Thus, the accident risk due to unintentional rolling backwards is

The first stage of automation is the electronic clutch. Using eCS

functions like the automated parking

the driver can drive off without pressing the clutch pedal despite

the driver's preferences fully enable the user to

improve safety and facilitate
driver automation.

Depending on the transmission type, vehicles with automatic

and electronically assisted clutch use.

since they can be driven without the

operator. Inside two steps in automatic

to change to automatic transmission at the same time prepare

transmission can be more fuel-efficient and less polluting, since

as well as complete systems for transmission automation.

include simulations of the hydraulic systems and the entire power-

improving their transmission technology. The services from Bosch

focus on long-term relationships with its customers to cement

market conditions, but also the cultures and the re-

transmissions.

The

be realized as well. Manufacturers who decide

vehicles as well. It consists of two separate transmissions. The

the DCT is gaining popularity and can easily be adjusted for hybrid

clusivity of the powertrain for every transmission type. The

proves its comprehensive expertise in the powertrain area. Bosch

innovative drive systems and transmission technologies.

world’s first parallel-hybrid vehicles with automatic transmission

in 2010. In 2011, the world’s first axle-split hybrid system went into series

in 2011 that are particularly fast shifting operations. The trans-

low torque.

even gears are located on one transmission, the uneven ones on

Bosch teams of experts work intensively

production ensure fast delivery. Local contact persons take care of

requirements of every market. Global logistics and large-scale series

know the local market conditions, but also the culture and the re-

production ensure fast delivery. Local contact persons take care of

ability of third parties, which ensure a permanent

motive technology. Our customers benefit from economic stability

reliable and economic evaluation of the entire system solution. This

addition to shifting comfort.

automatically select the optimal shifting point and comfort

functionality of the overall system and maximizes the system bene-

innovative drive systems and transmission technologies.

innovative drive systems and transmission technologies.

automatically select the optimal shifting point and comfort

automatically selecting the point and comfort by extending the clutch pedal.

transmission

and the engine

with an automatic transmission the driver no longer has to actuate a clutch pedal, especially in urban and stop-and-go traffic. Instead, the vehicle automatically engages the transmission gears, so the driver

the clutch pedal. Instead of extending the clutch pedal, driving into the

automatically selecting the point and comfort by extending the clutch pedal.

automatically selecting the point and comfort by extending the clutch pedal.
Always in the optimal gear with automatic transmission

COMFORTABLE, DYNAMIC AND SAFE

For demanding drivers, automated transmissions offer considerable advantages. The automatic transmission is more comfortable and safer and at the same time more economical. And a comfortable and efficient ride makes even long trips more enjoyable.

The first stage of automation with an automatic clutch is the electronic clutch. Using eCS, vehicles with automatic transmission make hill-starts easier, too. Acceleration of the clutch pedal is electronically controlled. This ensures that the vehicle remains stationary, even when the clutch is disengaged. In case of a DCT the gears are already engaged prior to shifting. This allows an early driving off from the standstill point and comfort by eliminating the clutch pedal.

AUTOMATIC STEP TRANSMISSION (AT)

The first step of automation with an automatic clutch is the step transmission. The driver selects an effort level by shifting in the shift lever. The AT allows a smooth driving off even for engines with low torque.

A fully automated driving can be realized by way of shifting programs stored in the control unit. In some vehicles the driver can and should change gears with comfort and direct character according to the driving situations. The clutch pedal is completely unnecessary in this case.

DUAL-CLUTCH TRANSMISSION (DCT)

In case of a DCT the gears are already engaged prior to shifting. This allows driving shifting, which even the experienced driver cannot achieve with manual shifting.ivity in Europe and Asia.

In a DCT the gears are already engaged prior to shifting. This allows driving shifting, which even the experienced driver cannot achieve with manual shifting.

CONTINUOUS VARIABLE TRANSMISSION (CVT)

The CVT is an automatic transmission with fixed wheels. It offers additional driving comfort because the transmission operates with a continuously variable ratio of the separate transmissions. The engine merely provides the necessary ratio. The control unit monitors the complex interaction of the separate transmissions.

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

The CVT is an automatic transmission with fixed wheels. It offers additional driving comfort because the transmission operates with a continuously variable ratio of the separate transmissions. The engine merely provides the necessary ratio. The control unit monitors the complex interaction of the separate transmissions.

LONG-TERM AND CLOSE COOPERATION FROM JOINT DEVELOPMENT UP TO DELIVERY

Bosch continuously works on improving the quality and reliability of its products. Bosch offers transmission services in addition to single key components or system solutions for automatic transmission of all types and for all vehicle classes up to six tons. Bosch assists its customers in making the right decision for a drive technology that ideally fits into the overall system and maximizes the system benefits.

