BOSCH
Invented for life

Bosch diesel system components

for professional repairs on modern and conventional diesel systems

Modern diesel injection systems
Overview

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

Common-rail fuel injection: Pioneering diesel engine technology

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

For effective exhaust-gas treatment, Bosch also offers a wide range of products for No_x reduction and thermal regeneration of particle filters.

History of modern diesel injection systems

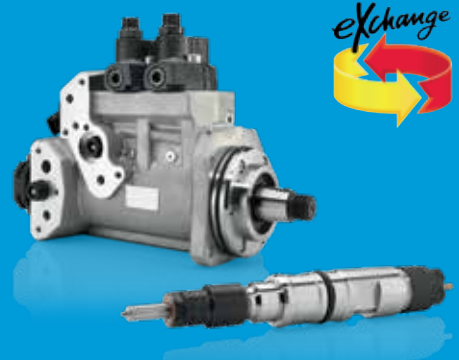
1994 UIS Unit injector system 2 for cars (PCs) and commercial vehicles (CVs)
1995 UPS unit pump system for CVs
1996 VP44 radial-piston distributor injection pump for PCs and CVs
1997 CRS CRI 1 common-rail system for PCs
1998 CRS CRIN 1 common-rail system for CVs
2004 Denoxtronic 1 for CVs
2005 UIS unit injection system 3 for CVs
2006 Denoxtronic 2 for CVs
2007 Departronic 1 for CVs
2007 Denoxtronic 2.2 for CVs
2010 Departronic 2 for CVs
2012 Modular common-rail system for large diesel engines
2012 Denoxtronic 5.1 for PCs
2014 CPN5 common-rail high-pressure pump for CVs
2015 CRS2 solenoid valve with 2,200 bar for PCs
2017 CRS3 Piezo with 2,700 bar for PCs
2018 Denoxtronic 6-HD for CVs
2019 CPN6 common-rail high-pressure pump for CVs
2019 Denoxtronic 5.3 for PCs
2021 CRIN20L common-rail injector for CVs

Modern diesel injection systems
Product range & details

	CR pump	CR injectors	Unit injector system	Unit pump systems
	In 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.	Injectors inject fuel directly 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.	The unit injector system (UIS) also known as pump/nozzle injection system is an electronically controlled direct diesel injection system developed by Bosch. The unit injector system consists of a nozzle-and-holder assembly with integrated high-pressure pump.	The unit pump system (UPS) is used for commercial vehicles only. It stands out for its design. As is the case with UIS, it features a single pump for each cylinder. Unlike UIS, however, nozzle and pump are not combined into a single unit. They consist of two separate products. A short line connects them with one another.
Scope of application				
Advantages at a glance	▶ **High engine performance and smooth operation** by volume and pressure supply as required ▶ **High efficiency** since the rail pressure is already available at low engine speeds ▶ **Reduced consumption** if combined with start/stop systems ▶ **Long service life** due to robust design	▶ **Highly efficient fuel injection** due to extremely short injection intervals and multiple injection ▶ **Smooth operation and high engine performance** in all driving conditions due to pilot, main and post injections ▶ **Quiet and highly efficient combustion** due to an individually controlled injection at each cylinder	▶ **Optimized and high engine performance combined with low fuel consumption** due to a compact design ▶ **Low noise generation** due to installation within the engine block ▶ **Best possible air/fuel ratio** due to injection pressures of up to 2,200 bar	▶ **Optimized and high engine performance combined with low fuel consumption** due to a compact design ▶ **Low noise generation** due to installation within the engine block ▶ **Best possible air/fuel ratio** due to injection pressures of up to 2,200 bar

Bosch eXchange

With its comprehensive range of exchangeable products, Bosch eXchange provides an attractive option for value-based vehicle repairs – featuring the same warranty as with Bosch new-parts.



Common-rail pumps
Product details

In common-rail systems, the high-pressure pump compresses the fuel to up to 2,700 bar and provides the correct 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. Most common-rail systems are equipped with radial piston pumps.

Advantages at a glance

- **High engine performance and smooth operation** by volume and pressure supply as required
- **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

Bosch eXchange

By means of CP4, Bosch eXchange provides a exchangeable product of the latest generation as an attractive option for value-based vehicle repairs featuring the same warranty as with Bosch new-parts.

