



**BOSCH**

Invented for life

Driven by

# RELIABILITY

**Everything from a single source**

Commercial vehicle parts,  
diagnostics and workshop services

# Reliability and profitability along the way

## Reduced idle times, increased planning certainty



### Did you know?

Every year, some

# 13.4 million

commercial vehicles with more than six tons of GVW circulate on European roads – covering an annual overall distance of some 145,000 km in long-haul traffic.

Today Paris, tomorrow already heading towards Barcelona. Where asphalt glows in midday heat today, the rising sun will make frosty roads glow in half a year. What sounds like an idyllic trucker lifestyle is rather a race against the clock. Everyone knows: trucks can only make money if they are out on the roads. Whoever wants to increase profitability doesn't make any compromises and relies on excellent Bosch quality.



### Commercial vehicle parts, diagnostics and workshop services

The workshop and retail range includes high-quality spare parts, diagnostics and workshop equipment as well as special training courses and a Technical Support. The diagnostic software ESI[tronic] Truck covers 90 % of the European commercial vehicle market and works with diagnostic tester Bosch KTS Truck.



### Global presence

More than 14,000 associates in 150 countries and an extensive dealer network reliably ensure target-oriented workshop support and local availability of the spare parts range.



### Value-based solutions

Bosch eXchange provides a high-quality alternative for value-based repairs. The exchange products are treated according to the same standards as original parts and have to pass strict functional and quality tests. This ensures high quality and reliability at lower prices while still providing the same warranty as in the new parts program.



### Competence and know-how

Bosch knows the technical requirements of commercial vehicles very well and offers innovative and reliable solutions within its aftermarket range.





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### ESI[tronic] Truck

More than

# 500,000

error codes are covered by the ESI[tronic] 2.0 Truck diagnostic software.





# Commercial vehicle parts, diagnostics and workshop services

Today's commercial vehicles have to meet extremely high demands in terms of reliability and profitability. This affects work at workshops as well. Bosch therefore offers workshops a comprehensive range of high-quality spare parts as well as diagnostic solutions, workshop equipment and services. At the same time, the workshops also benefit from Bosch competence based on decades of experience as an original equipment supplier. They can rely on each spare part being geared to an excellent interaction with the commercial vehicle's remaining technical components.

## ENERGY MANAGEMENT

- DRIVE BELTS
- BATTERIES
- STARTERS
- ALTERNATORS

## LIGHT & VISION

- AUTOMOTIVE BULBS
- WIPER BLADES

## STEERING SYSTEMS

## VEHICLE ELECTRONICS

- ELECTRICAL MOTORS
- WATER PUMPS
- SOLENOID VALVES
- INSTALLATION EQUIPMENT
- SWITCHES
- RELAYS

## EXHAUST-GAS TREATMENT

- EXHAUST-GAS SENSORS
- DENOXTRONIC
- DEPARTRONIC
- LAMBDA SENSORS
- FILTERS

## ENGINE MANAGEMENT

- DIESEL INJECTION SYSTEMS
- SENSORS
- FILTERS

## COMPRESSED-AIR SYSTEMS

- FILTERS
- HORNS
- FANFARES

## DIAGNOSTICS & WORKSHOP EQUIPMENT

## SERVICES

# Bosch eXchange

## Value-based commercial vehicle repair

Value-based repairs are in higher demand than ever before – and not only for older commercial vehicles. But how can this be achieved without compromising on quality? Bosch eXchange provides the answer. With its comprehensive range of high-quality exchange products, vehicle repair becomes a success factor for automotive workshops.

### Bosch eXchange



Commercial vehicle spare parts from Bosch are also available as Bosch eXchange parts

### Advantages at a glance

- ▶ **High quality and reliability:** Bosch eXchange products are tested to the same standards as original parts and have to pass stringent functional and quality tests
- ▶ **Outstanding price-performance ratio:** Up to 30% more affordable than comparable products in the Bosch new parts program, while still offering the same warranty
- ▶ **Resource-saving and environmentally friendly:** Bosch eXchange saves resources and makes an important contribution to the circular economy by reusing old parts





# Diagnosics, workshop equipment and services

## Overview

Everyday commercial vehicle workshop life: Mechanical repairs have evolved into diagnosis of connected systems and target-oriented replacement of high-quality components. Professional repairs and servicing of the sophisticated systems of modern commercial vehicles require qualified diagnosis. Besides ECU diagnostics, Bosch also supplies additional workshop equipment – everything from a single source.

### The core of vehicle diagnosis:

#### Mobile diagnostic system KTS 900 Truck

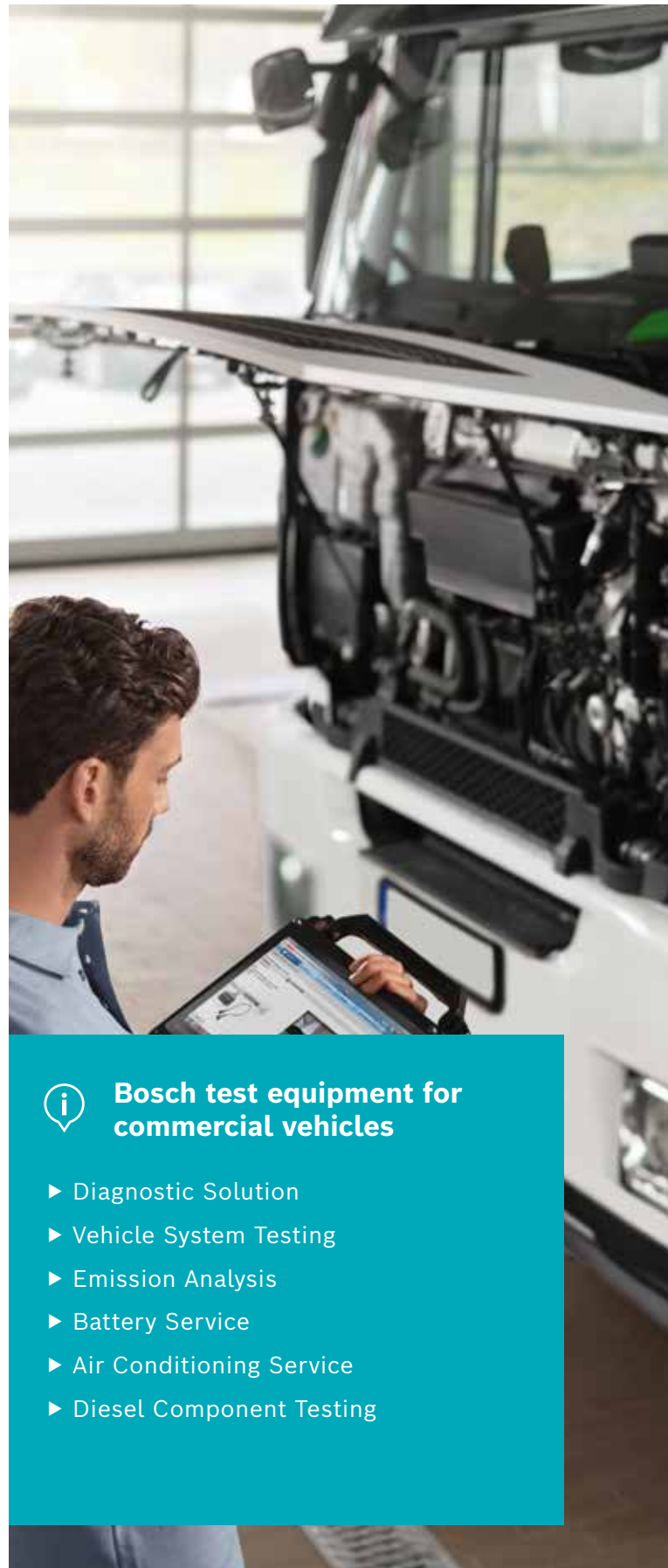
- ▶ **Ready-to-use and workshop-oriented ECU diagnostics** including DCU 220, mobile KTS Truck module and workshop software ESI[tronic] Truck
- ▶ **Easy to switch** between tablet and notebook operation
- ▶ **Two lithium-ion batteries** for the mobile use of DCU 220 at the workshop or on the roadside
- ▶ **Robust housing** with 11.6" touch screen
- ▶ **Integrated camera** for the documentation of damages on the vehicle and of required spare parts

### Technical Support

The Bosch Technical Support provides commercial vehicle workshops with a service helping them in a target-oriented manner. With repair and/or service problems, Bosch experts help with their qualified knowledge. Modern tools like the Visual Connect app and Remote Diagnosis ensure the highest efficiency during the troubleshooting process.

### Service training

Professional Bosch service training courses enable workshop employees to perform tasks related to modern commercial vehicle technology: powertrain (diesel systems), exhaust-gas treatment (Denoxtronic), electric systems and diagnosis using ESI[tronic] and KTS 900 Truck.



### Bosch test equipment for commercial vehicles

- ▶ Diagnostic Solution
- ▶ Vehicle System Testing
- ▶ Emission Analysis
- ▶ Battery Service
- ▶ Air Conditioning Service
- ▶ Diesel Component Testing

*“Racing implies a constant search for optimization potentials. A reliable partner is thus a huge support. Bosch workshop equipment and parts feature a particularly high quality. That’s material for professionals.”*

Jochen Hahn





# Team Hahn Racing

## Successful with Bosch

Jochen Hahn has been successfully competing in the FIA European Truck Racing Championship (ETRC) since 2000. Since 2011, he has won six European championship titles and two vice championships (as of 2021). This success is facilitated by his Team Hahn Racing, a real family business run by him, his wife and his children. For several years, Bosch has been supporting Team Hahn Racing providing both technology and know-how. The European truck motor racing series ETRC is a real crowd-puller attracting more than 800 000 spectators at roughly eight events each year.

### Bosch technology inside the race truck



#### Battery

Bosch TE battery with EFB technology and PowerFrame: more power right from the start



#### Diesel injection system

Diesel injection system with EDC7U control unit and unit injectors for excellent fuel injection



#### Alternator

Heavy Duty alternator for reliable power supply



#### Ribbed V-belts

Bosch ribbed V-belts provide top performance in racing applications



#### Filters

The fuel-filter replacement box and the oil filter protect both the injection system and the engine



#### Sensors

Crankshaft, camshaft and intake-manifold pressure sensors provide accurately measured data



#### Relays

Bosch relays – reliably and safely switch high currents within the race truck



#### Fuses

Bosch fuses protect cables, harnesses and devices against overloads or short circuits



#### Wiper

Bosch Aerotwin wiper blades – highly esteemed in racing for their high wiping performance

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- ▶ Bosch TE Battery with EFB technology and PowerFrame: more power right from the start
- ▶ Diesel injection system with EDC7U control unit and unit injectors
- ▶ Heavy Duty alternator for reliable power supply
- ▶ Bosch ribbed V-belts provide top performance under racing conditions
- ▶ Fuel-filter replacement box and oil filter protect both injection system and engine
- ▶ Crankshaft, camshaft and intake-manifold pressure sensors provide accurately measured data
- ▶ Bosch relays – invisible from the outside but extremely important for the race truck
- ▶ Bosch fuses protect cables, harnesses and devices against overloads or short circuits
- ▶ Bosch Aerotwin wiper blades – highly esteemed in racing for their high wiping performance





# Commercial-vehicle batteries

## Overview



### A tough job for today's commercial-vehicle batteries

#### Reliability

On an average, modern trucks cover some 145 000 km every year. Often, the drivers sleep inside the cab up to 5 nights per week. And yet the batteries need to provide enough starting power to start the engine the next day.

#### Performance

Even in case of stationary operation, the batteries power a wealth of safety and convenience features. And yet they are to cope with frequent charge and discharge cycles.

#### Economy

Low maintenance efforts help reducing the fleet operating costs.

#### Vibration resistance

As commercial-vehicle batteries are installed close to the rear axle more and more often, they are subject to increased vibrations. High robustness and vibration resistance are thus required.

As batteries have to cope with increasing strains, according to several statistics, they are one of the key reasons for breakdowns. Good to know, you can fully rely on Bosch commercial-vehicle batteries. They are powerful, vibration-resistant and even maintenance-free. This will cut the fleet operating costs.







### Did you know?

Vibration resistance is of increasing importance for commercial-vehicle batteries. More and more often, the battery is installed close to the rear axle thus clearing the space required for AdBlue and SCR catalytic converters. In order to cope with the strong vibrations at the rear axle, however, a high vibration resistance is absolutely indispensable.

# Commercial-vehicle batteries: EFB and AGM

## Product range







	TA AGM	TE EFB
	<p><b>Most powerful commercial-vehicle battery within the Bosch range with AGM technology and patented PowerFrame (grid)</b> – supporting start/stop systems and especially designed for advanced hoteling-functions with parking cooler/heater, providing energy reliably for commercial-vehicles with the extensive electrical demand of long-distance traffic, even if many days on the road or at low stage of charge</p>	<p><b>Extremely powerful and vibration-resistant commercial-vehicle battery with EFB technology</b> – designed to cope with the huge energy demands of long-distance traffic, numerous convenience and comfort functions as well as off-highway and heavy-duty applications</p>
Technology	<p> <b>AGM (Absorbent Glass Mat):</b> acid absorbed by micro-fiberglass mat allows more energy to pass through</p>	<p> <b>EFB (Enhanced Flooded Battery):</b> positive plate coated with polyester scrim ensures additional retention of the active material and a high deep-cycle resistance</p>
Scope of application	<p> Long-haul trucks, distribution traffic/trucks with tail lift, coaches and buses, applications with advanced hoteling functions – including parking cooler/heater</p>	<p> Long-haul trucks, distribution traffic/trucks with tail lift, construction machinery and off-road trucks, coaches and buses, municipal vehicles with a high rate of city traffic and fire-fighting vehicles, agricultural vehicles, applications with numerous electrical consumers</p>
Service life	● ● ● ● ●	● ● ● ● ●
Cold starting performance	● ● ●	● ● ●
Deep-cycle resistance	● ● ● ●	● ● ●
Number of electrical consumers	● ● ● ●	● ● ●
Vibration resistance	● ● ● V4/EN-50342-1	● ● ● V4/EN-50342-1
Maintenance and water consumption	Absolutely maintenance-free and leakproof – reduces fleet operating costs Very low water consumption	Absolutely maintenance-free – reduces fleet operating costs Very low water consumption thanks to labyrinth lid
Installation inside the vehicle	Yes	Yes
Installation angle	0°	0°
Shelf life	18 months	18 months



# Commercial-vehicle batteries: Lead-acid SLI

## Product range



	T5 SLI	T4 SLI	T3 SLI
	<p><b>Particularly powerful and deep-cycle-resistant commercial-vehicle starter battery with flow-optimized grid design – for high energy demands on long-distance trips</b></p>	<p><b>Persistent commercial-vehicle starter battery with patented PowerFrame (grid) for optimized current flow and reduced corrosion – for average energy demands</b></p>	<p><b>Reliable commercial-vehicle starter battery with patented PowerFrame (grid) for optimized current flow and reduced corrosion – ideal for vehicles with low energy demands</b></p>
Technology	 <p><b>Lead-acid SLI:</b> Starting-Lighting-Ignition/starter battery</p>		
Scope of application	 <p>Long-haul trucks, distribution traffic/trucks with tail lift, construction machinery and off-road trucks, coaches, applications with numerous electrical consumers</p>	 <p>Long-haul trucks, distribution traffic/trucks with tail lift, construction machinery and off-road trucks, coaches</p>	 <p>Distribution traffic/trucks with tail lift, vans and LCVs</p>
Service life	● ● ●	● ● ●	● ●
Cold starting performance	● ● ●	● ● ●	● ●
Deep-cycle resistance	● ●	● ●	●
Number of electrical consumers	● ●	● ●	●
Vibration resistance	● ● V3/EN-50342-1	● ● V3/EN-50342-1	● V2 or V3 (depending on type)/ EN-50342-1
Maintenance and water consumption	Absolutely maintenance-free – reduces the fleet operating costs Very low water consumption thanks to labyrinth lid	Absolutely maintenance-free – reduces the fleet operating costs Very low water consumption thanks to labyrinth lid	Low maintenance requirement*
Installation inside the vehicle	Yes	Yes	No
Installation angle	0°	0°	0°
Shelf life	18 months	15 months	12 months

\* Depending on type, hybrid-lid allows topping-up with water in case of excessive use

# TA AGM commercial-vehicle battery

## Product details

**Most powerful commercial-vehicle battery within the Bosch range with AGM technology and patented PowerFrame (grid)** – supporting start/stop systems and especially designed for advanced hoteling functions with parking cooler/heater, providing energy reliably for commercial-vehicles with the extensive electrical demand of long-distance traffic, even if many days on the road or at low stage of charge



### Advantages at a glance

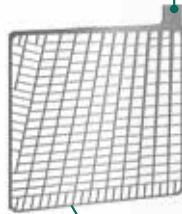
- ▶ **Acid absorbed by micro-fiberglass mats (AGM technology) allows higher amounts of energy to be provided:** ensures a 6 times higher deep-cycle resistance than conventional batteries with up to 80% DoD (Depth of Discharge), ensuring constant power in stationary mode and stop-and-go traffic
- ▶ **Reliable starting power and improved cycling performance:** active mass with specially designed waffle-structure on both negative and positive PowerFrame grids lead to very low internal resistance
- ▶ **Highest vibration resistance V4 according to EN-standard and for safe installation at the rear axle:** due to additional reinforcements and a central arrangement of intercell connectors
- ▶ **Absolutely maintenance-free and leakproof – reducing fleet operating costs:** special sealed lid design with degassing channel and cell plugs with integrated valve for each individually sealed cell
- ▶ **High quality and outstanding starting power:** material quality and standards equivalent to the ones used for original equipment



# AGM (Absorbent Glass Mat) Technology

## Patented PowerFrame (grid) both on positive and negative grid for optimized current flow and reduced corrosion

The flow-optimized grid design of the PowerFrame ensures consistently high starting power and a long service life. In addition, a special alloy ensures a high corrosion resistance and lower self-discharge.



## Cell-Plug with integrated valve

## Special lid design with degassing channel

Special sealed lid design with degassing channel and cell plugs with integrated valve for each individually sealed cell. Absolutely maintenance-free and leakproof.



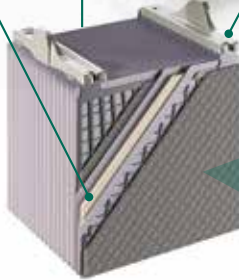
## Additional stabilization for vibration resistance (V4 according to EN-standard)

## Special Case for AGM technology

Increased wall thickness to ensure durable compression for particularly high stability.

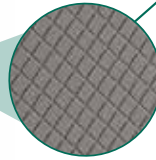
## AGM (Absorbent Glass Mat) – acid absorbed by micro-fiberglass mats

In AGM technology, special micro-fiberglass mats are installed close to the lead plates and absorb the battery acid completely. High contact pressure minimizes the loss of active material at very low internal resistance. Due to the fast reaction of acid and plate material, higher amounts of energy can be provided.



## Set of plates with particularly robust connection

The central arrangement of the intercell connectors between positive and negative plates ensures additional stability.



## Active mass with specially designed waffle structure for improved performance

Active mass with specially designed waffle structure on both negative and positive PowerFrame (grids) ensures improved cycling performance and reliable starting power due to very low internal resistance.



## Did you know?

Remarkable deep-cycle resistance at up to

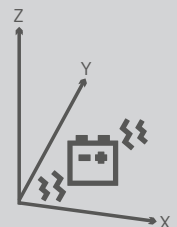
# 80 % DoD

(Depth of Discharge)



## 3D stress tests in the laboratory

To be classified as V4 according to EN-standard the battery has to undergo stress tests whereby real driving conditions are simulated. Three dimensions are tested – vertical, horizontal and diagonal. These tests are much more extensive than for the EN V3-requirement where only the vertical dimension is tested.



# Increasing demands placed on batteries

## Trends in long-haul traffic

Due to the growing number of electronic consumers on board and changing usage profiles, commercial-vehicle batteries have to meet ever higher demands.