CONTINUOUS OPTIMIZATION FOR HIGH QUALITY AND ECONOMIC TRANSMISSION TECHNOLOGY

The comprehensive Bosch expertise ensures state-of-the-art technology. Exceptional transmission and application know-how through the entire value chain and application.

Bosch has comprehensive expertise for future requirements such as automated driving.

Innovative and strong in speed Bosch continuously works on improvements of the components and systems for automatic transmissions. Bosch brings technical innovations in market at a speed that is difficult to imagine. New products, new services, and new business models are part of the Bosch strategy.

Global networks like Bosch’s are essential for development and manufacture of high-quality transmission technology. Bosch knows the market-specific requirements and trends and is able to know the best possible technical solutions for automated driving.

Bosch – your strong partner for transmission technology

System and connectivity expert through its development of innovative, driver assistance systems and electrification technologies. Bosch provides its comprehensive expertise in this powered area. Bosch knows the most requirements of each component, knows how optima solutions can be developed. Bosch assists its customers in making the right choice for a future-proof and improving transmission technology.

Key components and system solutions for all transmission types

Comprehensive portfolio of key components for automatic transmission. From single key components up to system solutions for automated transmission of all types and for all vehicle classes up to six tons. Bosch assists its customers in making the right decision for a drive technology that ideally fits into the overall system and maximizes the system benefits.

Bosch brings technical innovations in market at a speed that is difficult to imagine. New products, new services, and new business models are part of the Bosch strategy.

Bosch delivers services such as transmission simulations, calibration and application.

Innovative transmission solutions for automated driving and electric drives

Bosch can deliver a broad spectrum of transmission technologies: from single key components or system solutions for automatic transmission of all types and for all vehicle classes up to six tons. Bosch assists its customers in making the right decision for a future-proof and improving transmission technology.

Innovative transmission solutions for automated driving and electric drives

Quality and reliability The ideal propulsion is based on maximum high-quality transmission technology. Bosch continuously works on improvements to its ever more customer-specific requirements. The Bosch portfolio offers fuel-efficient, electrically driven transmission technology. Bosch offers single key components or system solutions for automatic transmission. Long-term commitment and comprehensive expertise in automotive technology. Bosch works on improving the drive technology for many transmission types. The world is full of possibilities with automated transmission technology. Bosch is your strong partner for transmission technology.

Bosch Mobility Solutions

Automated for more efficiency and more driving fun

Bosch – your strong partner for transmission technology
Advantages of automatic transmissions

- **CO₂**
  - less CO₂ and reduced fuel consumption compared with a manual transmission.

- **Comfort**
  - more comfort thanks to automatic shifting, so that the driver does not need to actuate a clutch pedal in stop-and-go traffic, for example.

- **Safety**
  - more safety due to functions such as the automatic protection against engine stalling at hill-starts.

- **Dynamic driving**
  - more dynamic driving due to the particularly fast shifting of the automatic transmission.

**SYSTEM BENEFITS**
- Automatic transmissions allow functions of electric and automated driving.
- Increased driving fun with automatic transmissions due to more agile driving behavior, for example.
- Automatic transmissions allow fuel-saving functions such as coasting.
- Automatic transmissions allow functions such as start-stop coasting.
- Increased comfort due to elimination of the clutch pedal.
- Smooth dynamic driving of high-performance Behavior.

**Powertrain systems and nested Bed stability**
- Automatic transmissions assist in efficient and dynamic driving with combination engines as well as with electric drives. Particularly for the complex coordination of the different operating states of the powertrain, automatic transmissions are needed to relieve the stress on the driver.

**Automated mobility**
- Automatic transmissions are a key technology for the realization of automated driving. To ensure that vehicles can accelerate to high speeds and can again be brought to a standstill in a standard automated and autonomous mode of operation, automatic transmissions are used in the context of automatically controlled automatic transmissions in essential.
Transmission technology
Pressure or flow activated direct electric shift control

PRODUCT BENEFITS
- Low leakage
- High accuracy
- Meets the highest requirements as regards dynamics and robustness
- High level of flexibility for mechanical and electrical interfaces

1 Connector
2 Flange
**drive economically**

thanks to very low leakage in the transmission hydraulics

**flexible**

due to variable mechanical and electrical interfaces

---

**TECHNICAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Areas of use</th>
<th>automatic step transmission, continuously variable transmission, dual-clutch transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet pressure</td>
<td>≤ 6,000 kPa</td>
</tr>
<tr>
<td>Control pressure</td>
<td>0 – 80% $P_{\text{max}}$</td>
</tr>
<tr>
<td>Operating current</td>
<td>0 – 1.2 A</td>
</tr>
<tr>
<td>Leakage</td>
<td>10 – 250 ml/min</td>
</tr>
<tr>
<td>Flow rate</td>
<td>7.5 – 14 l/min</td>
</tr>
<tr>
<td>Diameter</td>
<td>28 mm</td>
</tr>
</tbody>
</table>

---

**TASK**
The pressure or flow activated direct electric shift control serves as an actuator for pressure or throughput control on automatic transmissions.