Common-rail injectors
Product details

Injectors inject fuel directly into the combustion chamber. They are supplied by the fuel rail and via short high-pressure fuel lines. The engine control unit manages the switching valves integrated into the injector thus opening and closing the injection nozzle. The switching valves can be controlled either electromagnetically or by a Piezo element.

Advantages at a glance

- **Highly efficient fuel injection** due to extremely short injection intervals and multiple injections
- **Smooth operation and high engine performance** in driving conditions due to pilot, main and post injections
- **Quiet and highly efficient combustion** due to individually controlled injections by each cylinder
- **Immediate injection stop** by hydraulically closed nozzle needles

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 commercial vehicles (CRIN)

Unit injector system
Product details

The unit injector system (UIS) also known as pump/nozzle injection system is an electronically controlled diesel direct injection system developed by Bosch. In unit injector systems, the single-plunger pump and the injection nozzle are combined into a single unit. The main peculiarity of unit injector systems is their design with an individual pump for each cylinder. For this purpose, both the pump and the injection nozzle are combined into a single unit installed directly into the cylinder head.

Advantages at a glance

- **Highly optimized engine performance combined with low fuel consumption** due to compact design
- **Low noise generation** due to installation directly into the engine block
- **Best possible air/fuel ratio** due to injection pressures of up to 2,200 bar

Unit injectors for champions

Photo: A. & W. Bartscher / Hahn Racing

This season, 6-time European Truck Racing Champion (FIA ETRC, as of 2021) Jochen Hahn again relies on Bosch unit injectors for his race truck.

Unit pump systems
Product details

The unit pump system (UPS) is used for commercial vehicles only. It stands out for its design. As is the case with UIS, it features a single pump for each cylinder. Unlike UIS, however, nozzle and pump are not combined into a single unit. They consist of two separate products, with a short line connecting them to each other.

Advantages at a glance

- **Highly optimized engine performance combined with low fuel consumption** due to compact design
- **Low noise generation** due to installation directly into the engine block
- **Best possible air/fuel ratio** due to injection pressures of up to 2,200 bar

ESI[tronic] Truck

KTS Truck and ESI[tronic] 2.0 Truck allow maintenance and repair on more than

70,000

electronic vehicle systems

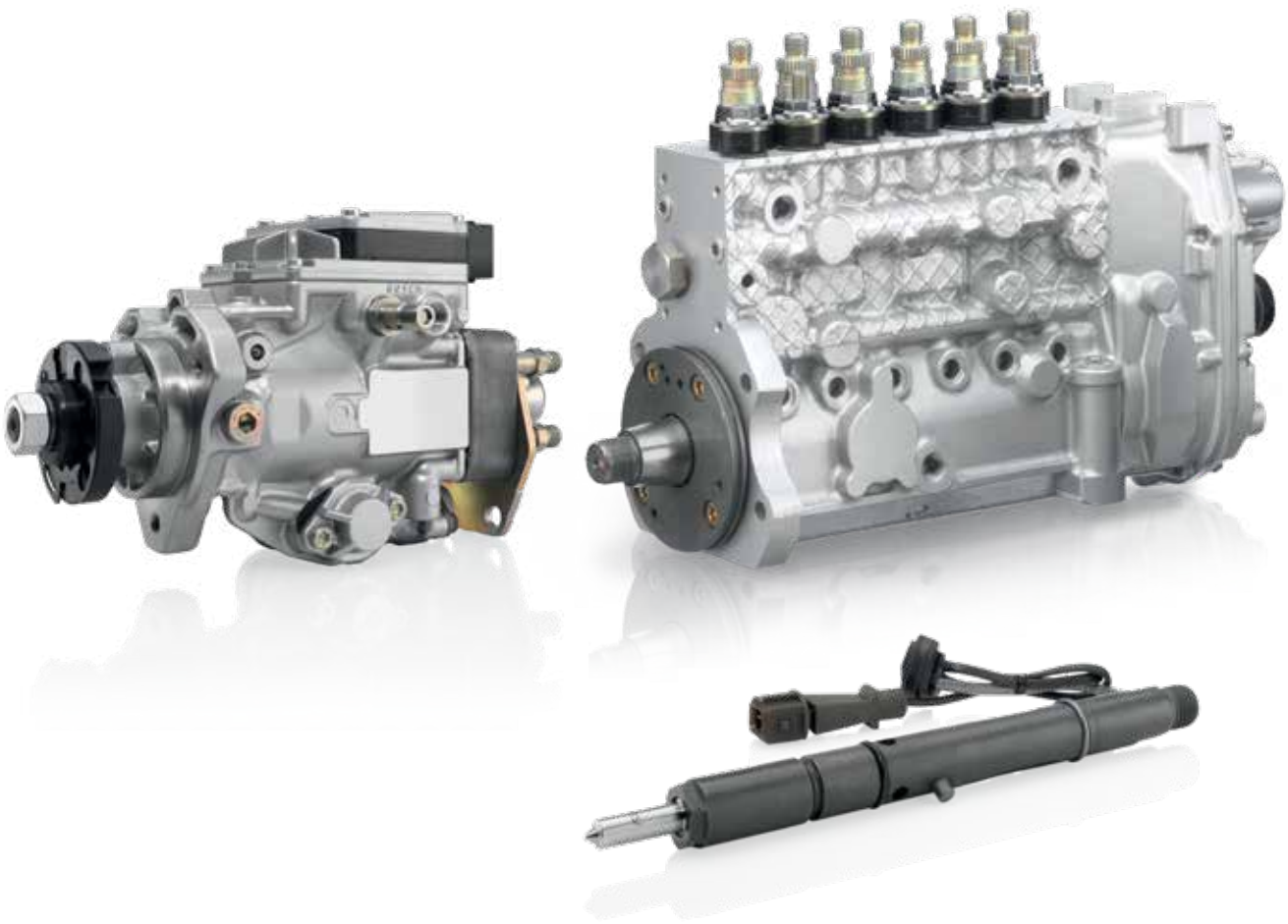
Conventional diesel injection systems
Overview