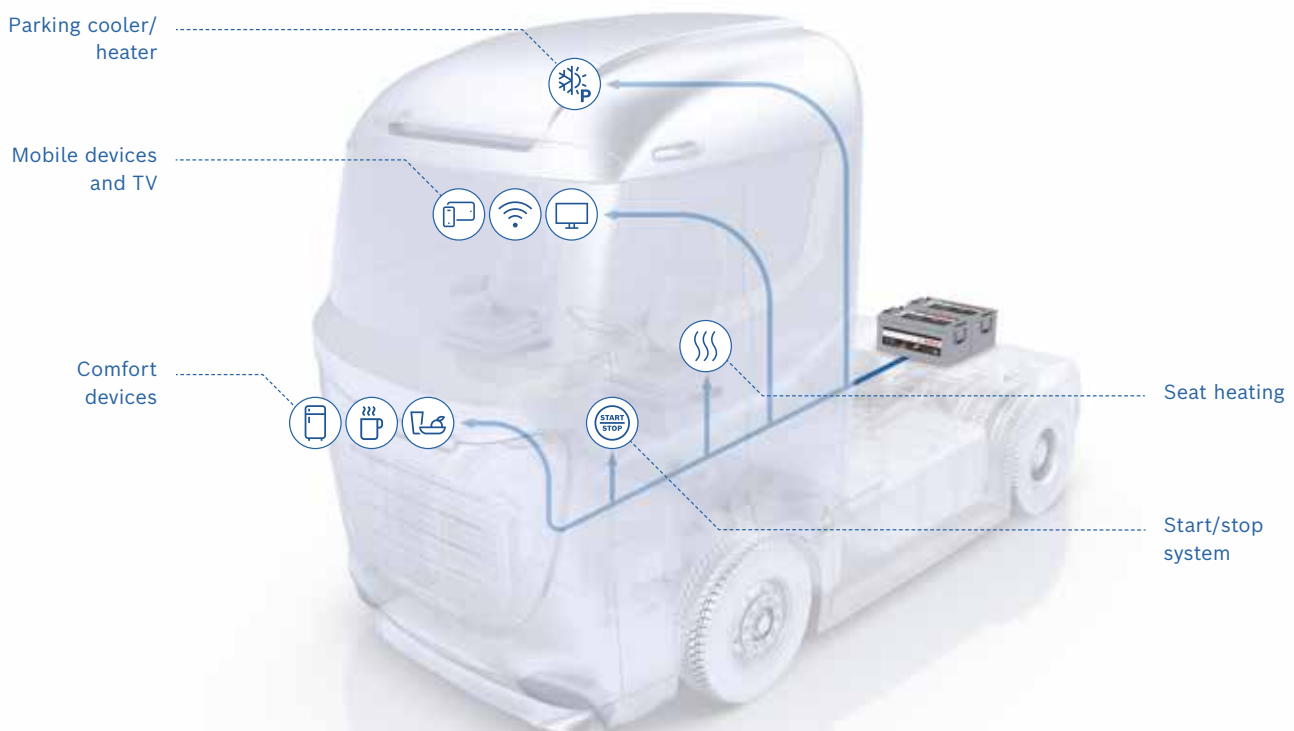
### A lot of electrical consumers

In modern long-haul traffic, truck drivers spend more and more days and nights at their truck's cabin. Accordingly, comfort and convenience features are of increasing importance. These electrical consumers on board modern commercial vehicles need to be powered in stationary operation as well. Nonetheless, there must always be enough energy left for reliable engine startups. These increased demands call for particularly powerful and deep-cycle resistant batteries.

### Changed usage profile

Concomitantly with a growing number of overnight stays on board, the individual stages get shorter thus reducing the time to recharge the batteries during the journey. This results in increased power consumption and reduced battery recovery periods. To reduce the risk of failure and downtimes, extremely powerful commercial-vehicle batteries are thus required which allow quick recharging and ensure increased charge acceptance.

## Functions reliably powered by modern truck batteries





# TE EFB commercial-vehicle battery

## Product details

**Extremely powerful and vibration-resistant commercial-vehicle battery with EFB technology** – designed to cope with the huge energy demands of long-distance traffic, numerous convenience and comfort functions as well as off-highway and heavy-duty applications

**Extremely powerful and vibration resistant according to EN V4**



### Advantages at a glance

- ▶ **Extremely powerful commercial-vehicle battery – for tremendous electrical demands as well as several convenience and comfort functions in stationary operation:** EFB (Enhanced Flooded Battery) technology ensures twice the deep-cycle resistance of conventional batteries – the battery copes much better with frequent discharging and charging
- ▶ **Particularly vibration resistant according to EN V4-requirement and for safe installation at the rear axle, off-highway vehicles and heavy-duty construction machinery:** specially glued polyester fleece reliably keeps the battery plates in position, additional reinforcements and stabilized connectors make the battery highly vibration-resistant
- ▶ **Above-average service life and starting power:** material quality and standards equivalent to the ones used for original equipment
- ▶ **Absolutely maintenance-free and leakproof – reducing fleet operating costs:** the labyrinth lid ensures evaporated liquid to remain inside the battery; this results in very low water consumption

# EFB (Enhanced Flooded Battery) Technology

## Patented PowerFrame (grid) for optimized current flow and reduced corrosion

The special grid-stamping technique makes this battery particularly corrosion-resistant and durable. The flow-optimized PowerFrame grid design ensures consistently high starting power. This results in a very low self-discharge rate.

## Labyrinth lid

The double lid with labyrinth design returns condensed water to the battery. As a result, TE batteries are absolutely maintenance-free and leak-proof. They consume very little water. The integrated central degassing, backfire protection and an additional sealing ring ensure high operational safety.

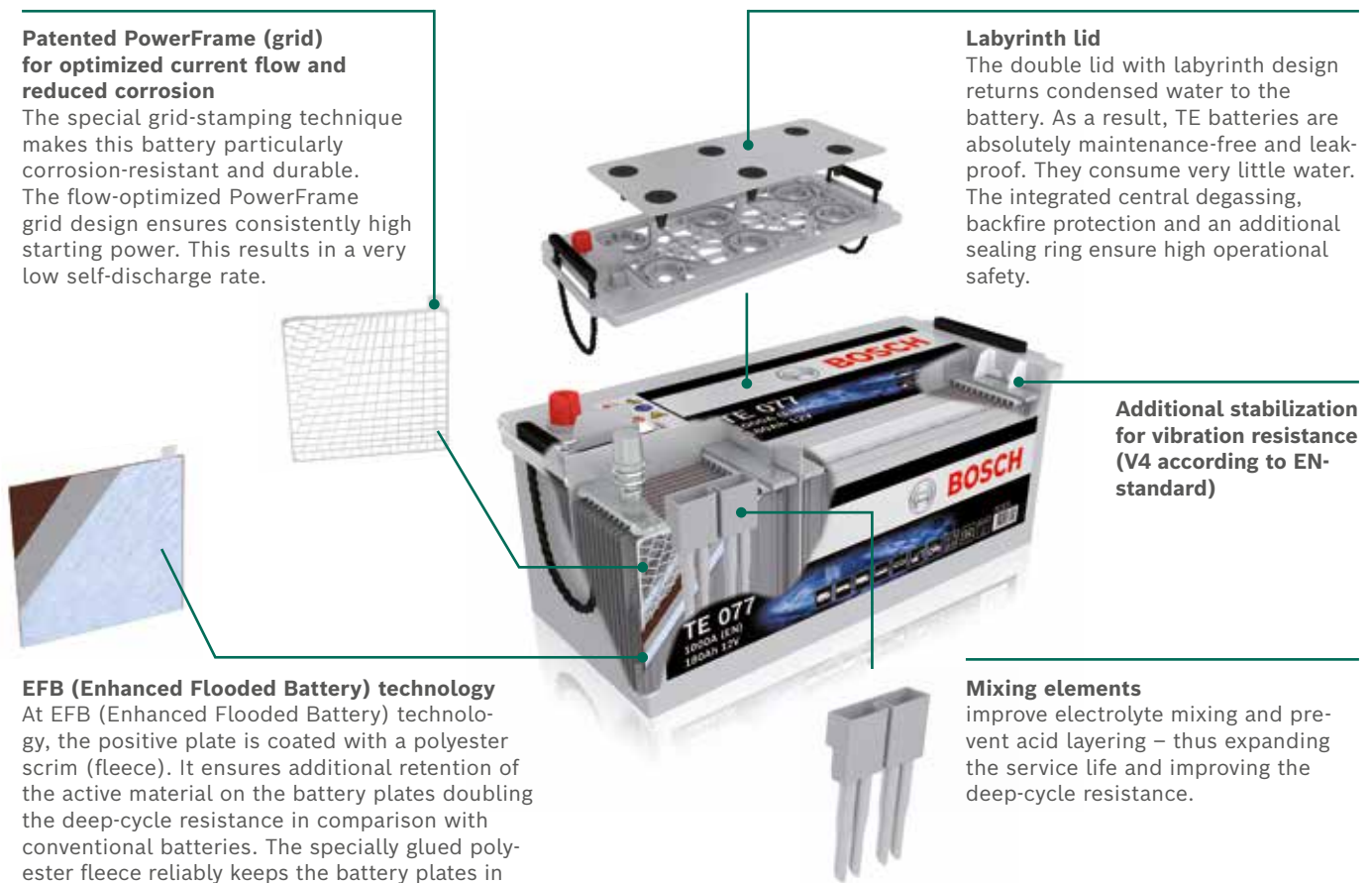
Additional stabilization for vibration resistance (V4 according to EN-standard)

## Mixing elements

improve electrolyte mixing and prevent acid layering – thus expanding the service life and improving the deep-cycle resistance.

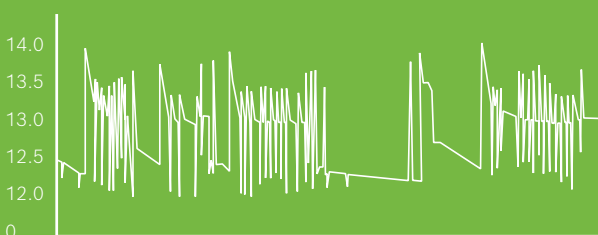
## EFB (Enhanced Flooded Battery) technology

At EFB (Enhanced Flooded Battery) technology, the positive plate is coated with a polyester scrim (fleece). It ensures additional retention of the active material on the battery plates doubling the deep-cycle resistance in comparison with conventional batteries. The specially glued polyester fleece reliably keeps the battery plates in position. As a consequence, the battery remains operational even if subject to strong and lasting vibrations.



## Straining of batteries due to frequent starts and stops as well as a large number of electrical consumers

Frequent starts and stops, e.g. in inner-city traffic, and a lot of electrical consumers, such as convenience functions in long-distance traffic, often cause a negative energy balance.



With their high capacity, Bosch TE EFB batteries cope better with frequent charging and discharging. As a result, the energy efficiency, for instance in start/stop traffic, is increased significantly. The high deep-cycle resistance is particularly beneficial for long-haul trucks. At these vehicles, the battery supplies the large number of convenience functions. The result: reliable long-term operation.

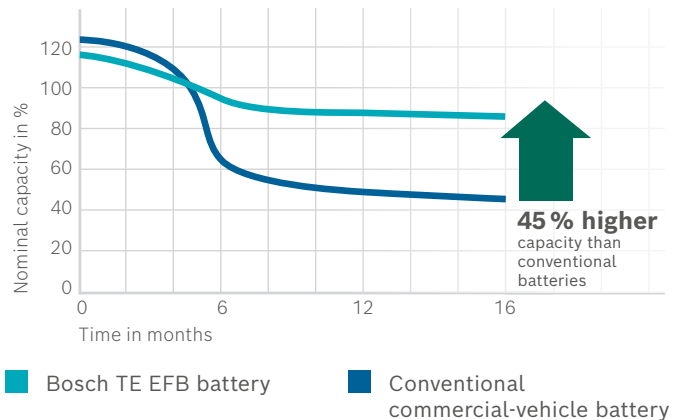
# EFB (Enhanced Flooded Battery)

## Quality tests

### High performance, long service life

#### Field test with renowned commercial-vehicle manufacturers proves:

- ▶ Capacity of 85% after 16 months – despite large amount of comfort and convenience functions
- ▶ Noticeably longer service life and higher reliability



### Above average

#### A benchmark test proves:

- ▶ There is hardly any other battery meeting the test criteria as Bosch TE batteries do

#### Test criteria and results of Bosch TE EFB battery

##### Capacity according to EN at 20 h:

Low loss of capacity throughout the complete service life

##### Cold starting performance according to EN at -18 °C:

Very high

##### Deep-cycle resistance according to EN at 50% DOD\*:

Above average

##### Water consumption according to EN:

Extremely low thanks to labyrinth lid

##### Vibration resistance according to EN:

Meets V4 (highest vibration resistance within the EN requirements)

##### Acid layering:

None – thanks to effective mixing elements

\* DOD: depth of discharge

### High quality pays off

#### Cutting fleet operating costs:

Choosing the right battery, the general maintenance costs, the fuel costs and the costs for servicing and repairs can be cut. Wear and maintenance efforts are reduced as well.

Bear in mind: The outstanding battery management reduces the risk of losses of earnings caused by unexpected downtimes or repairs.

#### Example:

Type of costs	Not maintenance-free battery	Bosch commercial-vehicle battery
Acquisition costs	EUR 300.00	EUR 425.00
Maintenance costs	EUR 350.00	EUR 0
Downtime costs	EUR 131.25	EUR 0
<b>Total:</b>	<b>EUR 781.25</b>	<b>EUR 425.00</b>



# T5 SLI lead-acid commercial-vehicle battery

## Product details

Particularly powerful and deep-cycle-resistant commercial-vehicle starter battery with patented PowerFrame (grid) for optimized current flow, reduced corrosion and high energy demands on long-distance trips



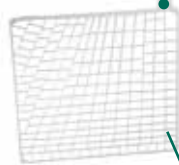
### Advantages at a glance

- ▶ **Very long service life and reliable starting power, even after extended downtimes:** special grid stamping technique for optimized current flow, reduced corrosion and a long service life
- ▶ **Reliably covers the high energy demands of long-distance operation:** very high quality standards for materials and production
- ▶ **Very high resistance to vibrations:** thanks to their robust design, T5 batteries meet the vibration resistance V3 according to EN-standard
- ▶ **Absolutely maintenance-free and leak-proof – reducing fleet operating costs:** the labyrinth lid ensures evaporated liquid to remain inside the battery; this results in very low water consumption

# PowerFrame Technology

## Patented PowerFrame (grid) for optimized current flow and reduced corrosion

The special grid-stamping technique makes this battery particularly corrosion-resistant and durable. The flow-optimized PowerFrame grid design ensures consistently high starting power. This results in a very low self-discharge rate.



## Labyrinth lid

The double lid with labyrinth design returns condensed water to the battery. As a result, T5 batteries are absolutely maintenance-free and leak-proof. They consume very little water. The integrated central degassing, backfire protection and an additional sealing ring ensure high operational safety.



## Ion-permeable pocket separator

Prevents any contact between positive and negative plates – thus increasing both service life and starting power.



## KTS Truck: ECU diagnoses for modern commercial-vehicle electronics

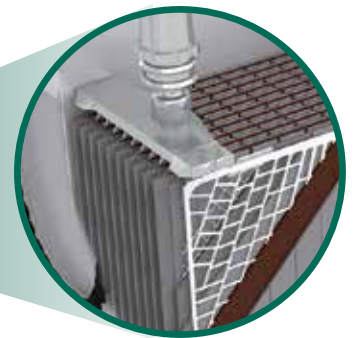
- ▶ KTS Truck module for trucks, vans, LCVs, trailers and buses in Europe, Asia, North and South America
- ▶ Can be connected to DCU 220 and all common laptops/PCs thanks to USB interface
- ▶ Integrated long-distance Bluetooth connection with high range up to 100m
- ▶ Bluetooth-USB adapter included within scope of delivery
- ▶ Robust housing



# T4 SLI lead-acid commercial-vehicle battery

## Product details & technology

**Persistent commercial-vehicle starter battery with patented PowerFrame (grid) for optimized current flow and reduced corrosion** – for average energy demands



### **Patented PowerFrame (grid) for optimized current flow and reduced corrosion**

The special grid-stamping technique makes this battery particularly corrosion-resistant and durable. The flow-optimized PowerFrame grid design ensures consistently high starting power. This results in a very low self-discharge rate.



### Advantages at a glance

- ▶ **Long service life and high starting power:** special grid stamping technique for optimized current flow and reduced corrosion – prevents early battery failure
- ▶ **High resistance to vibrations:** thanks to their robust design, T4 batteries meet the vibration resistance V3 according to EN-standard
- ▶ **Absolutely maintenance-free and leakproof – thus reducing fleet operating costs:** the labyrinth lid ensures evaporated liquid to remain inside the battery, this results in very low water consumption

**?** Did you know?

## Battery expert since 1922

In 1922, Bosch produced its first battery in Stuttgart-Feuerbach.





# T3 SLI lead-acid commercial-vehicle battery

## Product details

**Reliable commercial-vehicle starter battery with patented PowerFrame (grid) for optimized current flow and reduced corrosion** – ideal for vehicles with low energy demands



### Advantages at a glance

- ▶ **Average service life and reliable starting power:** special grid stamping technique for optimized flow of current and reduced corrosion – prevents early battery failure
- ▶ **Vibration resistant:** T3 batteries meet depending on type the vibration resistance V2 or V3 according to EN-standard
- ▶ **Maintenance-Free:** depending on type, hybrid-lid allows topping-up with water in case of excessive use

# Relays

## Overview

**Bosch relays reliably perform switching operations** – in both mobile and stationary applications. The comprehensive range includes 12- and 24-volt relays of all sizes for practically any application purpose.

### Competent and experienced

Bosch relays are not only used at the automotive sector, but also for a variety of other sectors. The huge development experience and more than 40 years of production know-how make Bosch a competent partner for anything related to relay applications.

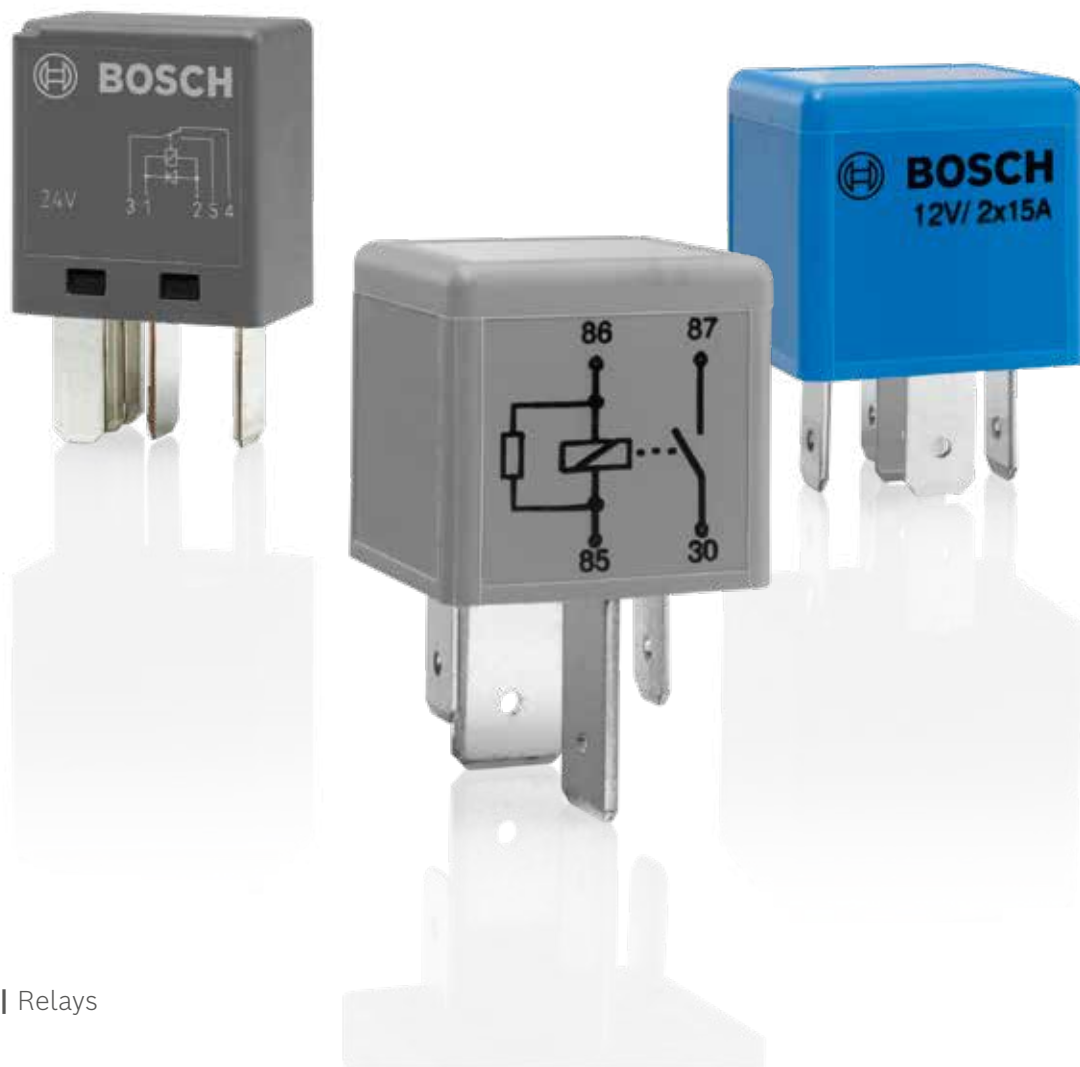
### Comprehensive range

Bosch provides a comprehensive range of 12- and 24-volt relays of all sizes and for almost any application purpose – in both mobile and stationary applications.

Continuous further development of the whole range ensures state-of-the-art technology at all times.

### Premium quality

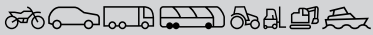
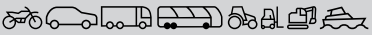

Due to meticulous processing and the use of high-quality materials allowing up to 250 000 switching cycles, Bosch relays feature a particularly long service life. Designed for ambient temperatures reaching from -40 °C to up to +100 °C, the compact relays also stand out for their high robustness.



