes und anderen elektrischen Kleinfahrzeugen steigern" (Increasing sustainability by taking back used batteries from eBikes and other small electric vehicles), presented at Eurobike 2023

not yet available or existing recycling solutions are inadequate, Bosch eBike Systems works closely with its partners, promotes pilot projects and supports the development of industry solutions. The company currently supports battery collection systems in 18 countries, including the Czech Republic and the United Kingdom as of this year.

Moving forward together

Through its measures, Bosch eBike Systems contributes to the overarching sustainability goals of the Bosch Group. With more than 400 locations worldwide, the Bosch Group has been carbon-neutral overall since 2020 (Scope 1 & 2).⁸ At the same time, the company intends to shape climate protection beyond its direct sphere of influence and also systematically reduce upstream and downstream emissions – the aim is to reduce emissions by 15 percent by 2030 (Scope 3).

"We are aware that we still face a number of challenges on our path to a sustainable future. Responsible and sustainable behaviour is very important to us as a company and is already daily practice in many areas at Bosch eBike Systems. Both small and large improvements have already had a positive impact – and we want to achieve more and more of these in the future," says Claus Fleischer.

⁸ Since 2020, the Bosch Group with its more than 400 locations worldwide has been carbon-neutral overall (Scope 1 & 2 according to [Greenhouse Gas Protocol Corporate Accounting and Reporting Standard](#)). Bosch uses four levers to achieve this: increasing energy efficiency, generating its own energy from renewable sources, purchasing green electricity and offsetting remaining CO₂ emissions with carbon credits. Further information on the Bosch Group's sustainability strategy can be found at nachhaltigkeit.bosch.com

Contact for journalists:

Robert Bosch GmbH

Tamara Winograd

Head of Marketing Communications Bosch eBike Systems

Tel.: +49 (0)7121 35-394 64

Tamara.Winograd@de.bosch.com

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10 years of Connected Biking at Bosch eBike Systems

July 2024

Connectivity makes eBiking more customised, convenient and secure

- ▶ Back in 2014, Bosch eBike Systems focussed on Connected Biking - which became the new standard for eBikes
- ▶ Development milestone: launch of the smart system
- ▶ Digital functions have been making eBiking more customised, convenient and secure ever since
- ▶ Ever new functions in the areas of theft protection, navigation, personalisation as well as updates and service improve the eBike experience

Stuttgart/Reutlingen – Over the past decade, eBiking has become an integral part of mobility. In some European countries such as Germany and the Netherlands, every second bike sold is already an eBike – and the trend is upwards. Since its introduction, the eBike has undergone numerous stages of development – and has evolved into a fully connected product over the past ten years.

Ten years ago, Bosch eBike Systems laid the foundations for the dawn of the eBike future. Since 2014, Connected Biking has stood for the further development of eBiking with a continuous stream of new features and complements the physical experience with the world of digital life. With Nyon, Bosch launched the first connected, all-in-one on-board computer in the bicycle industry onto the market. Together with an online portal and a phone app, it combined an eBike control unit, navigation system, fitness trainer and access to the online world in a single device. The next important step towards the digitalisation of eBikes soon followed. With the acquisition of COBI.Bike, Bosch eBike Systems expanded its product and expertise portfolio to include phone-based solutions for the first time in 2017. Further innovations such as the Kiox display (2019) and the first integration of an anti-theft protection feature (2019) soon followed.

Smart system milestone: the eBike Flow app as a digital assistant

A particularly important milestone in this development and the start of a new, connected eBiking future was the launch of the smart system in 2021. With this system generation from Bosch eBike Systems, all components – such as the drive unit, battery, display and phone – are fully connected, can communicate with one another and exchange data. Since then, eBike riders have been offered an intuitive and convenient eBike experience with a wealth of new options. The centrepiece is the eBike Flow app, which is trusted by more than one million eBikers worldwide, with an average app store rating of 4.3 out of 5 stars. It enables access to additional digital functions, personal settings, analysis and display of riding data, navigation, updates and much more. The eBike makes everyday life and leisure activities easier. Bosch is continuously improving the smart system with ongoing updates and new functions in the four areas of theft protection, navigation, personalisation and update & service.