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 regarding the development of conventional diesel injection systems.

Designed for high cylinder outputs,
in-line injection pumps are used for 2-to-12-cylinder engines – mainly engines used by 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 with 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 size. 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
Bosch developed the nozzle-and-holder assembly specifically for the injection of the air/fuel mixture into each of the cylinders of an engine.



In-line injection pumps
Product details

In-line injection pumps allow high cylinder outputs in 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 a line. In engines equipped with this pump, each cylinder is supplied with fuel by its own pump element and via a pressure valve and a high-pressure line.

Advantages at a glance

- **No special seals required,** due to the high fitting accuracy of the pump piston – 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** with regular maintenance and proper installation of Bosch spare parts

Diesel component repair

BOSCH Diesel Center

BOSCH Diesel Service

Bosch Diesel Center and 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.

Distributor-type 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 for construction and agricultural machinery (off-highway).

	Distributor-type injection pump (VE)	Distributor-type injection pump (VP)
	Axial-piston distributor-type injection pumps (VE) are used for engines with a power output of approx. 30 kW per cylinder. Axial-piston distributor-type injection pumps (VE) for indirect injection (IDI) engines generate pressures of up to 1,250 bar at the injector. Used for direct injection (DI) engines, they generate peak pressures of approx. 1,950 bar.	Radial-piston distributor-type injection pumps (VP) are used for engines with a power output of up to 45 kW per cylinder. Radial-piston distributor-type injection pumps (VP) generate peak pressures of approx. 1,950 bar if used for direct injection (DI) engines.
Scope of application		
Advantages at a glance	▶ **Precise fuel dosing** by adjustable injection pressure and timing through electronically controlled injection via electric supply pump ▶ **Long service life** due to high robustness ▶ **Wide-spread application** in vehicles due to its space-saving design ▶ **Maintenance-free, long service life** due to lubrication by fuel	

Bosch eXchange

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

Having been produced for decades and in millions, these days, VP30 and VP44 distributor injection pumps 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). It is used to inject fuel into the combustion chamber of diesel engines. 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 behavior** due to major influence on both mixture formation and combustion
- **Suitable for all common systems and types of engines** – ranging from single-cylinder engines to car and truck engines thanks to their robust technology and design with a large variety of possible combinations
- **Precise injection** into the combustion chamber due to injection pressures of up to 1,800 bar

Did you know?

Since 1927, Bosch produced more than

60 million
in-line injection pumps,

75 million
distributor-type injection pumps and

950 million
nozzle-and-holder assemblies.