# Relays

## Product range & details



	Micro relays	Mini relays	Power relays
	Featuring a particularly compact design and a nominal voltage of either 12 or 24 volts, <b>Bosch micro relays</b> are perfectly suitable for a wide range of vehicles. They reliably perform switching operations and allow rated switching currents of up to 25 A. Thanks to their precisely fitting design, they are an ideal solutions for easy and quick service tasks.	<b>Bosch mini relays</b> feature a compact design and a nominal voltage of either 12 or 24 volts making them perfectly suitable for a wide range of vehicles. They reliably perform switching operations and allow rated switching currents of up to 75 A. Thanks to their precisely fitting design, they are an ideal solution for safe and quick service tasks.	<b>Bosch power relays</b> are particularly suitable for switching operations concerning engines, starters and other large consumers. They work with rated switching currents of up to 350 A – in case of battery cut-off relays even up to 3 500 A. Optionally also available as heavy-duty version.
Nominal voltage	12 V / 24 V	12 V / 24 V	12 V / 24 V
Switching current	up to 25 A	up to 75 A	up to 350 A
Temperature	from -40 °C to +100 °C	from -40 °C to +100 °C	Type 1: from -40 °C to +65 °C Type 2: from -40 °C to +100 °C Type 3: from -40 °C to +100 °C
Functions	Make/changeover contact with and without resistor/diode	Make/changeover contact with and without resistor/diode, with and without bracket	Make/changeover contact with and without resistor/diode
Application			
Advantages at a glance	<ul style="list-style-type: none"> <li>▶ Durable and robust due to meticulous processing and use of high-quality materials for up to 250 000 switching cycles</li> <li>▶ Particularly high temperature resistance</li> <li>▶ Flexible and easy to use</li> </ul>	<ul style="list-style-type: none"> <li>▶ Particularly powerful due to high rated switching currents of up to 75 A.</li> <li>▶ Durable and robust due to meticulous processing and use of high-quality materials for up to 250 000 switching cycles</li> <li>▶ High corrosion resistance</li> </ul>	<ul style="list-style-type: none"> <li>▶ Long service life due to particularly high vibration and shock resistance.</li> <li>▶ Powerful version ideal for applications related to large consumers/engines</li> <li>▶ Particularly high temperature resistance</li> </ul>



### Bosch relays in mobile applications

#### Proven in cars, trucks and motorcycles

- ▶ Coolant fan
- ▶ Gasoline pump
- ▶ Wiper motor
- ▶ Fan motor
- ▶ Electric seat heating, seat adjustment
- ▶ Heated rear window
- ▶ Brake light
- ▶ Central locking system
- ▶ Electric windows
- ▶ Electric side mirrors
- ▶ Starters
- ▶ Horns
- ▶ ABS





# Modern diesel injection systems

## Overview

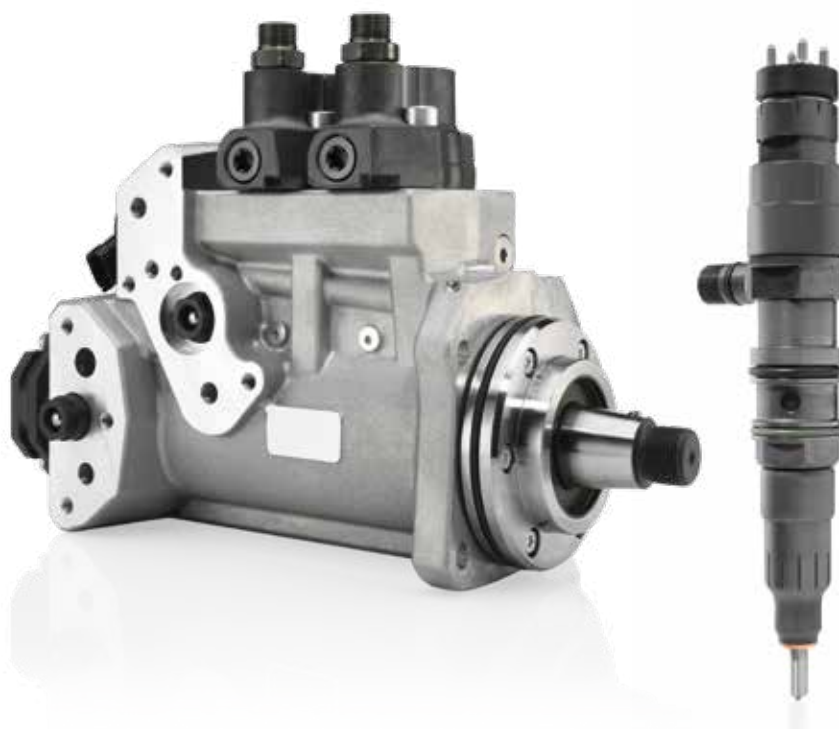
**The common-rail system:** By means of products such as unit pumps, unit injectors or even the common-rail system, Bosch made a significant contribution to the development of modern diesel systems. Bosch technology stands for the powerful performance and the efficient fuel combustion of modern diesel engines.

### Common-rail injection: pioneering diesel engine technology

In 1997, Bosch launched the first common-rail system onto the market. The system's name is based on the common rail supplying all cylinders with fuel. At conventional diesel injection systems, the fuel pressure for each injection cycle has to be generated separately. At common-rail systems, however, pressure build-up and injection are separated from each other. Fuel is thus always available at the required injection pressure.

### History of modern diesel injection systems in commercial vehicles

- 1994** UIS unit injection system 2
- 1995** UPS unit pump system
- 1996** Radial piston distributor pump VP44
- 1998** CRS common-rail system CRIN 1
- 2004** Denoxtronic 1
- 2005** UIS unit injector system 3
- 2006** Denoxtronic 2
- 2007** Departronic 1
- 2007** Denoxtronic 2.2
- 2010** Departronic 2
- 2014** Common-rail high-pressure pump CPN5
- 2018** Denoxtronic 6-HD
- 2019** Common-rail high-pressure pump CPN6
- 2021** Common-rail injector CRIN20L



# Modern diesel injection systems

## Product range & details

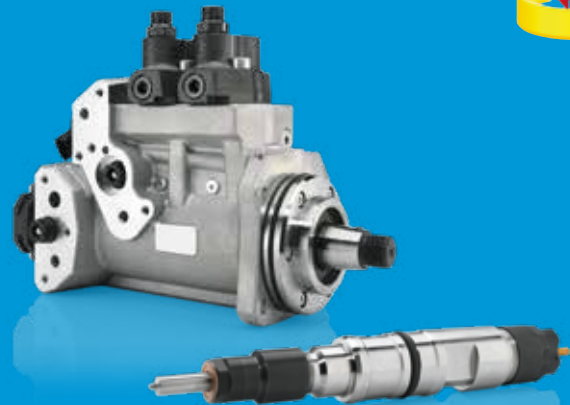


CR pump	CR injectors	Unit injector system	Unit pump systems
<p>At common-rail systems, the high-pressure pump compresses the fuel to up to 2 700 bar and provides the amount required. For this purpose, it constantly supplies the high-pressure rail with fuel and maintains a consistent system pressure. As the pressure build-up is not linked to the engine speed, the pressure required is thus available even at low engine speeds.</p>	<p>Injectors inject fuel right into the combustion chamber. They are supplied by the fuel rail and via short high-pressure fuel lines. The engine control unit manages the switch valve integrated into the injector thus opening and closing the injection nozzle. The switch valve can be controlled either electromagnetically or by a Piezo element.</p>	<p>The unit injector system (UIS) also known as pump/nozzle system is an electronically controlled diesel direct injection system developed by Bosch. At unit injector systems, the single-plunger pump and the injection nozzle are combined into a single unit.</p>	<p>The unit pump system (UPS) is used for commercial vehicles only. It uses a pressure pump for each cylinder. Therefore, the system also known as “pump/line/nozzle” system is closely related to the unit injector system (UIS). This system allows injection pressures of up to 2 000 bar.</p>

Areas of application			
<p><b>Advantages at a glance</b></p>	<ul style="list-style-type: none"> <li>▶ Highly efficient fuel injection</li> <li>▶ High engine running smoothness and performance at any operating point</li> <li>▶ Injection can be controlled individually for each cylinder</li> </ul>	<ul style="list-style-type: none"> <li>▶ High engine performance concomitant with low fuel consumption</li> <li>▶ High level of efficiency</li> <li>▶ Low noise level</li> </ul>	<ul style="list-style-type: none"> <li>▶ High engine performance concomitant with reduced engine emissions and low consumption</li> <li>▶ Very high injection pressures and accurate quantity control</li> <li>▶ High wear resistance</li> </ul>

### Bosch eXchange

The comprehensive range of Bosch eXchange products provides an attractive option for value-based vehicle repairs. Bosch eXchange parts come with the same warranty as the Bosch new parts program.



# Common-rail pumps

## Product details

**At common-rail systems, the high-pressure pump** compresses the fuel to up to 2700 bar and provides the amount required. For this purpose, it constantly supplies the high-pressure rail with fuel and maintains a consistent system pressure. As the pressure build-up is not linked to the engine speed, the pressure required is thus available even at low engine speeds.



### Advantages at a glance:

- ▶ **High engine performance and smooth operation** combined with low consumption
- ▶ **High efficiency** since the rail pressure is already available at low engine speeds
- ▶ **Reduced consumption** in combination with start/stop systems
- ▶ **Long service life** due to robust design

**i** **Bosch eXchange**

*eXchange*

By means of CPN5, Bosch provides an eXchange product of the latest generation as an attractive option for value-based vehicle repairs. Bosch eXchange parts come with the same warranty as the Bosch new parts program.



# Common-rail injectors

## Product details

**Injectors** inject fuel right into the combustion chamber. They are supplied by the fuel rail and via short high-pressure fuel lines. The engine control unit manages the switch valve integrated into the injector thus opening and closing the injection nozzle.



### Advantages at a glance:

- ▶ **Highly efficient fuel injection**  
due to extremely short injection intervals and multiple injection
- ▶ **Pilot, main and post injections increase the efficiency of fuel combustion**, the running smoothness of the engine and the engine performance at any operating point
- ▶ **The injection into each cylinder** can be controlled individually
- ▶ **Closing hydraulically, the nozzle needle** ensures a quick injection stop

### Bosch QualityScan (BQS)

#### Professionals rely on high quality.

In future, Bosch common-rail injectors and injection pumps will thus be equipped with the repair-ID label proving they were repaired by an authorized Bosch diesel specialist. On the left side of the picture: data matrix code on the blue repair-ID clip on a common-rail injector for trucks (CRIN)



# Unit injector system

## Product details

**The unit injector system (UIS)** also known as pump/nozzle system is an electronically controlled diesel direct injection system developed by Bosch. At unit injector systems, the single-plunger pump and the injection nozzle are combined into a single unit.



### Advantages at a glance:

- ▶ **High and optimized engine performance** combined with low fuel consumption
- ▶ **High coefficient of performance** due to compact design
- ▶ **Low noise generation** due to installation right into the engine block
- ▶ **Injection pressures of up to 2 200 bar** for best possible air/fuel mixture formation

### Unit injectors for champions



Jochen Hahn, six-time European champion in the European Truck Racing Championship (FIA ETRC, as of 2021), is again relying on unit injectors from Bosch in his race truck this season.

# Unit pump systems

## Product details

**The unit pump system (UPS)** is used for commercial vehicles only. It uses a pressure pump for each cylinder. Therefore, the system also known as “pump/line/nozzle” system is closely related to the unit injector system (UIS). In the UPS in fact the nozzle holder combination and the injection pump are connected via a short high pressure connection.



### Advantages at a glance:

- ▶ **Very high injection pressures** and accurate quantity control
- ▶ **High engine performance** concomitant with reduced engine emissions and low consumption
- ▶ **Very high wear resistance** of the roller plungers
- ▶ **Lower emissions** thanks to pilot injection
- ▶ **Quick and easy** replacement in case of servicing

### ESI[tronic] Truck

KTS Truck and ESI[tronic] 2.0 Truck enable maintenance and repair for over

# 70,000

electronic vehicle systems





# Conventional diesel systems

## Overview

**Bosch started producing in-line injection pumps back in 1927.** The distributor injection pump (1962), the electronic diesel control (1987) and the control-sleeve in-line fuel injection pump (1993) marked important milestones at the development of conventional diesel systems.

### Designed for high cylinder outputs

in-line injection pumps are used for 2-to-12-cylinder engines – mainly engines of commercial vehicles, construction and agricultural machinery and stationary engines.

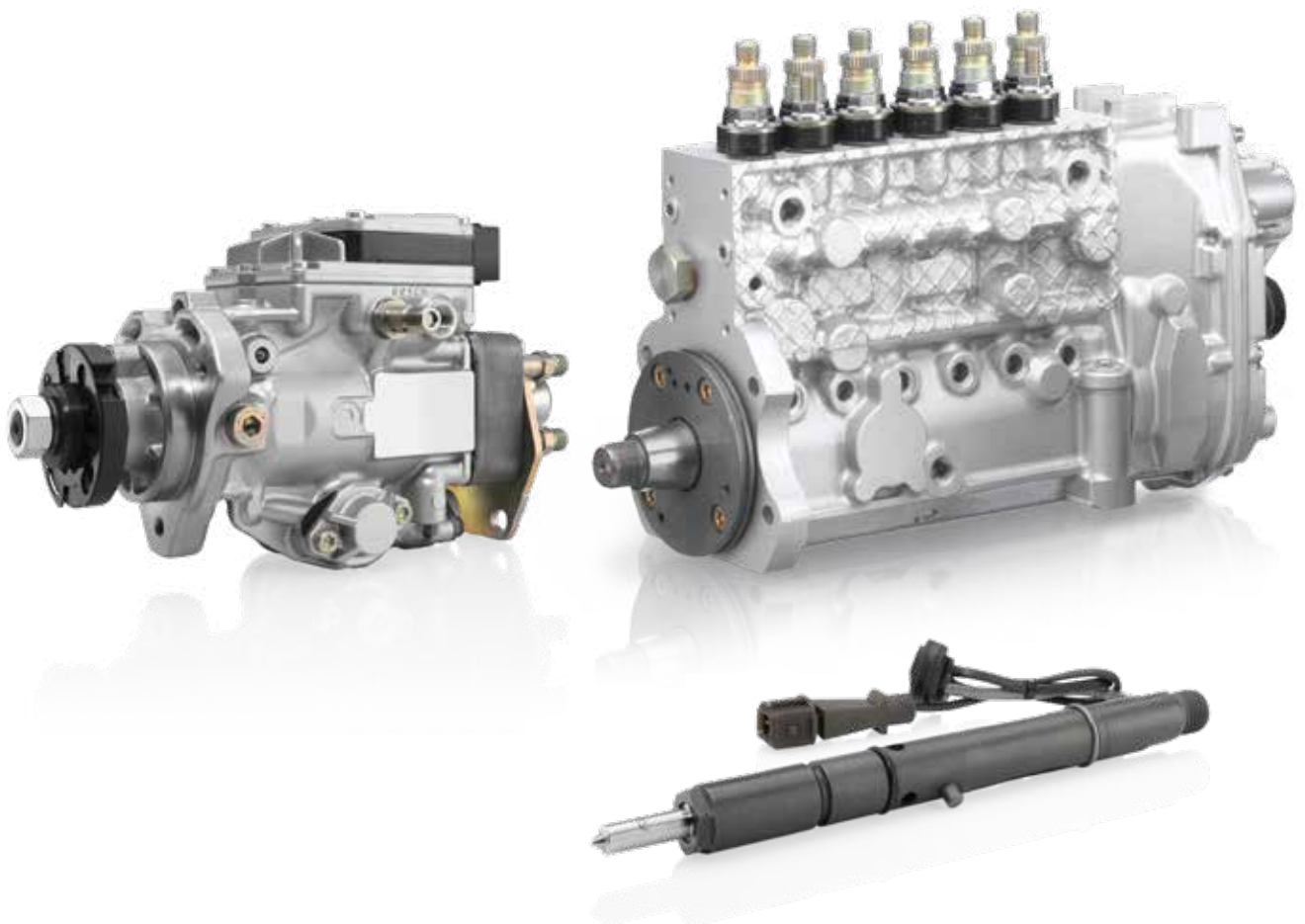
As this type of pump is lubricated by means of the engine oil circuit, it even copes with lower quality fuels. Nevertheless, lasting reliability and a long service life can only be ensured in case of regular maintenance and proper installation of Bosch spare parts.

### Small diesel engines running at high speeds

need a high-performance injection system combining quick injection sequences, low weight and a small installation volume. Distributor-type injection pumps meet these requirements. They consist of a small, compact assembly containing the supply pump, the high-pressure pump and the regulator.

### Injection into the combustion chamber

Specifically for the injection of the air/fuel mixture into each of the cylinders of an engine, Bosch also developed the nozzle-and-holder assembly.



# In-line pumps

## Product details

**In-line injection pumps** allow high cylinder outputs at 2-to-12-cylinder engines. They are used in engines of commercial vehicles, construction and agricultural machinery as well as for stationary engines. Their name is based on the pump cylinders arranged in lines. At engines equipped with this pump, each cylinder is supplied with fuel by an own pump element and via a pressure valve and a high-pressure line.



### Advantages at a glance:

- ▶ **Due to the top fitting accuracy of the pump pistons**, no special seal is required – not even in case of high pressures and low rotational speeds
- ▶ **Can also be operated with lower quality fuels** due to lubrication via engine oil circuit
- ▶ **Lasting reliability and a long service life** in case of regular maintenance and use of the proper Bosch spare parts

### Diesel component repair



**Diesel Center**



**Diesel Service**

**Bosch Diesel Center & Bosch Diesel Service** have an excellent reputation as centers of competence for all aspects of maintenance and servicing of diesel injection systems. They are competent contacts for authorized workshops, fleet operators, business customers and private vehicle owners.

# VE/VP distributor injection pumps

## Product range & details


Due to their compact design, **distributor-type injection pumps** can be used for diverse application purposes in passenger cars, commercial vehicles, stationary engines as well as construction and agricultural machinery (off-highway).




Distributor injection pump (VE)	Distributor injection pump (VP)
<p>Axial-piston distributor injection pumps are used for engines with a power output of approx. 30 kW per cylinder.</p> <p>Axial-piston distributor injection pumps (VE) for engines with indirect injection (IDI) generate pressures of up to 250 bar at the nozzle. Used for engines with direct injection (DI), they generate peak pressures of approx. 1 950 bar.</p>	<p>Radial-piston distributor injection pumps (VP) are used for engines with a power output of up to 45 kW per cylinder.</p> <p>Used for direct injection (DI) engines, radial-piston distributor injection pumps (VP) generate peak pressures of approx. 1 950 bar.</p>

Scope of application	
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Advantages at a glance	<ul style="list-style-type: none"> <li>▶ <b>Accurate fuel dosing</b> by means of variable injection pressures and injection timing due to electronically controlled injection with electric supply pump</li> <li>▶ <b>Long service life</b> due to high robustness</li> <li>▶ <b>Widespread application</b> in vehicles due to its space-saving design</li> <li>▶ <b>Maintenance-free</b> due to lubrication by fuel</li> </ul>
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### Bosch eXchange



#### Bosch eXchange spare parts range for VP30 and VP44 distributor injection pumps

Having been produced for decades and in millions, these days distributor injection pumps of the types VP30 and VP44 are often used in vehicles featuring a high mileage. For value-based repairs on these pumps, Bosch supplies:

- ▶ Pump control unit part kits (PSG 5)
- ▶ Pressure solenoid valve part kits (DMV 10, DMV 11)



# Nozzle-and-holder assemblies

## Product details

**A nozzle-and-holder assembly (NHA)** consists of a nozzle holder, an injection nozzle, a nozzle clamping nut and different smaller bits and pieces (e.g. spring, pressure bolt, shim washer). Nozzle holder assemblies are needed to inject fuel into the combustion chamber of diesel engines.



### Accurate injection into the combustion chamber

Nozzle-and-holder assemblies are robust components. They work with injection pressures of up to 1 800 bar and reach up to 20 000 hours of operation. For the fuel injection, a nozzle-and-holder assembly is assigned to each of the cylinders of an engine. Thanks to their resilient design, nozzle holders can be operated with a large variety of different fuels. The selection of the matching nozzle-and-holder assembly is based on the required supply volume, spray pattern and injection pressure.

### Advantages at a glance:

- ▶ Optimization of engine performance, exhaust-gas and noise development due to major influence on both mixture formation and combustion
- ▶ Different types of Bosch nozzle-and-holder assemblies suitable for all conventional systems and types of engines – from single-cylinder engines to car and truck engines.



# Service parts for diesel specialists

## Overview

**Global production of reliable spare parts:** By now, Bosch produces conventional and modern diesel systems and a comprehensive range of spare parts in case they need any repair at a total of 28 locations on four continents. After all, high quality spare parts are a prerequisite for the optimum functionality of these systems. Bosch spare parts stand out for their high quality and reliability.

### Bosch – original equipment diesel competence

No matter whether common-rail or unit injector system, in-line or distributor injection pump, Bosch innovations ensure powerful performance and efficient fuel combustion of and in millions of diesel engines. Bosch products and spare parts are based on the system know-how gained over decades. They need to meet top quality expectations at all times. Workshops can thus be sure, they will always install modern and robust spare parts featuring well-known Bosch quality.