Additional theft protection: parking the eBike with complete confidence

Whether a quick stop at a café or an extended break on a sporty tour: anyone parking their eBike for a brief or lengthy period of time wants to do so with peace of mind. The digital [theft protection functions](#) of the smart system offer additional security and are the ideal complement to the mechanical lock. Thanks to the “eBike Lock”, the phone or display becomes a digital key that prevents the motor support from being enabled. The “eBike Alarm” function shows the current location and status of the eBike. In the event of attempted theft, the eBike emits an audible and visual alarm and sends a notification to the phone. If the eBike nevertheless does get stolen, automatic tracking starts – including location tracing for the police.

To explore means to experience: next-generation navigation features

So that every kilometre becomes an experience, the smart system offers [route planning, navigation and activity tracking](#) via the Flow app. Tours can be planned with maximum freedom and efficiency before setting off. The AI-based “Range Control” feature helps out here. When eBikers put together a route in the eBike Flow app, it immediately shows them what percentage of battery power is likely to remain when they reach their destination. To rule out every last worry about range during the journey, it’s even possible to set the desired minimum battery level at destination and the smart system takes care of the rest. Other AI-based functions recognise user behaviour, learn from previous journeys and can offer customised routes with a precisely calculated arrival time. Routes planned in advance with komoot can also be automatically imported. During the ride, clear display of the route and precise turn-by-turn directions ensure a modern navigation experience – whether using a display, phone on the handlebar or via voice-based navigation. If desired, all important data such as speed, battery

level, elevation graph or (in conjunction with a heart rate monitor), the current heart rate can be viewed at all times. Thanks to Activity Tracking, all tour and performance data is recorded – synchronised with Strava or Apple Health if desired – and can be analysed, exported as a GPX file or in FIT format and shared with the user's community after the ride.

Personalisation: adapting the eBike to individual preferences

Whether City eBike, Trekking eBike or eMTB: eBikes are as diverse as the requirements of eBikers are varied. The topic of [personalisation](#) is therefore becoming increasingly important. The eBike is increasingly adapting to individual lifestyles – fully in keeping with personal use habits. Thanks to the connectivity of the individual components, the eBike can be customised to the rider's needs via the eBike Flow app. The display screen layout, for example, can be customised with over 30 different options and shows the information relevant to the current riding situation and route. The riding modes can also be customised to suit personal preferences: dynamic on the trail, energy-saving on tour or relaxed in city traffic.

Update and service: the eBike always keeps up with the times

With [updates](#), improvements and new features are continuously being introduced in the smart system. This means that the eBike remains up to date and always feels like new. Here again, a great deal has changed in the ten years since the beginnings of Connected Biking. Whereas the specialist dealer used to install the latest version, updates simply take place over-the-air via the eBike Flow app. Particularly clever: the eBike Flow app also serves as a digital service booklet.

Outlook: connected eBikes will be the standard in the future

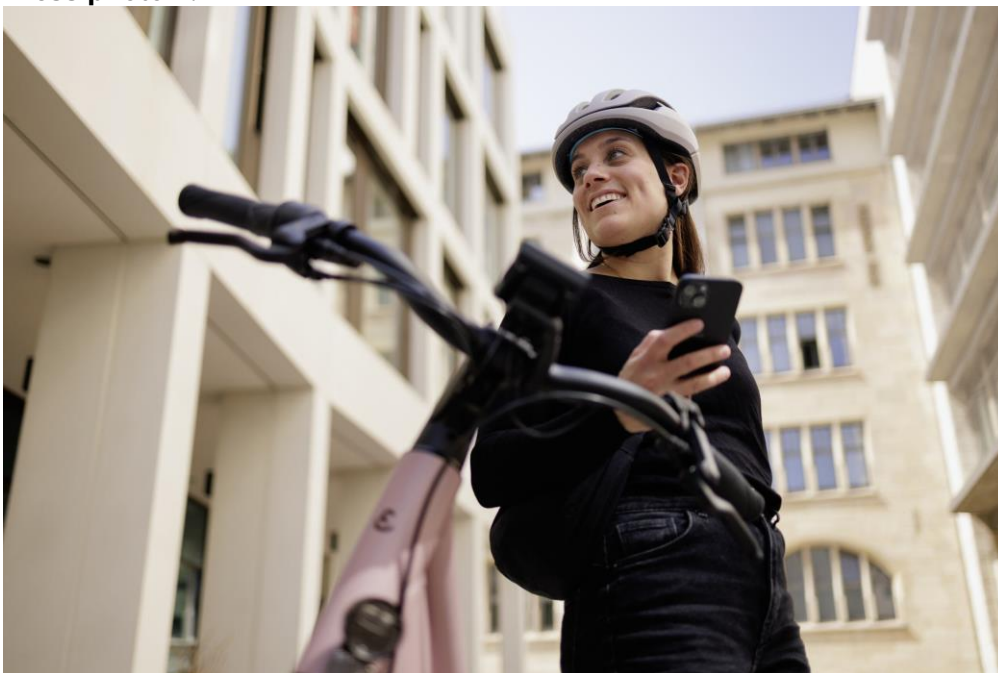
The future of the eBike will be characterised by additional digital functions and even more customisation options that can be installed via software updates. Non-connected eBikes will be the exception in the future – the topic of Connected Biking will therefore continue to play a central role for Bosch eBikes Systems in the coming years. In addition to greater flexibility and extra functions, eBike connectivity is also playing a decisive role on the road to the mobility of tomorrow. It forms the basis for networked communication between eBikes and the relevant infrastructure, such as bicycle traffic lights or other road users and providers of smart services, as is being discussed by science, industry and politics in the Smart City context of the Bike2X concept.