Service parts for diesel specialists
Overview

Global production of reliable spare parts: Bosch produces conventional and modern diesel systems and a comprehensive range of spare parts for repairs 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-type 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 diesel injection system components:

- 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 training
- Technical support

Pump elements
Product details

Each cylinder of an in-line injection pump is supplied with fuel by its own pump element and via a pressure valve and a high-pressure line. Bosch pump elements consist of a pump piston and a pump cylinder. The engine drives the pump's 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.

Advantages at a glance

- **Relaxed driving with guaranteed quality and safety** through Bosch know-how and reliability
- **Continuous top performance and optimized fuel consumption** due to high production accuracy
- **No spacial seals required** due to the high fitting accuracy of the pump piston – 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 damage affecting the operation of the engine. Bosch pump elements are produced according to a clearly defined quality guideline.

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 developers, Bosch provides valves with excellent quality both as original equipment and in the aftermarket.

Advantages at a glance

- **Low friction losses** due to valve pistons and pieces precisely 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 sprayed into the combustion chamber for an optimum combustion. Simultaneously, the nozzle seals off the fuel system from the combustion chamber. The versatile and broad range of Bosch nozzles covers all common applications. It includes comprehensive know-how from Bosch which is used together as an important partner of international vehicle manufacturers.

Advantages at a glance

- **Moving parts' guide clearance** of injection nozzles of 0.002 mm and fuel pressures of up to 2,000 bar due to very high production precision
- **Particularly long service life**
- **Prevention of increased smoke formation,** loud combustion noise, rough engine operation, performance drop and increased consumption by Bosch injection nozzles

Increased service life!

Nozzle needles with carbon coating
Dealing with system pressures of up to 2,700 bar, high-strength steels are used for the production of nozzles and injectors. If required for the specific application, Bosch coats the nozzles with a carbon coating for an even longer service life.

Glow plugs
Overview

Bosch diesel technology and glow plugs – an excellent combination! This opinion is shared by international vehicle manufacturers equipping their vehicles with Bosch glow plugs. Know-how gained with original equipment is implemented in the Bosch workshop range.

Professional quality for workshop experts
The comprehensive Bosch diesel experience directly influences each and every detail of Bosch glow plugs. They are developed in cooperation with vehicle manufacturers and perfectly matched to each engine. Workshops relying on Bosch glow plugs can rely on professional Bosch quality.

A program without equal
At Bosch, wholesalers and workshops benefit from a comprehensive range of glow plugs providing the ideal solution for almost any diesel vehicle – older models included.

Glow-plug competence since 1922
As one of the world's leading developers of injection systems, Bosch possesses comprehensive system know-how – in particular concerning diesel powertrains. Subsequently many international vehicle manufacturers trust in innovative Bosch glow systems.

Innovative technology
Glow plugs for modern diesel engines do not only support cold starts by means of preheating, their post-glowing function also ensures smooth operation and comfort across all load ranges. Working with such a low compression, modern diesel engines require post glowing. Bosch provides suitable glow plugs for precisely this purpose – featuring both a long service life and highly reliable. They ensure smooth operation, low consumption and thus reduced emissions.

A good choice for vehicle manufacturers
International vehicle manufacturers rely on Bosch glow-plug quality for their vehicles' original equipment.

Glow plugs
Program & product details

	Duraterm	Duraterm HighSpeed	DuraSpeed
	The 11-volt glow plugs developed by Bosch in 1990 are based on comprehensive Bosch diesel experience and OE know-how.	For improved and reliable combustion in rather newer diesel engines: Quick pre-heating and long post-glow times of these pencil-type glow plugs developed by Bosch contribute to increased fuel efficiency while ensuring a long service life.	Featuring a Bosch-invented design, these glow plugs are particularly robust. The shape of their ceramic heating elements and their location inside a support tube reduce the risk of breakage even if subject to transverse forces.
Scope of application			
Heating element	Metal	Metal	Ceramic
Voltage	11 V	4.4 - 5 V	7 V and 11 V
Heating	850 °C < 5 sec.	950 °C < 3 sec.	1,000 °C < 2 sec.
Max. glow temperature	1,150 °C	1,150 °C	1,300 °C
Post-glow time	3 min.	6 min.	15 min.