### Bosch supplies workshops with a comprehensive range of parts for diesel injection systems:

- ▶ Genuine spare parts and spare parts of equivalent quality for almost any vehicle – even for older cars
  - Pump elements
  - Injection nozzles
  - Pressure valves and valve sets
  - Rail-pressure sensors
  - Sealing kits
- ▶ Innovative workshop equipment and software
- ▶ Practice-oriented service trainings
- ▶ Technical hotline



# Pump elements

## Product details

**Each cylinder of an in-line injection pump is supplied with fuel by an own pump element and via a pressure valve and a high-pressure line.** The engine drives the pumps camshaft by means of either gears or a chain. The pump runs synchronously with the pistons – that is, half as fast as the engine. To ensure this performance throughout hundreds of thousands of kilometers of operation, Bosch pump elements feature a particularly high material and production quality.



Pump elements consist of a pump piston and a pump cylinder.

They work with overflow principle and beveled-edge control. Thanks to the high fitting accuracy of the pump piston, no special seal is required – not even in case of high pressures and low rotational speeds.

### High quality down to the last detail

No matter whether contact surfaces, bores or threads, pump elements need to be processed thoroughly and with top precision to prevent pump damages affecting the operation of the engine. Bosch pump elements are produced according to a clearly defined quality guideline.

### Advantages at a glance:

- ▶ As human eyes hardly see the details involved in the production of pump elements, being a Bosch product provides certainty and safety at the product selection
- ▶ Production with high precision prevents increased fuel consumption, loss of power and a shortened service life of both pump and engine as well as breakdowns and engine damage

# Valves

## Product details

**Valves are among the most strained components of conventional and modern diesel injection systems.** Therefore, the high quality of Bosch valves is particularly important. Especially valve pistons and pieces have to fit into one another accurately. As one of the world's largest OE suppliers and diesel system developer, Bosch provides pressure valves with excellent quality both as original equipment and on the aftermarket.



### Advantages at a glance:

- ▶ **Low friction losses** due to valve pistons and pieces perfectly fitting into one another
- ▶ **Reduced surface roughness** of valve sets due to accurate processing
- ▶ **Increased service life** and consumption benefits due to the use of high-tenacity materials – in part even with additional tempering or hard chromium plating
- ▶ **Particularly high manufacturing precision** due to stringent checks and permanent monitoring of the dimensional accuracy throughout the production

### Outstanding material quality!



Bosch valves are made of high quality materials with a special alloy. The risk of worn valve seats and material damage is thus minimized.

# Injection nozzles

## Product details

**Injection nozzles are used in conventional and modern diesel systems** to precisely atomize the fuel spraying it into the combustion chamber for an optimum combustion. Concomitantly, the nozzle also seals off the fuel system against the combustion chamber in a reliable manner. The versatile and broad range of Bosch nozzles covers all common applications. It includes comprehensive know-how Bosch bears as an important partner of international vehicle manufacturers.



### Advantages at a glance:

- ▶ **Production with very high precision** due to moving parts' guide clearance amounting to 0.002 mm and fuel pressures of up to 2000 bar
- ▶ **Particularly long service life** of Bosch nozzle needles due to their carbon coating
- ▶ **Bosch injection nozzles prevent increasing smoke formation** – especially after cold starting – as well as combustion noises with a cold engine, uneven engine performance and even loss of power or increased consumption

### Increased service life!



#### **Nozzle needles with carbon coating:**

Dealing with system pressures of up to 2700 bar, high-strength steels are to be used for the production of nozzles and injectors. Thanks to their carbon coating, the service life of Bosch nozzle needles is increased even further.



# Departronic particulate filter regeneration

## Product range & details

**Unlike pure engine-internal** measures of particulate filter regeneration such as post-injection for instance, Departronic doses and injects the fuel upstream of the oxidation catalytic converter and the diesel particle filter. Efficient regeneration of particle filters is achieved by optimum adjustment of injection timing and quantity.



	Dosing module	Injection unit
	The dosing module determines the required dosing quantity and forwards it to the injection unit.	The injection unit ensures a precise fuel injection and handles its atomization and distribution within the exhaust pipe.
Scope of application		
Advantages at a glance	<ul style="list-style-type: none"> <li>▶ Increasing the active regeneration efficiency, it contributes to reduced fuel consumption</li> <li>▶ Particularly robust and maintenance-free for a long service life</li> </ul>	

### Did you know?

## Departronic

Departronic is integrated into the low-pressure fuel circuit. Without compressed air support, it injects an accurately metered amount of diesel fuel into the exhaust tract upstream the oxidation catalytic converter. Flowing through the oxidation catalytic converter, the exhaust-gas temperature thus rises to 600°C and burns off any soot retained by the particulate filter. The flow rate varies depending on the current requirements. The robust and completely maintenance-free system controls the fuel addition as required and independent of the engine injection system.



# Denoxtronic exhaust-gas treatment for CV

## Product range & details

**With the aid of the AdBlue reduction agent,** SCR catalytic converters split nitrous oxides contained in exhaust-gases into nitrogen and water. Bosch Denoxtronic permanently aligns the AdBlue dosing with the actual operating condition of the engine and current exhaust-gas values. This technology helps vehicle manufacturers in several countries to comply with applicable emission limits.



	Supply module for commercial vehicles	Dosing module for commercial vehicles
	The supply module generate the required AdBlue pressure and delivers the pressurized reduction agent to the dosing module.	The main task of the control unit (within the dosing control unit) is the model-based calculation of the required dosing quantity in line with a predefined dosing strategy. The dosing module ensures a precise AdBlue quantity control and handles its atomization and distribution within the exhaust-pipe.
Scope of application		
Advantages at a glance	<ul style="list-style-type: none"> <li>▶ Contributes to compliance with emission standards by reducing the NO<sub>x</sub> emissions</li> <li>▶ Long service life thanks to well-proven and robust technology</li> <li>▶ Quick and easy replacement of the modules possible in case of servicing</li> </ul>	

### Workshop tip

#### Regular filter replacement

Replacing the Denoxtronic filter is a maintenance measure to be performed regularly. It ensures the vehicle's ongoing compliance with the legal emission limits. The replacement intervals are specified by the vehicle manufacturers and can be looked up at the maintenance schedules included in ESI[tronic]. Before changing the filter, the AdBlue circuit is to be drained using a KTS tester in order to depressurize the system. Using water, all components are to be cleaned thoroughly and crystalline deposits are to be removed. Once the new Denoxtronic filter has been installed, the circuit is to be reactivated and vented using a KTS.



# Commercial vehicle filters

## Overview

Commercial vehicles make money every day. Their operation is a constant race against the clock. Operators seeking to avoid expensive downtimes don't make any compromises and thus rely on Bosch commercial vehicle filters.

### Safety through outstanding product quality

High-quality materials, neat and accurate processing and well-defined quality checks – according to the same standards as for OE parts.

### Injection system competence

Bosch develops and produces diesel and Denoxtronic injection systems and therefore knows how to protect them.

### Complete range from a single source

Easier handling and ordering thanks to a comprehensive range for many common types of commercial vehicles and engines, which is permanently updated.

### High availability of goods

Bosch ensures quick availability of its parts by means of an international sales and logistics network.

### Strategic partner for the future





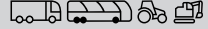
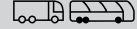
Suitable diagnostic solutions, training courses and seminars for wholesalers and workshops.



# Commercial vehicle filters

## Product range

			
<p><b>Diesel filter</b></p> <p>Bosch diesel filters protect the injection system. They reliably separate particles and water from fuel and contribute to optimum engine performance.</p>	<p><b>Oil filter</b></p> <p>Bosch oil filters protect the engine and engine components - e.g. the turbocharger. They reliably separate soot and metal abrasion from engine oil.</p>	<p><b>Air filter</b></p> <p>Bosch air filters protect the engine and support a proper function of the sensors in the intake air duct. They reliably separate particles from intake air and contribute to optimum engine performance.</p>	<p><b>Cabin filter</b></p> <p>Bosch cabin filters protect the vehicle occupants against pollen, fine dust as well as harmful and foul-smelling gases.</p>
			

		
<p><b>Air dryer cartridge</b></p> <p>Bosch air dryer cartridges protect pneumatic systems of commercial vehicles against damages, e.g. the braking system. They dehumidify compressed air and reliably separate particles and oil mist thus reducing the risk of expensive downtimes.</p>	<p><b>Denoxtronic filter</b></p> <p>Bosch Denoxtronic filters protect the Denoxtronic injection system. They reliably remove particles from AdBlue thus contributing to optimum dosing.</p>	<p><b>Special filters</b></p> <p>Special filters for special tasks – from coolant filters to oil mist separators and hydraulic oil filters.</p>
		



# Commercial vehicle filters

## Quality requirements

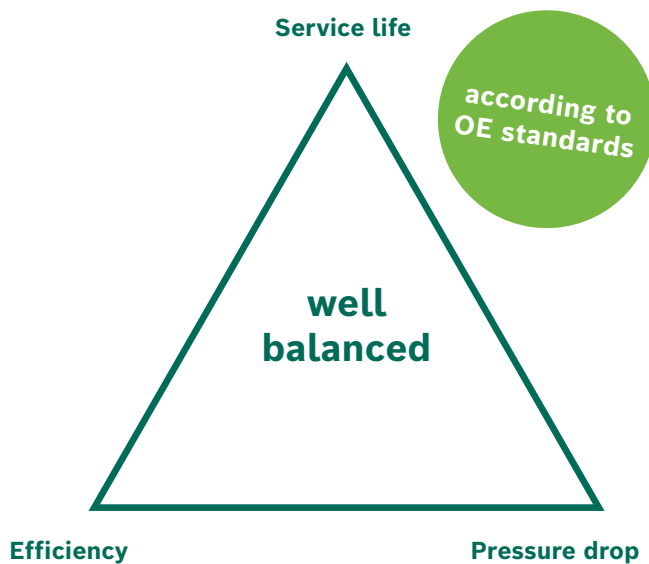
Product quality is not negotiable; there can't be any compromises in this regard. Besides high-quality materials and excellent processing, this includes optimized alignment of the filter specifications.

These specifications influence one another. They must thus be exactly geared to each other in order to ensure outstanding filter performance.

**All functional and quality tests are performed according to the same standards applied to original equipment parts.**



### Magic triangle of filtration



### Service life (particle holding capacity):

the amount of particles a filter is able to retain before reaching the change interval – should be as high as possible

### Efficiency (particle separation rate):

the ratio of the number of particles retained by the filter to the number entering the filter, expressed as a percentage – should be as high as possible

### Pressure drop (differential pressure):

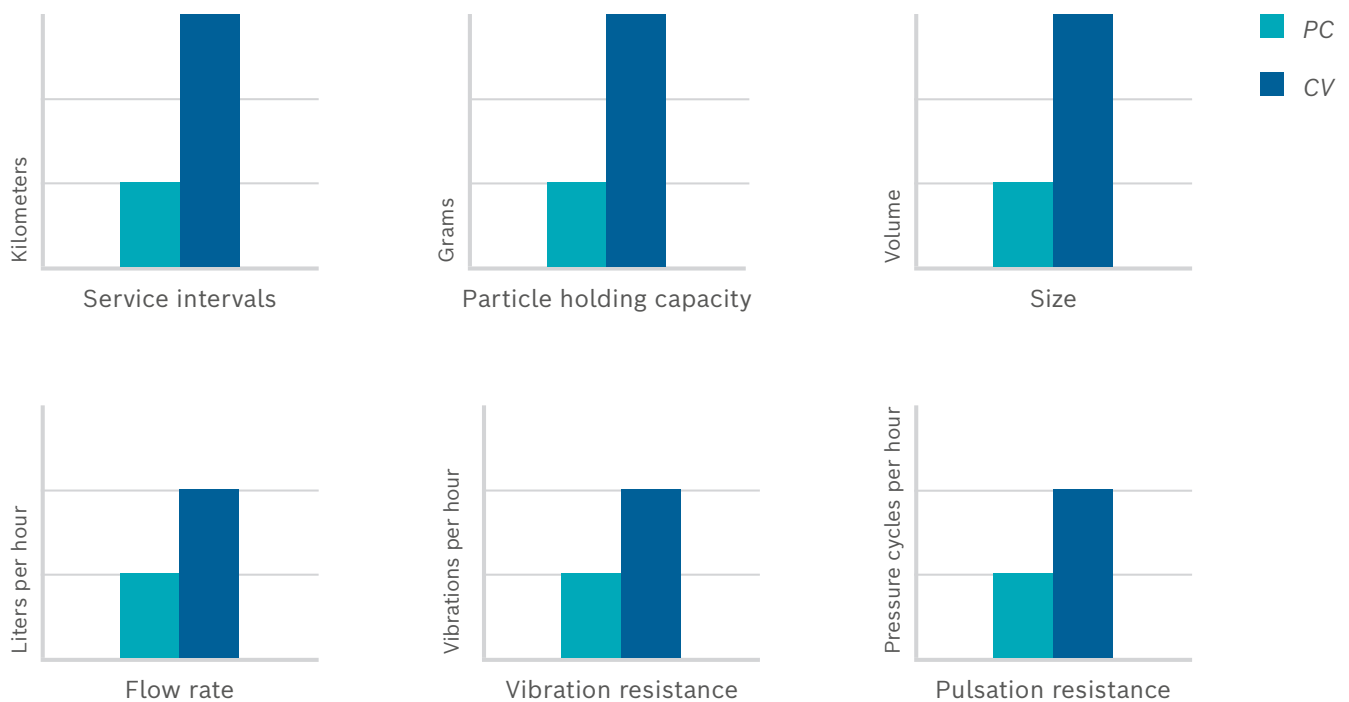
the difference in fuel/oil/air pressure between filter inlet and outlet – should be as low as possible

# Commercial vehicle filters

## Quality requirements

Commercial vehicles are almost always on the road. This means all filter types are constantly strained and – in case of international transport – it also implies significant variations in fuel quality in different countries. As a result, commercial vehicle filters need to meet technical requirements being appr. two to three times higher than those placed on passenger car filters.

### Technical requirements\* of passenger car and commercial vehicle oil filters in comparison (schematic illustration)



\*according to OE requirements, approximated values



### Did you know?

Every year, some

# 13.4 million

commercial vehicles with more than 6 tons of GVW circulate on European roads – covering an annual overall distance of some 145,000 km in long-haul traffic.

# Diesel filter

## Product details

Bosch diesel filters protect the injection system. They reliably separate particles and water from fuel and contribute to optimum engine performance.



### Advantages at a glance

- ▶ **Excellent filter efficiency and reliable water separation** due to multilayered, microporous filter media
- ▶ **High particle holding capacity and low flow resistance** due to large filter surface
- ▶ **Moisture resistance and tensile strength** due to specially impregnated filter media
- ▶ **Protected against inner and outer leakage** due to high-quality processing and usage of resistant materials

*Change diesel filters regularly as specified by the vehicle manufacturer!*

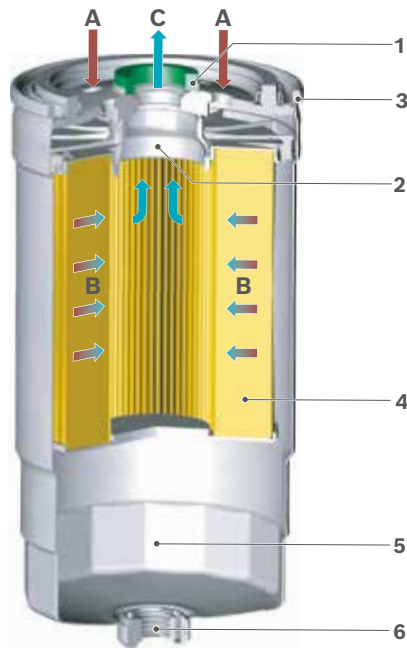


### Possible consequences of silted-up filters:

- ▶ Loss of engine power or even engine standstill
- ▶ Impairment of the fuel supply
- ▶ Impairments to the output of the fuel pump or even a short-circuit
- ▶ Internal corrosion of engine components

# Diesel filter

## Technology



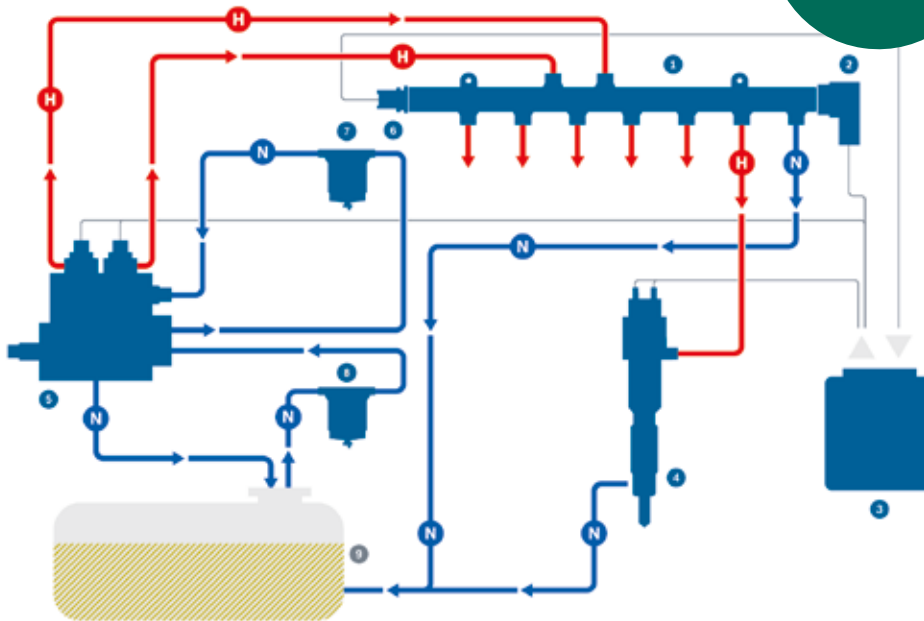
### Design and operation

- 1 Seal
- 2 Threaded connection
- 3 Double beading
- 4 Multilayer filter media
- 5 Water accumulation chamber
- 6 Water drain screw

- A Inflow of contaminated diesel  
 B Dirt and water filtration of diesel  
 C Cleaned diesel is conducted to the engine

### Common-rail system for up to 2,500 bar

**Bosch system competence**



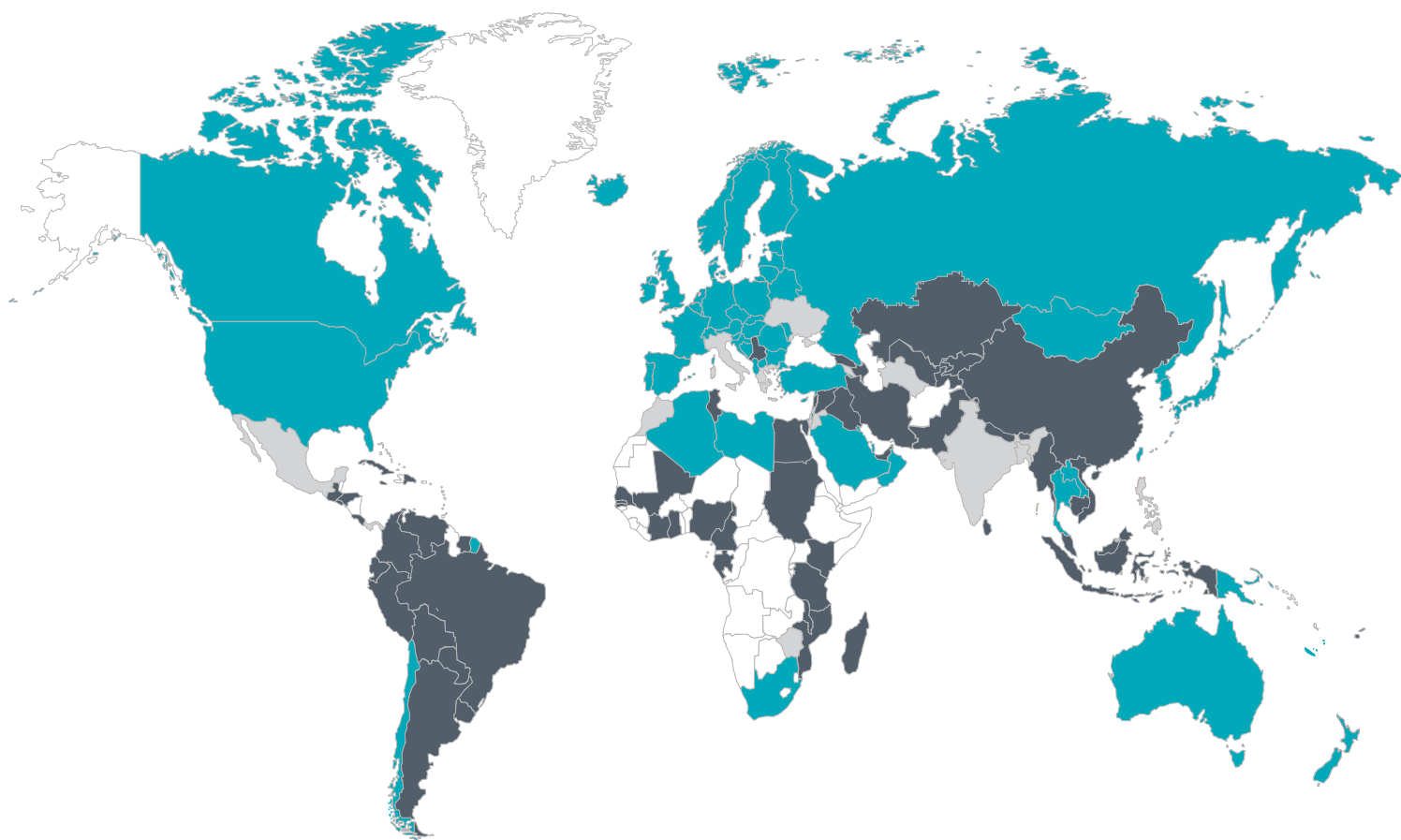
- 1 High-pressure rail
  - 2 Pressure control valve
  - 3 Electronic engine control unit
  - 4 Solenoid-valve injector
  - 5 High-pressure pump
  - 6 Rail pressure sensor
  - 7 Fuel filter
  - 8 Prefilter
  - 9 Tank
- H High pressure  
 L Low pressure  
 — Electrical connection  
 Fuel



# Diesel filter Technology

## Because of varying diesel quality

In global terms, the quality of diesel varies considerably. Depending on the region and the climatic conditions, the concentration of water and dust may be extremely high. Bosch thus provides various diesel filters exactly geared to the individual diesel qualities of the respective country.