Press photo 1:



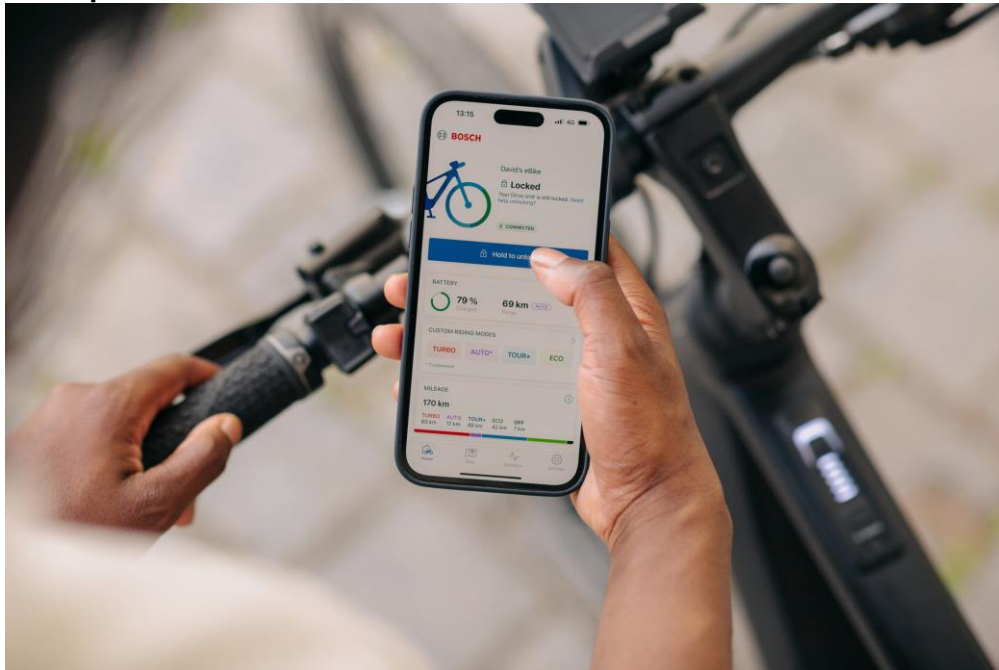
For more riding fun, convenience and personalisation: Bosch launched Connected Biking back in 2014, which became the new standard for eBikes.

Press photo 2:



In the smart system introduced in 2021, the mobile phone, in conjunction with the eBike Flow app, becomes the centrepiece and provides access to numerous additional digital functions.

Press photo 3:



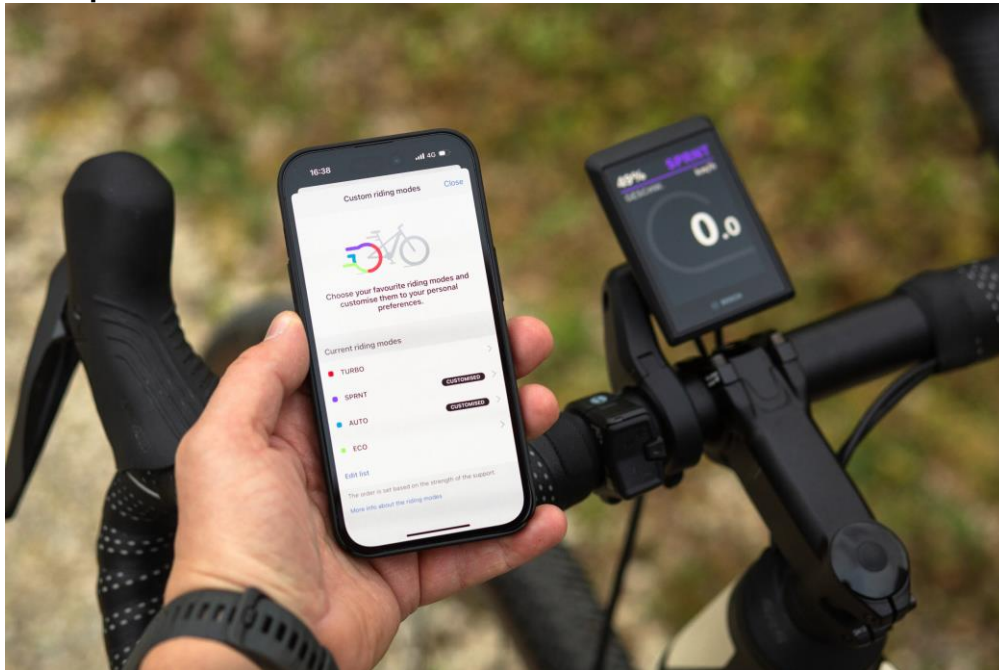
The digital smart system theft protection functions offer additional security and are the ideal complement to the mechanical lock.

Press photo 4:



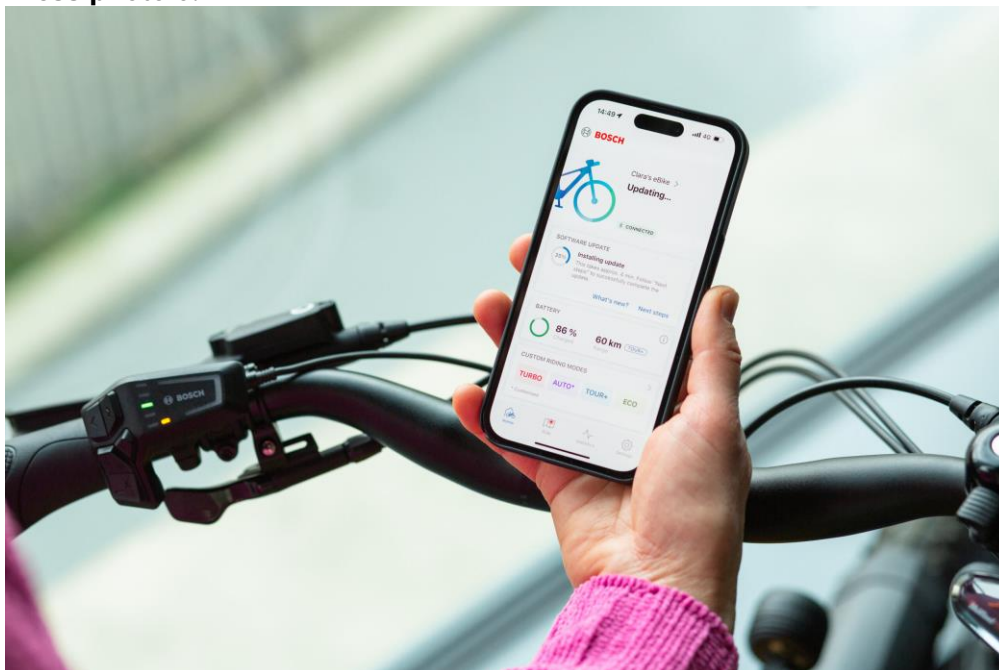
The smart system enables route planning, navigation and activity tracking via the eBike Flow app. A phone, for example, can become a navigation device with the SmartphoneGrip.

Press photo 5:



Thanks to the connectivity of the components, the eBike can be customised to the rider's own needs using the eBike Flow app – for example with individually adapted riding modes.

Press photo 6:



New features are continuously being introduced through updates to the smart system. They are simply transmitted over-the-air from the eBike Flow app to the eBike.

Contact for journalists:

Robert Bosch GmbH

Tamara Winograd

Head of Marketing Communications Bosch eBike Systems

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