Advantages at a glance

- **Comfortable starting behavior** through short preheating and long post-glow times
- **Smooth operation and high comfort** across all load ranges by regeneration heating
- **More than just a starting aid** by correctly adjusting the supply to the engine with the required temperature
- **Quiet idling and high comfort** across all load ranges from additional functions such as intermediate and regeneration heating
- **Outstanding starting comfort** via a very short heating phase, high glow temperatures and long post glowing
- **Easy on the alternator,** designed for low voltages in case of cold starts

Workshop-oriented packaging

Bosch glow plugs are available in **packs of ten and with blister packaging**.

KeySecure Code label

The **KeySecure Code label** provides protection against product counterfeiting.

The label with a special seal on it guarantees the integrity of the packaging.

Denoxtronic exhaust-gas treatment (PC/LCV)
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 engine's actual operating condition and current exhaust-gas values. This technology helps vehicle manufacturers in several countries to comply with applicable emission limits.

	Supply module	Dosing module	Heating pot kit
	The supply module brings AdBlue to the required pressure and feeds it to the dosing module.	The dosing module ensures the precise quantity of AdBlue is atomized and injected into the exhaust stream.	The heating pot kit contains the tank heater, for thawing the AdBlue at negative temperatures, and the level sensor. In addition, it is equipped with a maintenance-free filter.
Scope of application			
Advantages at a glance	▶ **Support for compliance with the emission standards** through reduction of the NO_x emissions ▶ **Long service life** thanks to well-proven and robust technology ▶ **Efficient solutions** for fast and easy replacement of the modules in the service		

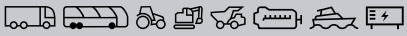
Workshop tip

Test equipment and service kits

For the diagnosis, a Bosch KTS tester and the Denoxtronic tool kit (see fig.) are used: In this manner, defective modules that need to be replaced can be easily identified.

Departronic particulate-filter regeneration
Product range & details

Unlike pure engine-internal measures of particle reduction, 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.

	Metering unit	Injection unit
	The metering unit 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 stream.
Scope of application		
Advantages at a glance	▶ **Fuel savings** through highly efficient particle-filter regeneration ▶ **Maintenance-free, long service life** due to robust design ▶ **High performance quality** through proven Bosch know-how ▶ **Efficient solutions** for fast and easy replacement of the modules in the service	

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 of 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 (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 engine's actual operating condition and current exhaust-gas values. This technology helps vehicle manufacturers in several countries to comply with applicable emission limits.

	Supply module	Dosing module
	The supply module brings the AdBlue to the required pressure and feeds it to the dosing module.	The dosing module ensures the precise quantity of AdBlue is atomized and injected into the exhaust stream.
Scope of application		
Advantages at a glance	▶ **Support for compliance with the emission standards** through reduction of the NO_x emissions ▶ **Long service life** thanks to well-proven and robust technology ▶ **Efficient solutions** for fast and easy replacement of the modules in the service	

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 manufacturer and can be looked up in 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.

Test equipment for workshops
Troubleshooting and repair

Qualified diagnoses are of increasing importance for automotive workshops. They are the only way to ensure professional maintenance and repair – the basis for high customer satisfaction.

Well-equipped and ready for the future

Besides all of the current vehicle interfaces, the latest generation of Bosch diagnostic testers – such as the KTS 560/590 ECU-diagnostic modules, the mobile KTS 350 all-rounder, the DCU 100 tablet computer or the DCU 220 notebook/tablet combination – also support future Ethernet-based interfaces.

DCI 700 diesel test bench

Since Bosch invented the common-rail system, a large number of system variants have emerged that need regular maintenance and repair at automotive workshops or at the diesel specialists. The new measurement system of the DCI 700 CR injector test bench also tests CRI2-20, -22, -25 CR injectors featuring VCC or NCC technologies as well as pressure-reinforced CRIN 4.2 injectors often used for commercial vehicles.

- Easy and quick installation / removal within < 5 min
- Quick test of a complete set of CRI/CRIN within < 15 min
- No HD hose (cost reduction)
- Service-friendly and with low maintenance requirements

What drives you, drives us

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

Therefore, we have dedicated the last 130 years of pioneering spirit and expertise in research and manufacturing to achieving this.

We provide the aftermarket and repair shops worldwide with modern diagnostic and workshop equipment and a wide range of spare parts for passenger cars and commercial vehicles:

- Solutions for efficient and effective 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 technical support
- Comprehensive range of trainings
- Targeted sales and marketing support

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