Source: SGS World Wide Fuel Surveys summer 2006 to winter 2010/2011

- $\leq 19$  Established diesel markets
- = 20
- $\geq 21$  } Increased impurity due to particles

# Diesel prefilter

## Product details

Bosch diesel prefilters support the function of the main diesel filter in commercial vehicles. They reliably separate coarse particles and water from the fuel thus ensuring the main diesel filter's service life. This helps to reduce the total cost of ownership.



### Advantages at a glance

- ▶ **Excellent filter efficiency and reliable water separation** due to multilayered, microporous filter media
- ▶ **High particle holding capacity and low flow resistance** due to large filter surface
- ▶ **Protected against inner and outer leakage** due to high-quality processing and usage of resistant materials

*Change the diesel prefilter regularly according to the vehicle manufacturer's specifications!*



### Particles contained in fuel

The particles contained in fuel are often mineral materials (sand). They end up in fuel as a result of dust from the atmosphere or dirt inside the tank or the supply pipes. But even corrosion or abrasion residues of metal and plastic components can mix with fuel. If those particles are not separated by the fuel filter, they can result in corrosion inside the fuel tank, mechanical grinding and early wear.

# Diesel water separator

## Product details

Bosch diesel water separators support the function of the main diesel filter in commercial vehicles. They reliably separate large amounts of water from the fuel thus ensuring the main diesel filter's service life. This helps to reduce the total cost of ownership.



### Advantages at a glance

- ▶ **Excellent water separation** due to specially pleated, multilayered filter media
- ▶ **Low flow resistance** due to large filter surface
- ▶ **Protected against inner and outer leakage** due to high-quality processing and usage of resistant materials

*Change the diesel water separator regularly according to the vehicle manufacturer's specifications!*



### Water contained in fuel

Any diesel fuel contains finely dissipated water. The water content depends on the fuel quality. Condensation inside the tank can increase the amount even further. Insufficient water separation – e.g. by non-compliance with replacement intervals or use of low-quality filters – can result in expensive corrosion damages on the engine, the high-pressure pump or even on the injectors.

# Oil filter

## Product details

Bosch oil filters protect the engine and engine components - e.g. the turbocharger. They reliably separate soot and metal abrasion from engine oil.



### Advantages at a glance

- ▶ **Long service life of filter and engine oil** due to multilayered, specially impregnated filter media
- ▶ **High particle holding capacity** due to large filter surface
- ▶ **Excellent filter efficiency** due to specially designed and well balanced filter components
- ▶ **Reliable engine lubrication** in almost all temperature and oil pressure conditions
- ▶ **No oil loss** by corrosion-resistant housing materials and seals made of special rubber

*Change oil filters and oil regularly as specified by the vehicle manufacturer!*



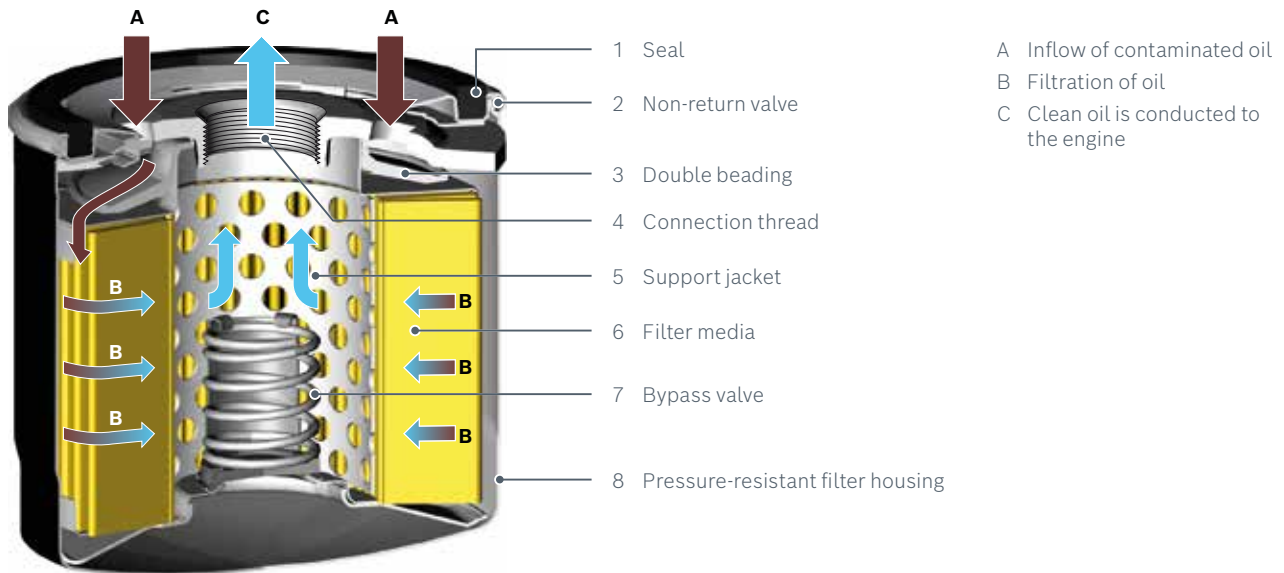
### Possible consequences of silted-up filters:

- ▶ Premature engine wear or even engine damage
- ▶ Reduced engine performance
- ▶ Increased oil consumption

# Oil filter

## Technology

### Design and operation



### Bypass valve

- ▶ Ensures continuous oil supply for the engine at low ambient temperatures and protection when the filter is clogged through brief bypassing of the filter
- ▶ Less damage caused by impurities than by interrupted oil supply and cooling

### Non-return valve

- ▶ Prevents idling of the oil filter after switching off the engine
- ▶ Immediate lubrication at restarts thanks to quick buildup of pressure



# Centrifugal oil filter

## Product details

Bosch centrifugal oil filters support the function of the main oil filter in commercial vehicles. They reliably separate ultrafine particles from the engine oil thus ensuring the main oil filter's service life and the lubrication properties of the engine oil. This helps to reduce the total cost of ownership.



### Advantages at a glance

- ▶ **Longer service life of the main oil filter and engine oil** due to an effective secondary flow filtration of the oil
- ▶ **Reduced wear on engine components** due to removal of ultrafine (1 micron) particles
- ▶ **High particle separation rate** due to centrifugal forces of up to 2000 times the force of gravity applied to the oil.

*Change the centrifugal oil filter regularly according to the vehicle manufacturer's specifications!*



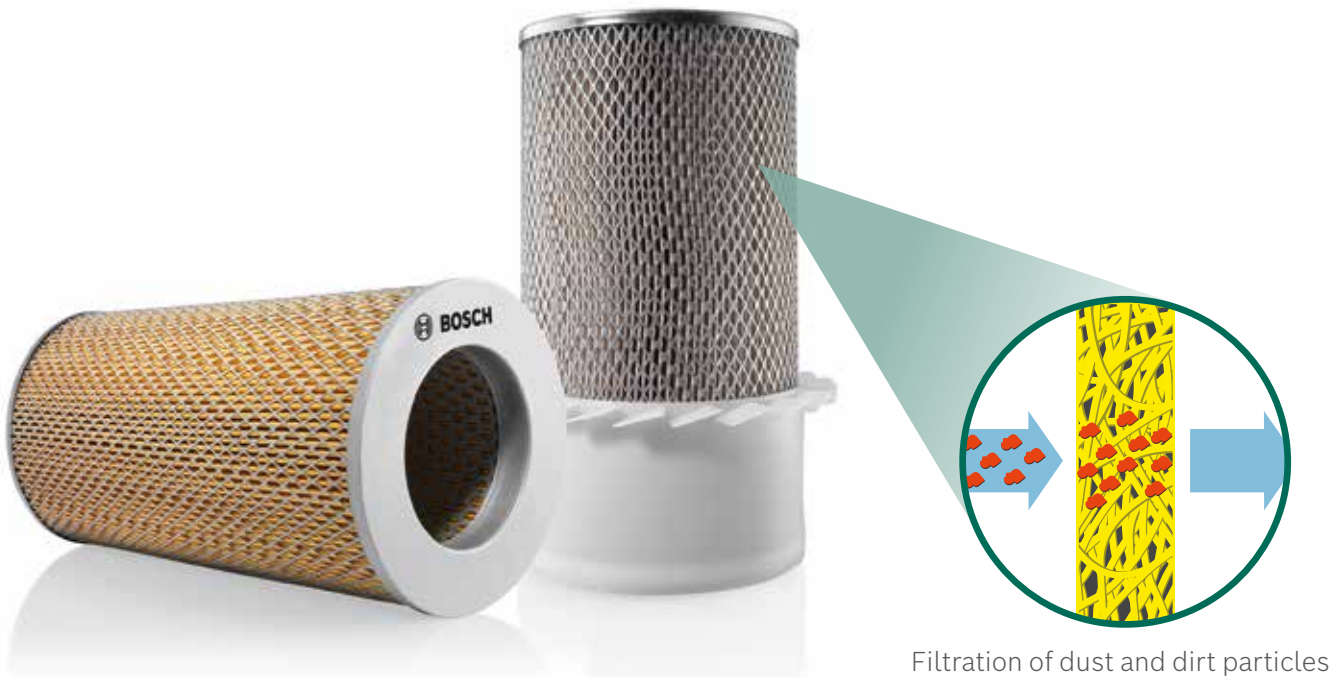
### Combined main-flow/bypass filter

- ▶ Main-flow filters: filtration of 100% of the oil
- ▶ Bypass filters: Additional fine filtration of 10% of the oil – delays oil aging

# Air filter

## Product details

Bosch air filters protect the engine and support a proper function of the sensors in the intake air duct. They reliably separate particles from intake air and contribute to optimum engine performance.



### Advantages at a glance

- ▶ **Long service life, excellent filter efficiency, moisture resistance and tensile strength** due to multilayered, specially impregnated filter media
- ▶ **High particle holding capacity and low flow resistance** due to large filter surface
- ▶ **Robust fold geometry** due to filter media with special embossing
- ▶ **Appropriate fit** due to precise dimensions and high-quality sealing materials

*Change air filters regularly as specified by the vehicle manufacturer!*



### Possible consequences of silted-up filters:

- ▶ Increased fuel consumption
- ▶ Reduced engine power
- ▶ Increased pollutant emissions

# Secondary air filter

## Product details

Bosch secondary air filters provide an important, additional safety function in commercial vehicles. In case of a damaged main air filter or during the change of the main air filter they protect the intake air duct from dirt particles thus reducing the risk of expensive downtimes.



### Advantages at a glance

- ▶ **Long service life** due to usage of high-quality materials
- ▶ **Low flow resistance** due to special filter media
- ▶ **Stable fit** due to accurate dimensions and sealings

*Change the secondary air filter regularly according to the vehicle manufacturer's specifications!*

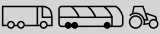
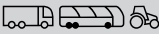
# Cabin filters

## Product range & details

Bosch cabin filters protect the vehicle occupants against pollen, fine dust as well as harmful and foul-smelling gases.



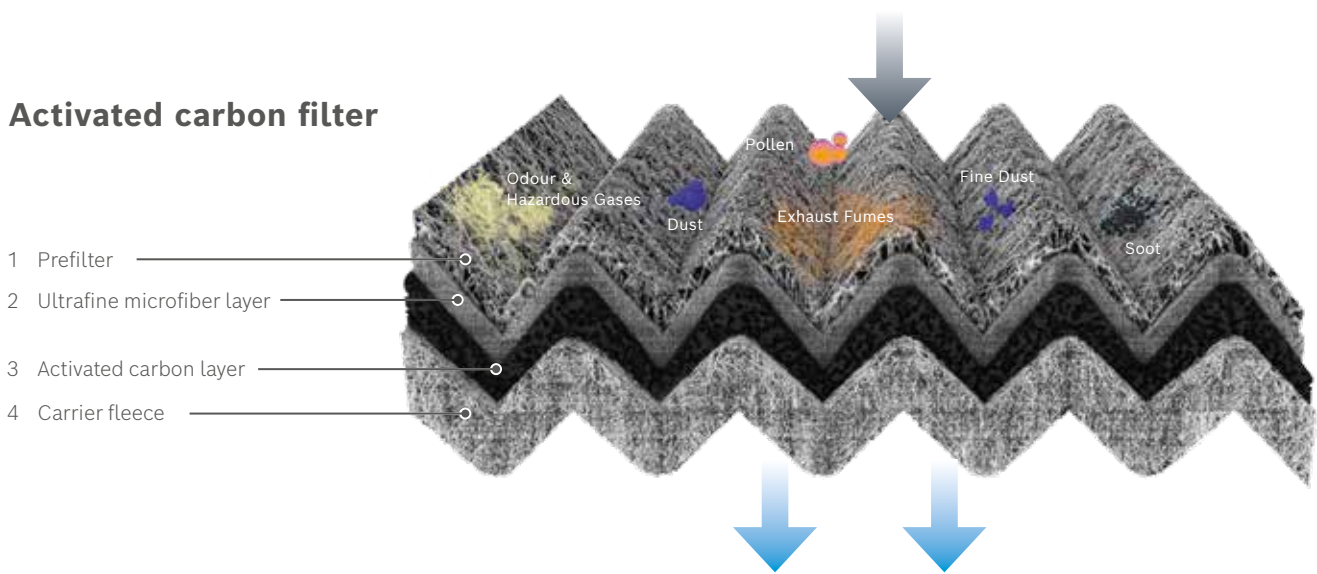
*Recommended replacement interval:  
Cabin filters should be changed every  
200 000 to 300 000 km. Please ob-  
serve the manufacturer specifications!*

Function	Activated carbon filter	Standard filter
	<b>Bosch activated carbon cabin filters</b> – for noticeably purer and more pleasant air inside the car.	<b>Bosch standard cabin filters</b> – for clean air inside the car.
Separates foul-smelling and harmful gases (ozone, smog, exhaust gases)	●	
Separates pollen and fine dusts (up to 100% of 10µm)	●	●
Protects the air conditioning	●	●
Reduces dazzling effects	●	●
Coverage		
<b>Advantages at a glance</b>	<ul style="list-style-type: none"> <li>▶ Neutralizes reliably harmful and foul-smelling gases in an activated-carbon layer</li> <li>▶ Filters effectively fine dusts, soot and pollen in an ultrafine microfiber layer</li> <li>▶ Protects the air conditioner and improves the vision by reducing deposits</li> </ul>	<ul style="list-style-type: none"> <li>▶ Filters effectively fine dust, soot and pollen in an ultrafine microfiber layer</li> <li>▶ Protects the air conditioner and improves the vision by reducing deposits</li> </ul>

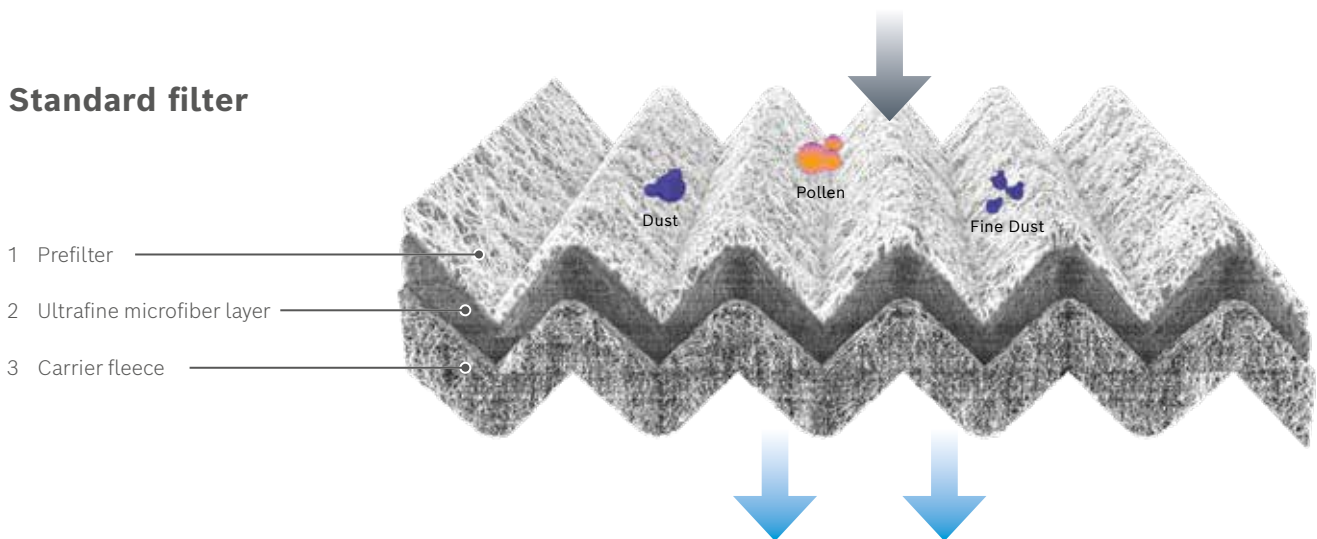
# Cabin filters

## Technology

### Activated carbon filter



### Standard filter



#### Possible consequences of silted-up filters:

- ▶ Poor vision due to misted windows, and thus reduced safety
- ▶ Increased concentration of pollutants inside the vehicle
- ▶ Allergic reactions, e.g. sneezing
- ▶ Restricted operation of the air conditioning system due to deposits on the evaporator



#### Did you know?

Activated carbon is made of coconut shells carbonized and crushed in a hermetically sealed environment. Water vapor with a temperature of

# 800° C

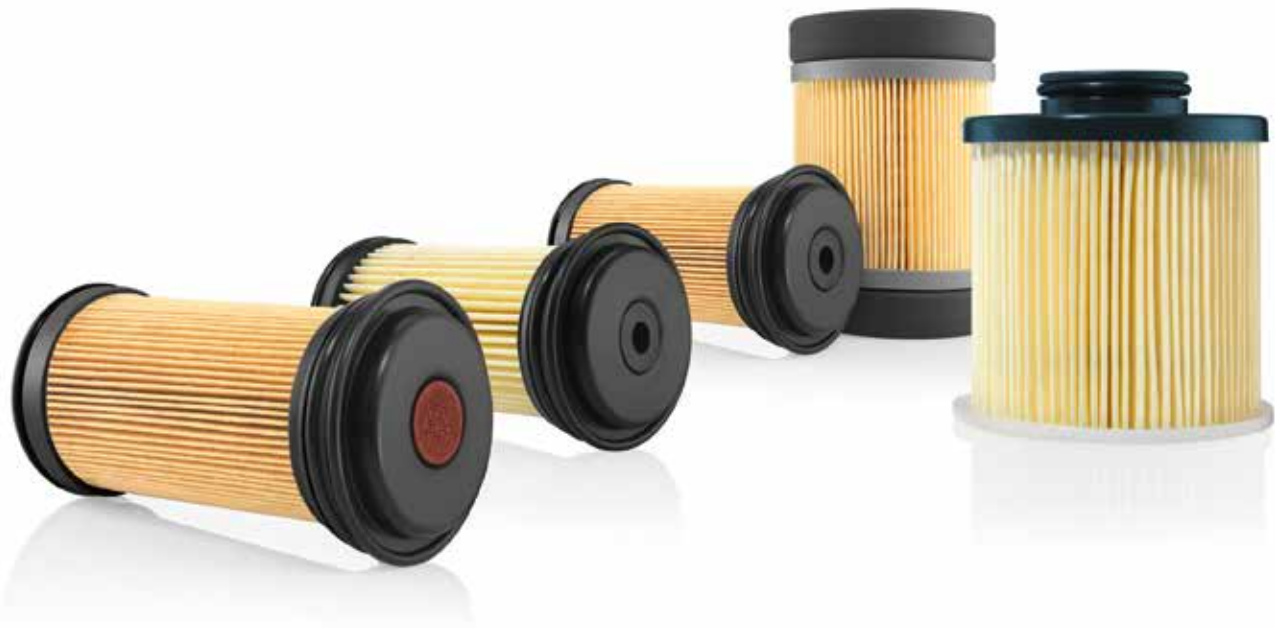
is used to create its sponge-like structure.



# Denoxtronic filter

## Product details

Bosch Denoxtronic filters protect the Denoxtronic injection system. They reliably remove particles from AdBlue thus contributing to optimum dosing.



### Advantages at a glance

- ▶ **High particle separation rate** due to microporous filter medium with special impregnation
- ▶ **High particle holding capacity** due to large filter surface
- ▶ **Chemical resistance to aggressive AdBlue** due to usage of high-quality materials
- ▶ **Frost resistance** due to compressible compensation elements

*Recommended replacement interval:  
Denoxtronic filters must be replaced regularly.  
Please observe the vehicle manufacturers'  
specifications!*

### Did you know?

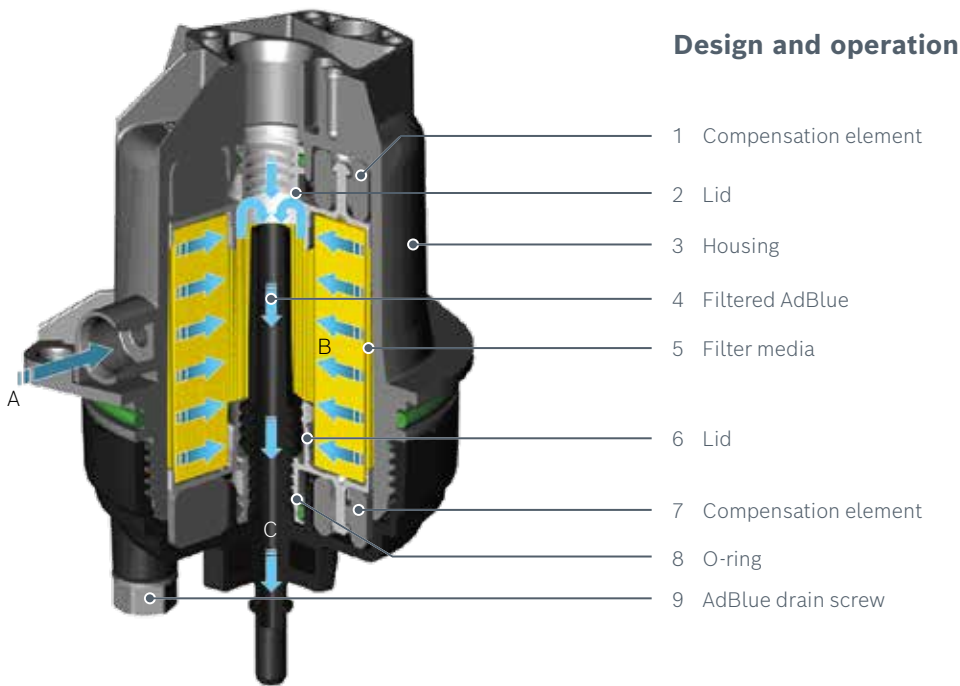
AdBlue is a watery urea solution composed of up to 32.5 % urea and up to 67.5 % demineralized water. Due to its high water content, AdBlue freezes and expands at just

## -11° C.

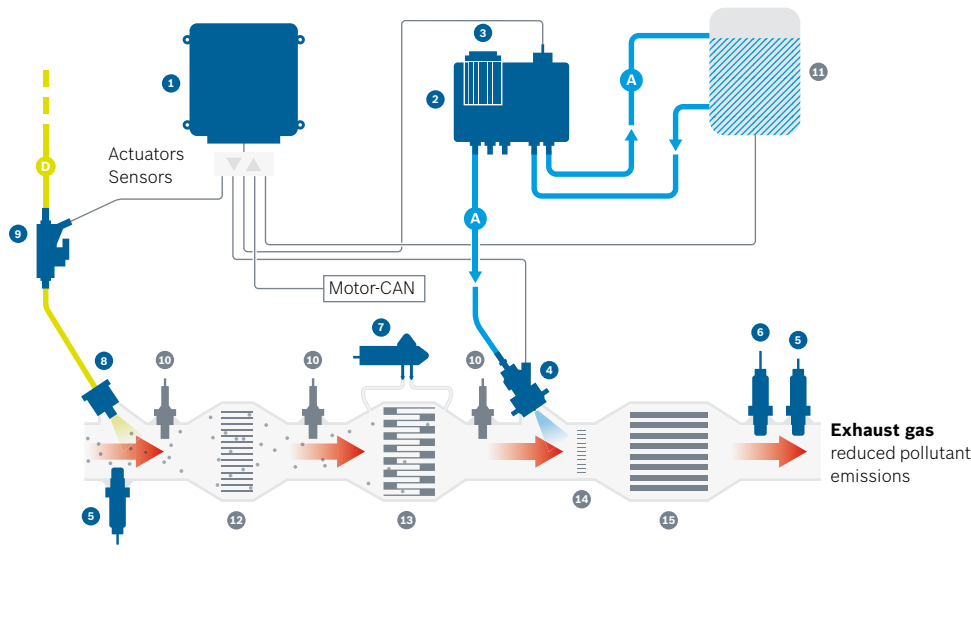
In this case, compressible compensation elements prevent damage to both the filter and the supply module.

# Denoxtronic filter

## Technology












## Denoxtronic exhaust-gas treatment and sensors (e.g. for Denoxtronic 2.2)



# Denoxtronic filter

## Product range

### Spare-part sets for repairs and servicing

Typ/KIT										
Denoxtronic 1 Service	1 457 436 042		•	•		•	•	•		DAF, MAN, IVECO, Scania, Volvo
Denoxtronic 1 Repair	F 00B H40 025					•	•		•	DAF, MAN, IVECO, Scania, Volvo
Denoxtronic 2.1 Service	1 457 436 006	•				•	•			Case, IVECO, KHD, Renault, Volvo
Denoxtronic 2.1 Repair	1 457 030 020							•		Case, IVECO, KHD, Renault, Volvo
Denoxtronic 2.2 Service	1 457 436 088		•			•			•	Cummins, IVECO, Mack, Nissan, Renault, Volvo
Denoxtronic 6.5 Service	1 457 436 039		•			•			•	Perkins, IVECO, CNH, JCB, Daimler India, CAMC (China)



Filter with compensation element



Compensation element with sealing function



Pre-filter



Filter element



Set of seals



Filter cover



Compensation element



Drain plug



Extraction tool



#### Replacement of Denoxtronic 2.1 filters

The filter is screwed onto the housing cover of the Denoxtronic supply module and is extracted from the housing along with the cover. In case the filter detaches from the cover or gets stuck at the housing, it can be extracted using the extraction tool.



#### Replacement of Denoxtronic 2.2 filters

Using the extraction tool, the filter is extracted from the Denoxtronic supply module. The matching extraction tool is included within the service kit.

# Air dryer cartridge

## Product details

Bosch air dryer cartridges protect pneumatic systems of commercial vehicles against damages – e.g. the braking system. They dehumidify compressed air and reliably separate particles and oil mist thus reducing the risk of expensive downtimes.



### Advantages at a glance

- ▶ **Large reserves for water absorption** due to usage of high-quality air dryer granulate
- ▶ **High resistance to pulsation and burst pressure** due to robust high-quality processing
- ▶ **Longer service life of air dryer granulate** by integrated oil separator

*Air dryer cartridges shall be replaced annually. Please observe the vehicle manufacturers' specifications!*



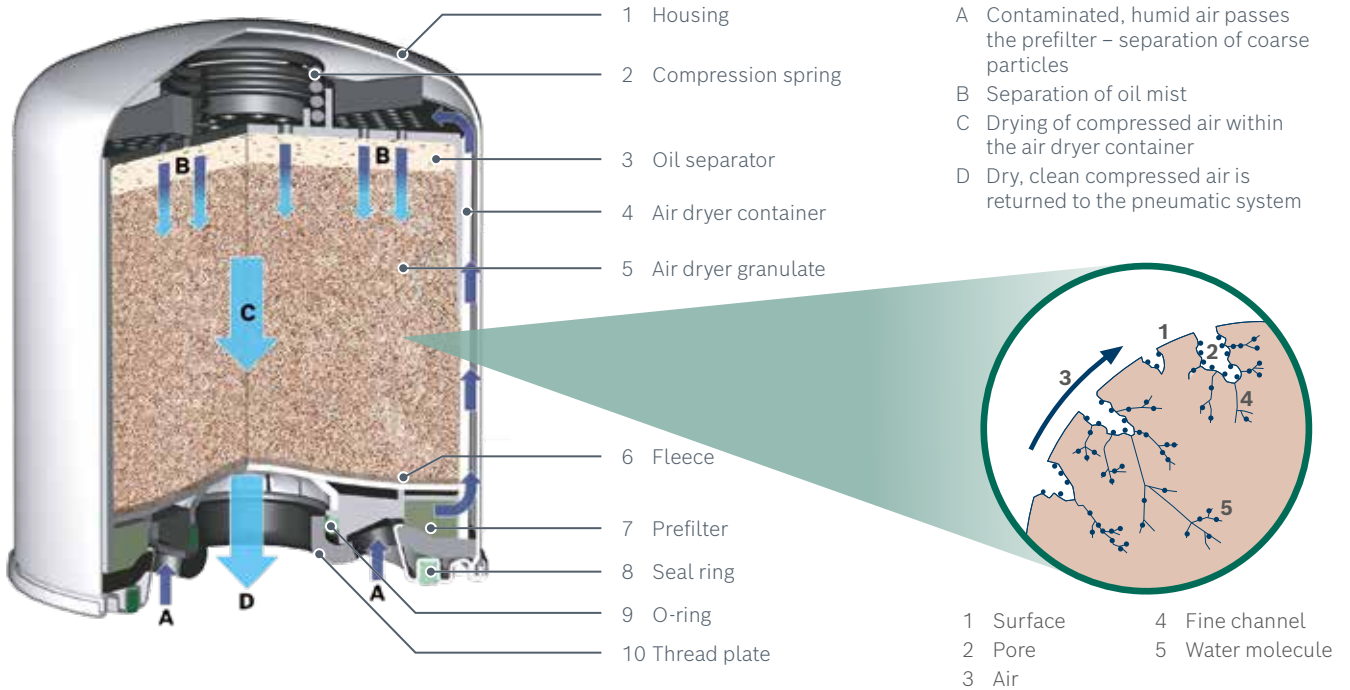
### Possible consequences of poor dehumidification of compressed air

- ▶ Risk of malfunctioning valves due to frozen water – in case of cold weather
- ▶ Corrosion in air reservoirs as well as on valves and cylinders
- ▶ Erosion of oil lubricant film in brake-system components

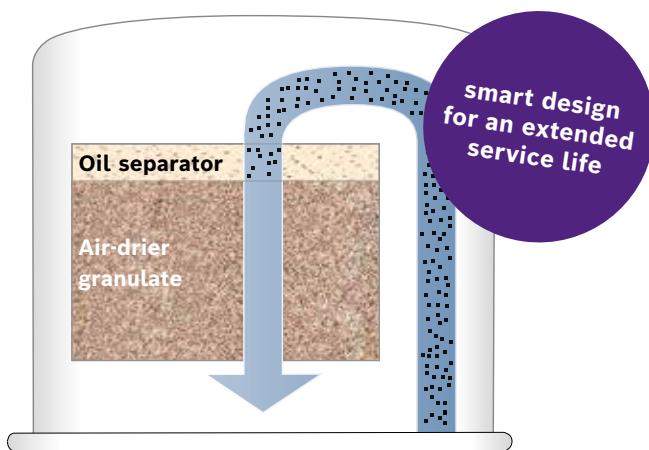
# Air dryer cartridge

## Technology

### Design and operation

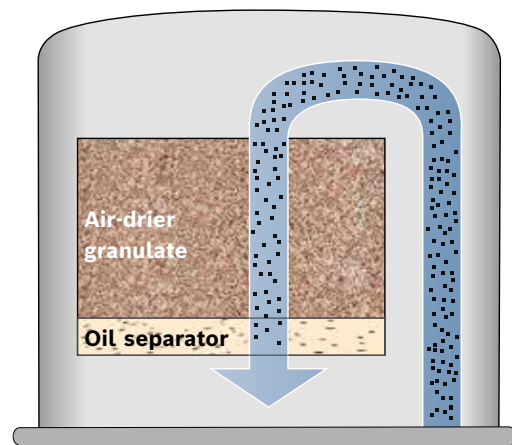


### Bosch air dryer cartridge



**Oil mist is separated before** reaching the air drier granulate  
→ water-absorption capability remains fully intact, extended service life

### Other air dryer cartridge



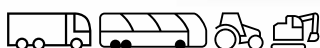
**Oil mist is separated after** reaching the air drier granulate  
→ deteriorated water-absorption capability, reduced service life



# Coolant filter

## Product details

Bosch coolant filters protect the fine channels of the cooling system of commercial vehicles against deposits. They reliably separate particles and other residues from coolant, thus reducing the risk of expensive downtimes.



### Advantages at a glance

- ▶ **High particle holding capacity** due to large filter surface and specially impregnated filter media
- ▶ **Long service life and engine protection** due to corrosion-resistant housing and coolant-resistant seals
- ▶ **Prevents bacterial growth, corrosion, chalk deposits and acidification** by easily soluble chemical additives

*Coolant filters should be replaced regularly and together with the oil filter. Please observe the vehicle manufacturers' specifications!*

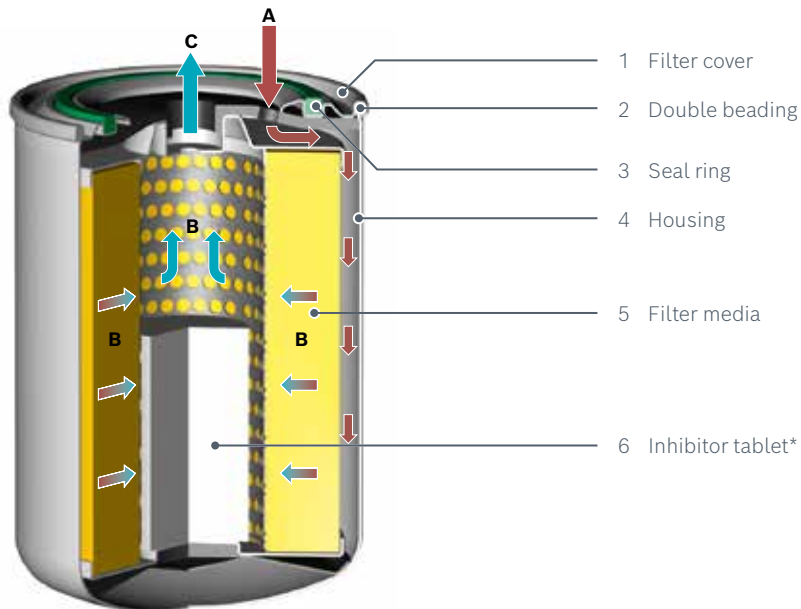


### Possible consequences of insufficient coolant filtration

- ▶ Pitting (corrosion within the cooling system)
- ▶ Premature wear of the coolant pump
- ▶ Deposits of calcium and magnesium
- ▶ Acidification and bacterial growth
- ▶ Particle residues within the cooling system

# Coolant filter Technology

## Design and operation



- A Inflow of contaminated coolant
- B Coolant is filtered and chemical additives are added
- C Cleaned coolant is conducted to radiator

\* not standard



Insufficient coolant filtration can result in pitting. The result: damage to the cylinder due to corrosion.



## KTS Truck: ECU diagnosis for CV electronics

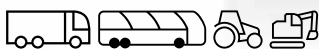
- ▶ KTS Truck module for trucks, vans, trailers and buses
- ▶ KTS Truck can be connected to the Bosch DCU range and all common laptops/PCs via the USB port
- ▶ Integrated Bluetooth connection with a large range of up to 100 m
- ▶ Bluetooth USB adapter included
- ▶ Robust housing



# Oil mist separator

## Product details

Bosch oil mist separators protect the engine intake duct of commercial vehicles – e.g. the turbocharger – against damages. They reliably separate oil mist and particles from returned blow-by gases thus reducing the risk of expensive downtimes.



### Advantages at a glance

- ▶ **Highly efficient oil separation and permanent particle collection** due to multilayer microfiber filter media
- ▶ **Protection of turbocharger**, charge air cooler and easing of the exhaust gas treatment system (in closed systems)
- ▶ **Cleaner ambient air** due to effective separation of oil mist (in open systems)

*In short-distance and distribution traffic, oil mist separators should be changed every 40 000 km; in long-distance traffic, they should be replaced every 80 000 km. Please observe the vehicle manufacturers' specifications!*



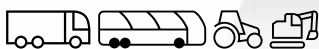
### How are blow-by gases formed?

During engine operation, gases flow out of the combustion chamber, through the construction-borne gaps between piston and cylinder wall and into the crankcase. Even with optimum sealing, these blowby gases make up approximately 0.5 % to 2 % of the entire gas volume inside the cylinders. Blow-by gases contain fuel residues, soot particles and oil mist.

# Hydraulic oil filter

## Product details

Bosch hydraulic oil filters protect the hydraulic system of commercial and off-highway vehicles against damages. They reliably separate particles and other residues from hydraulic oil thus reducing the risk of expensive downtimes.



### Advantages at a glance

- ▶ **Long filter service life and high particle holding capacity** due to specially designed and well balanced filter components
- ▶ **High particle separation rate** due to filter media made of synthetic or glass fibers
- ▶ **No oil loss** by corrosion-resistant housing materials and seals made of special rubber

*Hydraulic oil filters should be replaced every 500 to 1 000 hours of operation, at latest once a year. Please observe the vehicle manufacturers' specifications!*



### Properties of hydraulic fluids

Hydraulic fluid is used to transmit pressures in hydraulic systems. These pressures can be up to 400 bar, thus demanding hydraulic fluids to meet tough requirements:

- ▶ Low temperature sensitivity for viscosity (fluidity)
- ▶ Low compressibility
- ▶ Low tendency to form foams
- ▶ High shear stability, i.e. no rupture of the lubricant film – even if subject to high mechanical strains

# Commercial-vehicle halogen bulbs

## Product range & details



	Trucklight Maxlife	Trucklight	Eco Truck
Quick comparison	★★★★★	★★★	★★
	<b>The particularly durable and robust commercial-vehicle halogen bulb</b>	<b>The reliable commercial-vehicle halogen bulb</b>	<b>The commercial-vehicle halogen bulb with an attractive price/performance ratio – for value-based repairs</b>
Technology	Halogen		
Lighting range	●●●	●●●	●●●
Brightness	●●●	●●●	●●●
Service life	●●●●●	●●●●●	●●●
Vibration resistance	●●●●●	●●●	●●●
Scope of application			
Main types of automotive bulbs available	H1, H3, H4, H7	H1, H3, H4, H7, H11, R2	H1, H3, H4, H7
Workshop packaging	●	●	●

### Advantages at a glance

- ▶ Particularly long service life and very high vibration resistance
- ▶ Improved profitability
- ▶ Versatile application possibilities

- ▶ Versatile application possibilities
- ▶ Long service life
- ▶ Good price/performance ratio

- ▶ For value-based repairs
- ▶ Good durability and light output
- ▶ Attractive price/performance ratio

● Black packaging line

● Blue packaging line

● Gray packaging line



# Gas Discharge Lamps (HID)

## Product range & details



	Xenon Gigalight HID	Xenon White HID	Xenon HID
Quick comparison	★★★★★	★★★★★	★★★
	The brightest daylight like xenon lamp within the Bosch range provides up to 100% more light on the road ahead	The xenon lamp with the highest light intensity with up to 5500 Kelvin within the Bosch range	The xenon lamp with high light output
Technology	Gas-discharge lamp (HID)		
Lighting range	●●●●●	●●●●●	●●●
Brightness	●●●●●●	●●●●●	●●●
Service life	●●●	●●●	●●●●●
Vibration resistance	●●●	●●●	●●●
Scope of application			
Main types of automotive bulbs available	D1S, D2S	D1S, D2S	D1S, D2S, D2R, D3S, D4S
Workshop packaging	●	●	●

### Advantages at a glance

- |  |   |   |
|--|---|---|
| <ul style="list-style-type: none"> <li>▶ Daytime-bright light with 4400 Kelvin</li> <li>▶ 100% more light than standard xenon lamps</li> <li>▶ Increased driving safety</li> </ul> | <ul style="list-style-type: none"> <li>▶ Daytime-bright light with up to 5500 Kelvin</li> <li>▶ 20% more light than standard xenon lamps</li> <li>▶ Low energy consumption</li> </ul> | <ul style="list-style-type: none"> <li>▶ Daytime-bright light with high light output</li> <li>▶ Outstanding visibility</li> <li>▶ Low energy consumption</li> </ul> |
|--|---|---|

## Accessories

### Replacement-bulb box

In case a bulb fails, the replacement-bulb box is an immediate remedy. It is available as small and handy mini box or as maxi box with almost all replacement bulbs.



● Black packaging line

● Blue packaging line

# Steering systems

## Overview

Bosch steering systems stand out for their precise driving behavior and their easy handling. Workshops benefit from a broad portfolio based on decades of original-equipment experience – a range setting new standards at the aftermarket as well. The combination of parts, diagnostic equipment and additional services offers the ideal solution for almost all requirements.

### More than 70 years of experience

Ever since 1945, steering systems have been produced in the Bosch plant in Schwäbisch Gmünd, Germany. The result of so many years of experience: high-quality Bosch steering systems.

### Ready for the future

Bosch as an original equipment supplier of steering systems is also able to provide new and innovative products on the aftermarket as well and shortly after they have been launched.

### Worldwide network

Bosch ensures quick availability of its parts by means of an international sales and logistics network.

### The right solution for anyone

Bosch offers its customers a comprehensive range of steering systems, steering pumps, attachment parts and accessories. For value-based repairs, the products are also available as Bosch eXchange replacement parts.

### A competent partner

Bosch does not only provide the products itself, but supports its customers by means of diagnostic solutions, installation manuals, technical support and much more, as well.



# Steering systems for commercial vehicles

## Program & product details

### Steering systems and steering pumps



#### Steering gears

The robust steering systems for commercial vehicles: particularly reliable for heavy loads

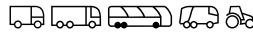
- ▶ RB-SERVOCOMTRONIC
- ▶ Semi-integral power steering for mobile cranes



#### Steering pumps

Steering pumps for hydraulic support of steering systems

- ▶ Vane pump
- ▶ Variable displacement pump VARIOSERV
- ▶ Tandem pump
- ▶ Radial piston pump



### Attachment parts and accessories



#### Attachment parts and accessories

Attachment parts and accessories for commercial vehicle steering systems

- ▶ Ball joint
- ▶ Bevel gearbox
- ▶ Flow indicator
- ▶ Flow limiting valve
- ▶ Oil reservoir
- ▶ Operating cylinder
- ▶ Pressure limiting valve
- ▶ Steering shaft
- ▶ Steering column
- ▶ Universal joint



### Advantages at a glance

- ▶ **Long service life of steering systems and pumps:** the production meets current standards and uses thoroughly tested material only
- ▶ **Quickly back onto the roads again:** due to the high availability of Bosch products, commercial vehicles can quickly be brought back into operation
- ▶ **Professional support:** Bosch provides comprehensive support for disassembly, assembly and putting into operation
- ▶ **Reliable steering systems for a safe journey:** Bosch steering systems pass stringent functional and quality checks before being delivered to the customers

# Commercial vehicle starters and alternators

## Overview

In terms of reliability and profitability, the demands on commercial vehicles (CV) today are extremely high. After all, commercial vehicles only earn money when they are on the move. The Bosch starter and alternator program contains products of outstanding quality – and ensures satisfied workshop customers.

### Reliable in professional operation

Bosch starters and alternators for commercial vehicles are carefully made from high quality materials and components. According to their future tasks, they are tested under extreme conditions. In professional operation – often in 24-hour operations every day – they ensure reliable starts and energy supply.

### Excellent quality

The production of CV starters and alternators for the aftermarket is subject to the same stringent quality guidelines as the production of original equipment. The entire production process and the final functional and quality tests meet the same high standards applied to original equipment.

### Competent, experienced, innovative

Bosch looks back at more than 100 years of experience with starters and alternators. The program continually includes innovative solutions that are suitable for a large number of commercial vehicles and that help modern powertrain systems to save fuel and reduce emissions.

### Extensive product range

Buses, trucks, tractors, cranes or vans – the performance requirements of commercial vehicle starters and alternators are as different as the actual vehicle concept. That is exactly what the Bosch product range is designed for. The extensive range and fast availability ensure that commercial vehicles are quickly back in operation.



# Commercial vehicle starters

## Product range & details

Bosch offers a broad range of high-quality starters for on- and off-highway vehicles. Whether for 12- or 24-volt on-board system, for diesel vehicles with up to 30 l or large engines with up to 90 l (diesel) or 180 l (gasoline) of displacement, Bosch has the matching solution for all of them.



### Starters for on- and off-highway vehicles

**Reliable starting performance:** developed, built and tested for reliable vehicle engine starting even under the most adverse conditions. These commercial vehicles (CV) starters are geared to the specific field of application of the respective vehicle and ensure an extraordinarily long service life.

On-board system	12 V	24 V
Performance at T=+20°C 100% SOC*	up to 5.5 kW	up to 13.2 kW
Performance at T= -20°C 80% SOC*	up to 4.2 kW	up to 10 kW
Diesel engine class	up to 9 l	up to 30 l
Scope of application		

\* SOC = the battery's state of charge

#### Advantages at a glance

- ▶ **Excellent starting reliability:** the robust and compact commercial vehicle starter design ensures reliable performance under extreme conditions
- ▶ **High quality:** these starters are produced under the same production and test conditions as original equipment
- ▶ **Outstanding service life:** these starters are made out of high-quality components geared to the specific requirements of each application



### Reliable starting of large engines

For use in large engine (up to 90 l diesel engines, up to 180 l gasoline engines), the Bosch range includes parallel-starter systems. It comprises two or three 24-volt starters combined at a relatively small installation space and combining their individual starting powers.



### Bosch CV starters and alternators for renowned manufacturers

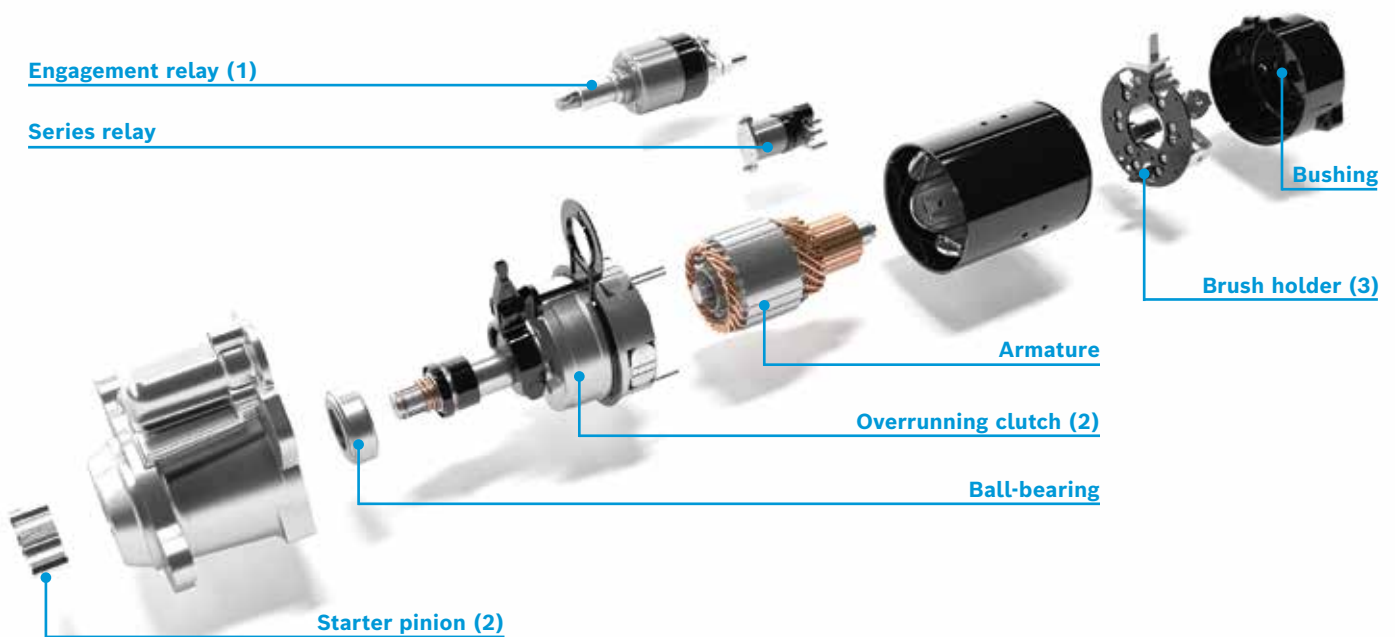
- |                 |                 |
|-----------------|-----------------|
| ▶ Ashok Leyland | ▶ Liebherr      |
| ▶ CAT           | ▶ MAN           |
| ▶ CNH           | ▶ Mercedes Benz |
| ▶ Cummins       | ▶ MTU           |
| ▶ DAF           | ▶ MWM           |
| ▶ DEUTZ         | ▶ PACCAR        |
| ▶ INTERNATIONAL | ▶ SCANIA        |
| ▶ IVECO         | ▶ TATA MOTORS   |
| ▶ John Deere    | ▶ VOLVO         |
| ▶ Komatsu       | ▶ WEICHAI POWER |



# Spare parts for commercial vehicle starters

## Product details

For quick and reliable CV starter repairs, Bosch provides workshops with selected spare parts – featuring high quality.



### (1) Engagement relay

- ▶ **Long service life:** due to the high quality of the plastics and metals used
- ▶ **Suited practically any application:** depending on vehicle and starter
- ▶ **Excellent switching reliability:** thanks to copper contacts with special contact design – in part even with silver-coated copper surfaces

### (2) Starter pinion with overrunning clutch

- ▶ **Trouble-free and reliable engaging:** due to optimized system featuring a special pinion geometry and engagement spring
- ▶ **High wear resistance:** thanks to optimized greases and curing procedures as well as to the use of high-quality materials

- ▶ **Long service life:** overrunning clutch equipped with optimized bearing bushings

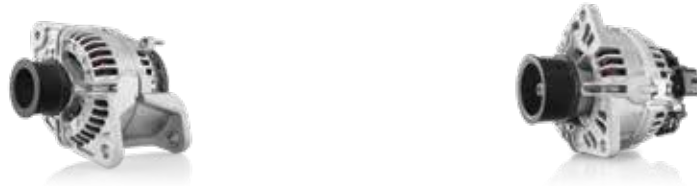
### (3) Brush holder

- ▶ **Long service life:** due to optimized carbon brushes featuring a special material composition
- ▶ **Protection against corrosion:** thanks to brush holders made of synthetic materials or coated metal
- ▶ **Consistent performance throughout the entire service life:** coil springs ensure the right contact pressure of the brushes

# Commercial vehicle alternators

## Product range & details

Bosch commercial vehicle alternators ensure a reliable on-board power supply for on- and off-highway vehicles with a large number of electrical consumers. They are designed for most diverse applications and reliably cover energy demands – even in case of extreme requirements.



Alternators for on- and off-highway vehicles		
<b>Bosch commercial vehicle alternators are the preferred choice in terms of reliability and durability.</b> They are developed, built and tested to reliably supply the electrical consumers of commercial vehicles – even under extremely adverse environmental conditions.		
On-board system	14 V	28 V
Output at 1800 rpm	40 – 100 A	20 – 65 A
6000 rpm	70 – 240 A	50 – 150 A
Level of efficiency in %	63 – 71 %	68 – 72 %
Scope of application		

### Advantages at a glance

- ▶ **Excellent reliability in terms of power supply:** the robust and compact design of commercial vehicle alternators ensure an outstandingly high power output under extreme environmental conditions
- ▶ **High quality:** these alternators are produced under the same production and test conditions as original equipment
- ▶ **Powerful energy supply:** outstanding charging current even at low engine speeds due to specifically matched high-quality components

### KTS Truck & ESI[tronic] 2.0 Truck

The solution for simple diagnoses and quick repair of on- and off-highway vehicles.

### Did you know?

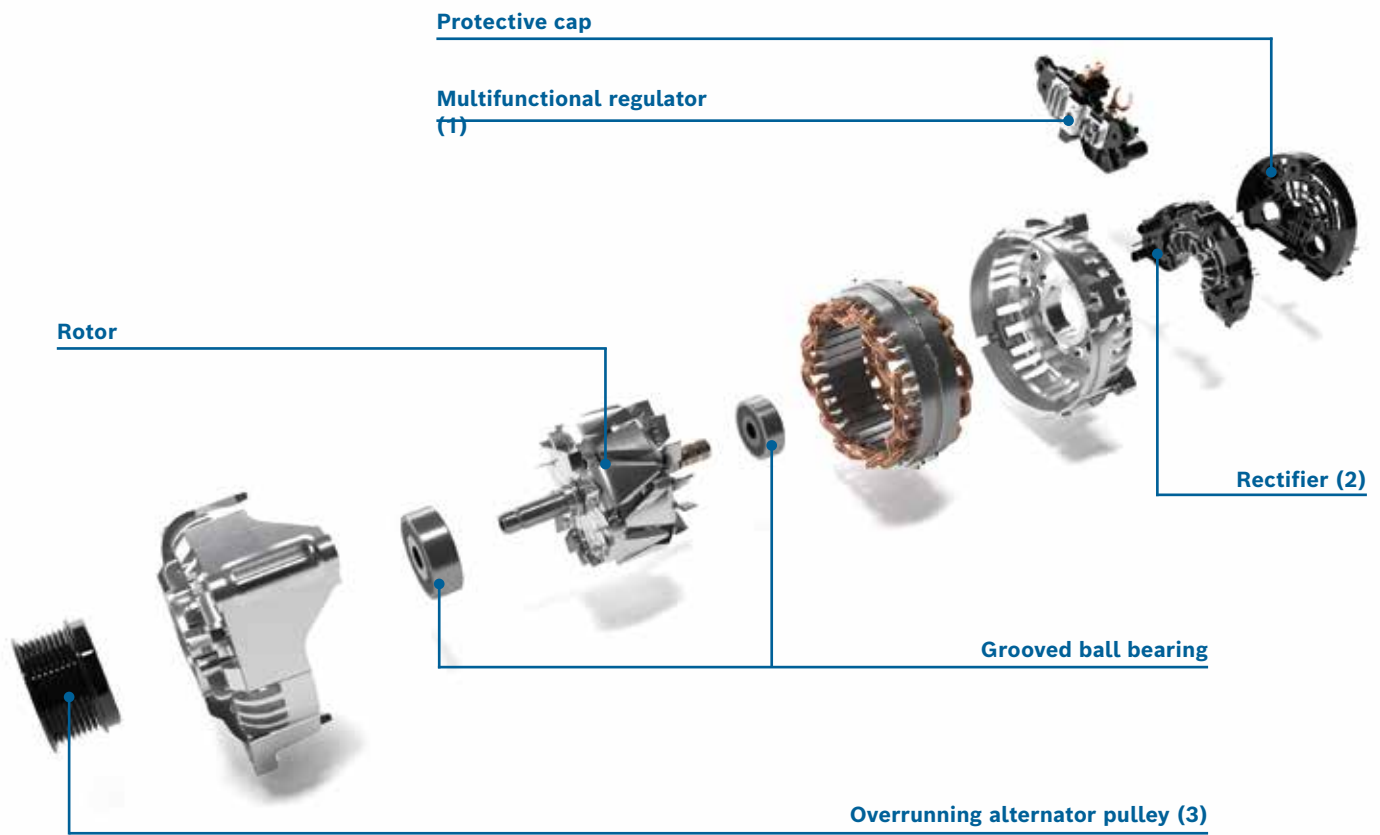
In order to meet different requirements, the Bosch range includes commercial vehicle alternators with modular performance features:

- ▶ **Service life:** particularly robust and durable due to increased number of ball bearings and reinforced bearing bushings
- ▶ **Temperature:** extremely heat resistant due to temperature-resistant sealing of ball bearings
- ▶ **Belt tension:** for extreme belt forces with reinforced bearing shields and bigger A-ball bearings
- ▶ **High ambient temperature:** coping even with extreme heat due to optimized ventilation system, high-temperature bearings and stator insulation materials

# Spare parts for commercial vehicle alternators

## Product details

For quick and reliable CV alternator repairs, the Bosch range thus also includes selected spare parts – featuring high quality.



### (1) Multifunctional regulator

- ▶ **Long service life:** due to brushes with optimized material mixture
- ▶ **Geared to the respective type of vehicle and alternator:** the parts are aligned with the OE specifications
- ▶ **Ensuring current flow throughout the entire service life:** by means of special connectors and high-quality materials
- ▶ **Protection against alternator overheating and overloads:** the control voltage is adjusted to ensure exact functionality of the on-board power supply and stable battery charging

### (2) Rectifier

- ▶ **High temperature resistance**
- ▶ **Reduction of voltage peaks:** due to individually tested Zener diodes
- ▶ **Reliable protection of the vehicle against overvoltages:** permanent current rectification prevents the emergence of overvoltages
- ▶ **High operational reliability:** special connection of all diodes by liquid welding

### (3) Overrunning alternator pulley

- ▶ **Protection against dust entry:** for being closed on both sides
- ▶ **Aligned with the engine type:** diameter, surface and number of grooves are perfectly matched
- ▶ **Relief for the belt drive**

# Bosch eXchange

## Value-based commercial vehicle repair



Value-based repairs are in higher demand than ever before – and not just for older commercial vehicles. But how can this be achieved without compromising on quality? The answer is Bosch eXchange. With its comprehensive range of high-quality exchange products, commercial vehicle repair has become a success factor for automotive workshops.



### Bosch eXchange



Commercial vehicle starters and alternators from Bosch are also available as Bosch eXchange products

### Advantages at a glance

- ▶ **High quality and reliability:** Bosch eXchange products are tested to the same standards as original parts and have to pass stringent functional and quality tests
- ▶ **Outstanding price-performance ratio:** Up to 30% more affordable than comparable products in the Bosch new parts program, while still offering the same warranty
- ▶ **Resource-saving and environmentally friendly:** Bosch eXchange saves resources and makes an important contribution to the circular economy by reusing old parts



# HEF/HEP 109 starters

## Overview

**Around the world, large-displacement engines are used for ore mining, decentralized supply of electric energy, construction machinery, agricultural vehicles as well as marine and railway vehicles.** Whether displacements of up to 180 l, high thermal loads or applications with additional hydraulic loads, Bosch HEF 109 starters ensure reliable starting – both as single-starter solutions or parallel-starter system.



**Starter range for several off-highway applications**  
Bosch HEF 109 starters are available in different versions meeting the specific requirements of different environmental conditions and off-highway applications. The modular starter concept

allows free selection of the performance features and even their partial combination (see table) – ideal for individual alignment with different specific requirements.



# HEF/HEP 109 starters

## Product range & details



Up to 50%  
lighter than  
comparable  
products

### HEF 109 starter for high power requirements

With a nominal output of up to 10 kW (24 V), HEF 109 starters are used to start diesel engines with a displacement of up to 30 l and usual cold start requirements. Their robust, compact and modular design makes them a great solution. The starter systems are designed for up to 14 000 hours of operation in stationary machines and off-highway applications (some 800 000 km on-highway). They stand out for their high performance density and great cold start performance. And, on top, they are up to 50 % lighter than direct starters of the same performance class.

### HEP 109 parallel-starter systems for large engines

Parallel starter systems consisting of two or three synchronized HEP 109 starters increase the scope of application. They are suitable for diesel engines with up to 90 l and gasoline engines with up to 180 l of displacement.

### Rotatable ductile-iron flange for high flexibility

- ▶ 8 possible mounting positions per part number
- ▶ Increased flexibility and cost effectiveness with small and medium batch sizes

### Protection class (IP57)

- ▶ Additional protection of starters used for tough off-highway applications
- ▶ Protection in case of short-term submersion

### Electrically insulated terminal 31

- ▶ Improved corrosion protection
- ▶ Ideal for marine applications and special application requirements of construction vehicles and railway applications

### Reversible thermal overload circuit breaker

- ▶ Safe protection against overloads
- ▶ Integrated into the starter harness

### Integrated mechanical relay (IMR) with optional plug connector

- ▶ Easy connection to the vehicle electrical system
- ▶ No external control relay required
- ▶ Controlled start via ECU is possible

### Smooth engaging

- ▶ Smooth electrical two-stage engaging
- ▶ Increased service life of ring gear and starter pinion

### Starter design in line with the specific application

- ▶ Designed for high cold start performance, high starting torque and good start-up support
- ▶ Different motor parts with a thermal behavior optimized for the specific application purpose

### Noseless bearing principle

- ▶ Optimized protection of the pinion shaft against dust, water and splash oil
- ▶ High installation flexibility due to the pinion-shaft bearing located inside the starter

# Wiper blades

## Overview

Improved visibility in the long run. Bosch wiper blades always fit – with any weather, on any vehicle and thanks to the comprehensive range they even meet most diverse market and customer requirements.

### Technological partnerships

In close cooperation with a large number of vehicle manufacturers, Bosch does a lot of development work. By means of the innovative Power Protection Plus wiper rubber, among other innovations, it provides clear perspectives of future technologies.

### A suitable solution for almost any customer

Bosch wiper blades fit almost any vehicle – no matter how different individual types may be: from latest car models to commercial vehicles and through to classic cars. This makes them a suitable solution for almost all customer requirements.

### Flexible range

A market-suited or customer-specific range of wiper blades for the most diverse types of vehicles and sales channels can be picked out of the complete Bosch range of wiper blades.

### Reliable performance, high level of safety

Bosch wiper blades are subject to tough performance and resilience tests – both at the test laboratory and right on the vehicle. Many years of experience in development and production make the difference. The result: high fitting accuracy and outstanding wiper performance.

### Strong-selling appearance





Starting with the eye-catching and practical packaging right through to attractive sales promotions – Bosch ensures success in sales of wiper blades. Intuitive product finders help finding the right wiper blade while fitting instructions and videos ease the mounting.



# Commercial vehicle wiper blades

## Product range






	Aerotwin CV	Twin CV
	<p><b>For high-performance and outstanding visibility at any time of the year:</b> The Bosch Aerotwin flat wiper blade for commercial vehicles has Power Protection Plus wiper rubber technology and includes a pre-assembled adapter for use on a range of commercial vehicles</p>	<p><b>For effective windshield cleaning, a smooth action and high durability:</b> The Bosch Twin conventional wiper blade for commercial vehicles has a dual-material rubber with smooth-glide coating and includes a pre-assembled Quick-Clip universal adapter for a range of commercial vehicles</p>
Wiper-rubber technology	Power Protection Plus wiper rubber technology for outstanding wiping performance, minimum wiping noise and an increased service life – even under extreme temperatures	Wiper rubber with smooth-glide coating
Scope of application	 (also suitable for vehicles with wash jets)	  
Structure	2 parallel high-tech spring strips made from Evodium steel for very good contact pressure	Robust and resilient all-metal bracket system with double corrosion protection
Adapter system	<p>Pre-assembled universal adapter, combi interface for 9 x 3 mm, 9 x 4 mm and 12 x 4 mm hooks</p> <p>For selected vehicles also suitable to upgrade from conventional to flat wiper-blade technology</p> <p>(Screw-type) interface for hasp fastening in case of 800 mm wiper blades</p>	Pre-assembled universal adapter for 700 mm wiper blades and specific connections for longer wiper blades
Assembly	● ● ● ● ●	● ● ● ● ●
Service life	● ● ● ● ●	● ● ● ● ●
Wiping performance	● ● ● ● ●	● ● ● ● ●
High-speed behavior	● ● ● ● ●	● ● ● ● ●
Smooth operation	● ● ● ● ●	● ● ● ● ●
Amount of part numbers	> 20	> 25
Market coverage	> 50 %	> 98 %
Wiper-blade lengths	500 – 800 mm	400 – 1.000 mm
Packaging	Set, Single	Set, Single

# Commercial vehicle

## Product range



	Aerotwin CV	Twin CV	Eco CV
	<p><b>For high-performance and outstanding visibility at any time of the year:</b> The Bosch Aerotwin flat wiper blade for commercial vehicles has Power Protection Plus wiper rubber technology and includes a pre-assembled adapter for use on a range of commercial vehicles</p>	<p><b>For effective windshield cleaning, a smooth action and high durability:</b> The Bosch Twin conventional wiper blade for commercial vehicles has a dual-material rubber with smooth-glide coating and includes a pre-assembled Quick-Clip universal adapter for a range of commercial vehicles</p>	<p><b>High quality performance at an affordable price:</b> The Bosch Eco Truck wiper blade for commercial vehicles has a natural wiper rubber with graphite coating and includes a pre-assembled Quick-Clip universal adapter for hook-type wiper arms for a range of commercial vehicles</p>
Wiper-rubber technology	Power Protection Plus wiper rubber technology for outstanding wiping performance, minimum wiping noise and an increased service life – even under extreme temperatures	Wiper rubber with smooth-glide coating	Proven wiper rubber technology with graphite coating
Scope of application	  (also suitable for vehicles with wash jets)	  	 
Structure	2 parallel high-tech spring strips made from Evodium steel for very good contact pressure	Robust and resilient all-metal bracket system with double corrosion protection	Robust all-metal bracket system with corrosion protection
Adapter system	Pre-assembled universal adapter, combi interface for 9 x 3 mm, 9 x 4 mm and 12 x 4 mm hooks  For selected vehicles also suitable to upgrade from conventional to flat wiper-blade technology  (Screw-type) interface for hasp fastening in case of 800 mm wiper blades	Pre-assembled universal adapter for 700 mm wiper blades and specific connections for longer wiper blades	Pre-assembled universal adapter for 12 x 4 mm hooks
Assembly	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
Service life	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
Wiping performance	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
High-speed behavior	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
Smooth operation	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
Amount of part numbers	> 20	> 25	3
Wiper-blade lengths	500 - 800 mm	400 - 1.000 mm	600 - 700 mm
Packaging	Set, Single	Set, Single	Single





Did you know?

**428.000 m<sup>2</sup>**

... is the windshield surface cleaned by a Bosch wiper blade throughout its average service life. It thus reliably ensures cleanliness and a clear view.

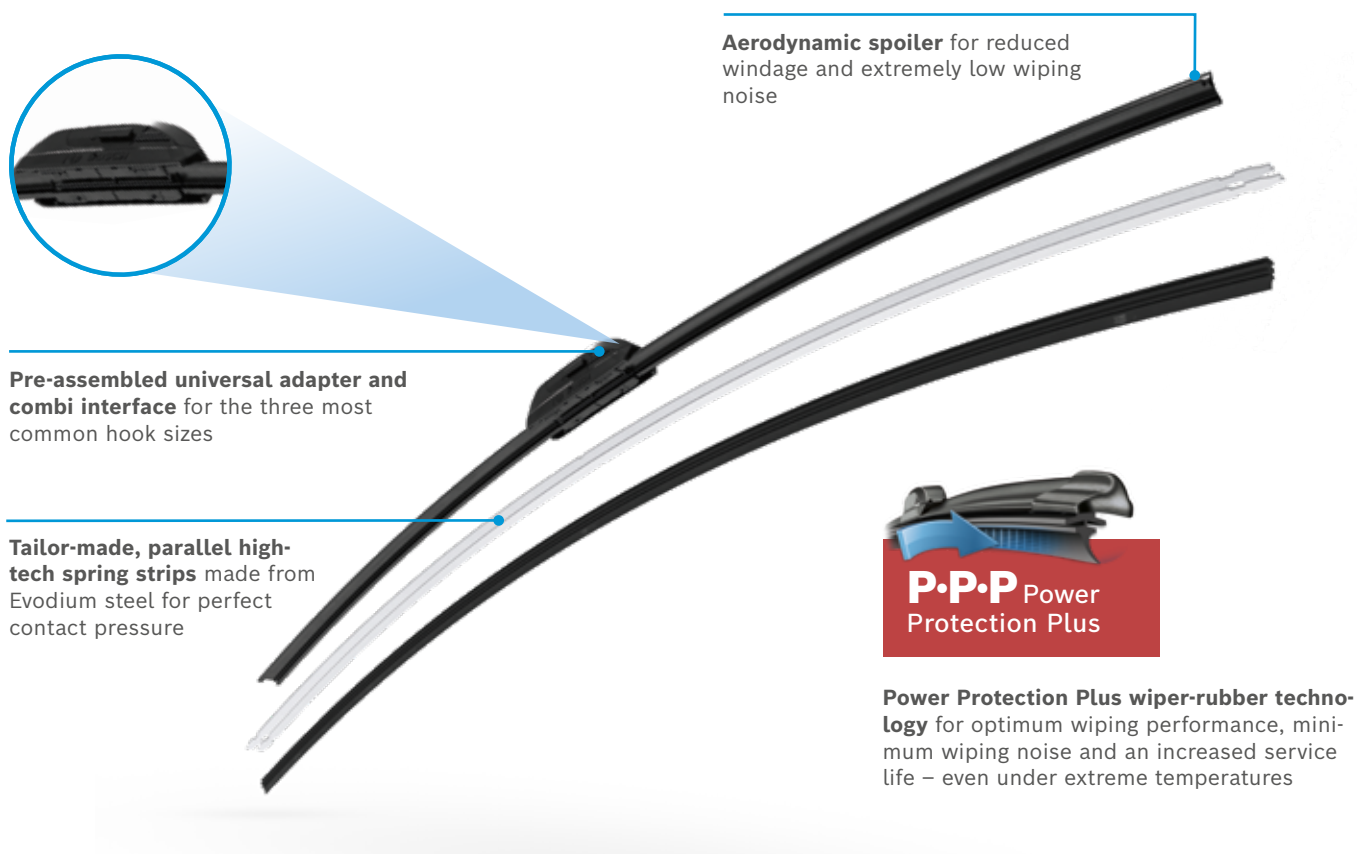


# Aerotwin commercial vehicle flat wiper blade

## Product details & technology

### For high-performance and outstanding visibility at any time of the year:

The Bosch Aerotwin flat wiper blade for commercial vehicles has Power Protection Plus wiper rubber technology and includes a pre-assembled adapter for use on a range of commercial vehicles



### Advantages at a glance

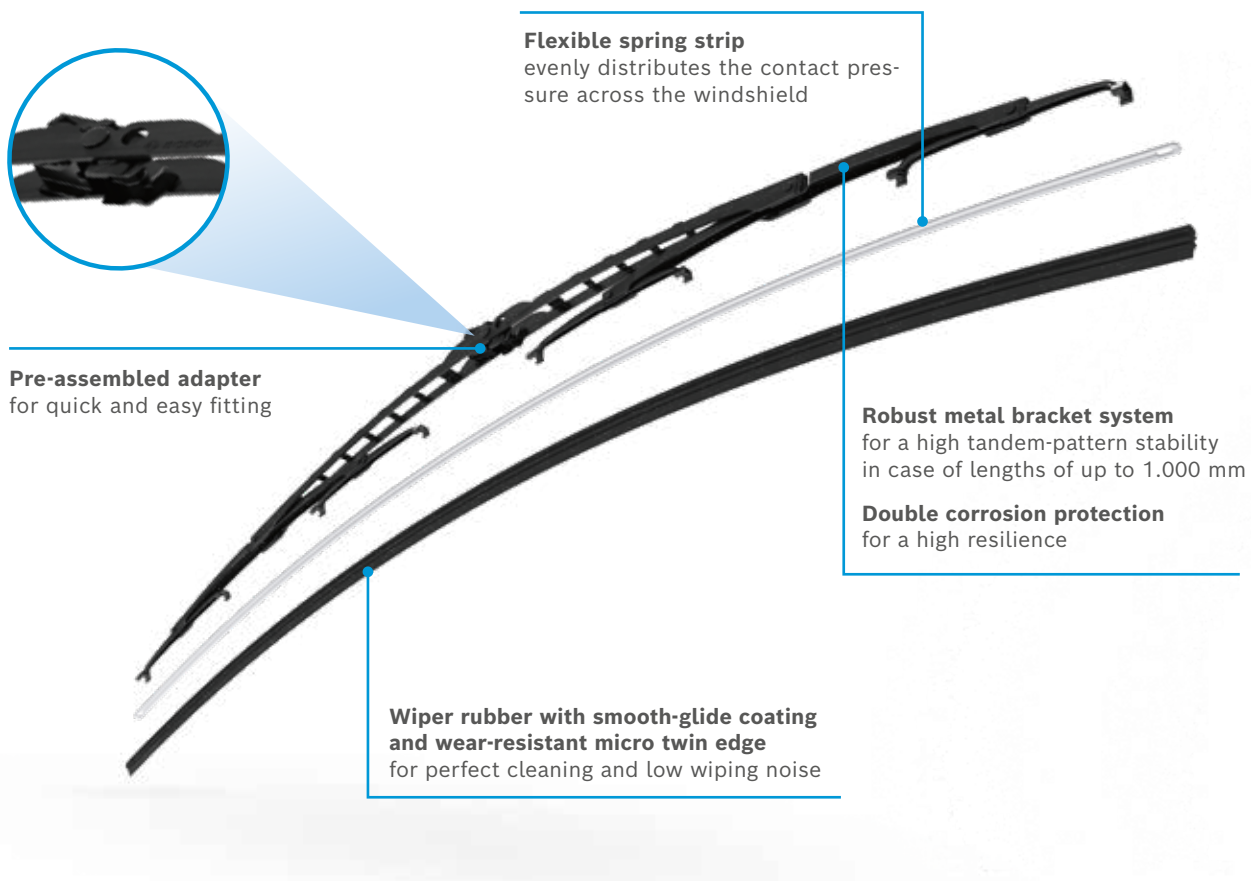
- ▶ **Outstanding wiping performance, increased service life and quiet wiping:** wiper rubber with patented Power Protection Plus coating
- ▶ **Clean and clear view on larger windshields:** lengths of 500 to 800 mm; tailor-made high-tech Evodium spring strips increase the contact pressure for the wiper blade to fully clean the whole windshield
- ▶ **Improved winter performance:** flat and smooth design prevents the accumulation of ice
- ▶ **Quick and easy fitting:** preassembled universal adapter as combi interface for the three most common U-hook sizes

# Twin commercial vehicle conventional wiper blade

## Product details & technology

### For effective windshield cleaning, a smooth action and high durability:

The Bosch Twin conventional wiper blade for commercial vehicles has a dual-material rubber with smooth-glide coating and includes a pre-assembled Quick-Clip universal adapter for a range of commercial vehicles



### Advantages at a glance

- ▶ **Outstanding cleaning performance and more consistent effect:** double wiper rubber with smooth-glide coating for increased wiping comfort
- ▶ **Consistently clean and with a clear view:** a modern bracket system evenly distributes the wiper-blade contact pressure across the windshield
- ▶ **Increased service life:** wear-resistant Twin wiper rubber
- ▶ **Lasting safety even under extreme weather conditions:** robust metal bracket system with double corrosion protection
- ▶ **Increased driving comfort:** robust metal design for wiper blades with lengths between 400 and 1.000 mm prevents lifting and fluttering – even if subject to strong winds

# Eco Truck metal-bracket wiper blade

## Product details

**High quality performance at an affordable price:** The Bosch Eco Truck wiper blade for commercial vehicles has a natural wiper rubber with graphite coating and includes a pre-assembled Quick-Clip universal adapter for hook-type wiper arms for a range of commercial vehicles



### Advantages at a glance

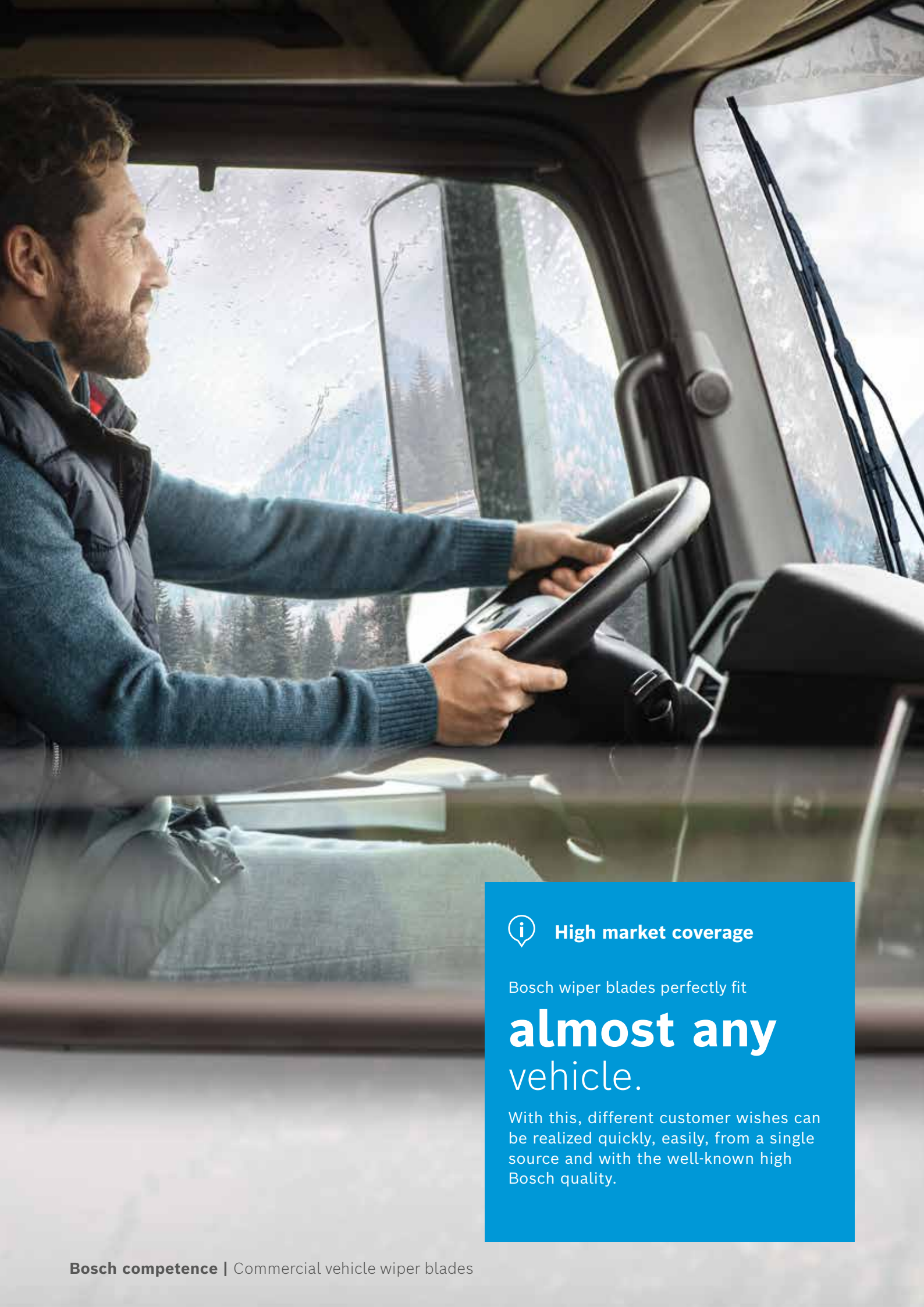
- ▶ **Thorough cleaning and reduced operational noises:** wiper rubber made of natural rubber with graphite coating
- ▶ **Robust and durable:** metal bracket system with corrosion protection for a longer service life
- ▶ **Quick and easy installation:** pre-assembled Quick Clip universal adapter for U-hook wiper arms



Did you know?

With only **3 part numbers,**

the Bosch Eco Truck wiper blade is suitable for a wide variety of vehicles with hook connections.



### High market coverage

Bosch wiper blades perfectly fit

**almost any**  
vehicle.

With this, different customer wishes can be realized quickly, easily, from a single source and with the well-known high Bosch quality.



# Wiper blades

## Development, production and quality tests

### Development and innovation

#### High comfort, pioneering design

- ▶ All components are developed in a vehicle-specific manner and the wiper system is adjusted down to the last detail by means of latest tools
- ▶ At the wind tunnel, Bosch tests e.g. different wind conditions and speeds



*Bosch develops wiper blades in Bühl (Germany) and Tienen (Belgium)*

### Large-batch production

#### Special Bosch rubber compound received numerous awards

- ▶ Consistently high series-production quality of the rubber compound ensured by sophisticated analyses at the laboratory prior to release for production
- ▶ Durable wiper rubber thanks to its high resistance to wear, UV radiation and aging as well as to its high thermal elasticity



### Performance and resilience tests

#### Prime principle: safety and reliability first

- ▶ Stringent performance and resilience tests at the test laboratory as well as right on the vehicle provide the basis for the consistently high quality of Bosch wiper blades
- ▶ The tested factors include resistance to environmental and ozone influences, chemical exposure and abrasion, among others
- ▶ Performance tests concerning wiper performance, noise generation, high-speed behavior and durability for lastingly high wiping quality





# Wiper blade packaging

## Appealing, practical and informative

The performance of Bosch wiper blades is impressive – just like the packaging. Its appealing design is a real sales support. A lot of practical details ease the selection of the right wiper blade as well as its installation.

### The quick way to find the matching product

List of the most important vehicle models



**QR code:**  
for online  
fitting videos

### Easy to fit

Easily understood step-by-step instructions

### Simply convincing

Overview of the top product features and advantages

### Most important information at a glance

Product name, customer search number, wiper-blade length and amount of wiper blades



## How to find the right wiper: Fast, online and mobile

### The Bosch wiper app for iOS and Android smartphones:

- ▶ Easy navigation to easily find your vehicle
- ▶ All matching wipers at a glance
- ▶ Detailed product information
- ▶ Quick comparison of product alternatives
- ▶ Simple installation video



### The Bosch wiper website:

- ▶ Offers all the same great features as the app
- ▶ Can be accessed online anywhere
- ▶ Optimal display on your smartphone, tablet or computer



[www.boschwiperblades.com](http://www.boschwiperblades.com)



# What drives you, drives us.

Bosch technologies are used worldwide in almost all vehicles. People, and assuring their mobility, is what we are focused on.

Therefore, we have dedicated the last 125 years of pioneering spirit and expertise in research and manufacturing to achieving this.

We continue to work on our unique combination of solutions for spare parts, diagnostic devices, workshop equipment and services:

- ▶ Solutions for efficient vehicle repairs
- ▶ Innovative workshop equipment and software
- ▶ The world's most comprehensive range of new and replacement parts
- ▶ Large network of wholesale customers, for quick and reliable parts supply
- ▶ Competent hotline support
- ▶ Comprehensive educational and training offers
- ▶ Targeted sales and marketing support

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