**FUNCTION**
This pressure or flow activated direct electric shift control (DESC) has a slider design. In dual-clutch transmissions, it controls the coupling pressures and activates the gear changes. In automatic step transmissions, it controls the main pressure and modulates the switching pressure. In continuously variable transmissions, it is used mainly for shifting the transmission ratio, regulating the belt tension and controlling the starting clutch.
Transmission technology

Electronic modules

PRODUCT BENEFITS

- Weight reduction for automatic transmission
- Simple installation (transmission and vehicle)
- Reduced effort with logistics, administration and processing
- Proven module and a higher level of reliability for the entire system

1 EM-L electronic module
2 EM-P electronic module
high level of reliability
due to the reduced number of components

less weight
for automatic transmissions thanks to integration of the electronic components in one module

TASK
The electronic module consolidates the electronic components of the transmission control into one unit. The integrated transmission control unit controls the hydraulic valves, which are responsible for the gear selection, depending on the input torque on the transmission, the running speed of the engine and the vehicle speed. It also has extensive diagnostic functions.

FUNCTION
The electronic module consists of the integrated transmission control unit and several sensors for speed, position and pressure, as well as connectors for attaching to the hydraulic valves. Lead frames are used for linking the individual components. The electrical linkage is made by means of extremely robust weld connections.

VARIANTS
The electronic module is available in various versions: the EM-L is a mechatronic module for all types of automatic transmission. Sensors for speed, position and temperature are integrated. The transmission control unit is housed in an hermetically sealed casing. A lead frame is used for the module wiring.

The EM-P has integrated sensors for speed, position and pressure. A high-temperature circuit board is used for installation and wiring of the module, and this enables a large number of functions to be incorporated. The integration of the transmission control unit in a molded casing ensures that the design height is kept to a minimum. The EM-P also offers an actuator for electric oil pumps.

TECHNICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Operating temperature range</th>
<th>−40 °C to +145 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit</td>
<td>optimized ASICs</td>
</tr>
</tbody>
</table>
Transmission technology

Electronic clutch system

PRODUCT BENEFITS
- Enables different functions for an economic and comfortable driving, such as coasting, stalling protection, shifting assistance, stop-and-go operation, shifting without clutch pedal
- Supports functions of automated driving

1 Clutch actuator module
2 Actuator control unit
The electronic clutch system consists of a clutch actuator module (CAM) and an actuator control unit (ACU). The CAM opens and closes the clutch. The ACU controls the CAM according to the current clutch and driving situation.

**FUNCTION**
The CAM is an actuator with a brushless direct current motor (BLDC motor) and a position sensor. It can be used in vehicles with manual transmission with and without electronic clutch pedal. It enables different functions for vehicles with manual transmission and supports functions for automated driving, such as parking assistant. The ACU can be used in vehicles with manual transmission in combination with a clutch actuator module, optionally also with an electronic clutch pedal. It provides coasting and comfort strategies as well as safety functions. Software sharing is possible with the ACU. Changes on the engine control unit are not required. The ACU is mounted on the bodywork and is thus independent of transmission- or engine-related, mechanical and thermal factors of influence.

**TECHNICAL FEATURES OF THE CLUTCH ACTUATOR MODULE**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>≤ 140 °C</td>
</tr>
<tr>
<td>Vibration load</td>
<td>≤ 10 g</td>
</tr>
<tr>
<td>Safety level</td>
<td>bi-stable</td>
</tr>
<tr>
<td>Dynamics</td>
<td>130 ms</td>
</tr>
<tr>
<td>Voltage range</td>
<td>6 – 24V</td>
</tr>
<tr>
<td>Hydraulic pressure</td>
<td>≤ 60 bar</td>
</tr>
<tr>
<td>Operating current</td>
<td>60 A peak (for 2.5 kN clutch force; only if actuated), 5 – 7 A_RMS (Root Mean Square)</td>
</tr>
</tbody>
</table>

**TECHNICAL FEATURES OF THE ACTUATOR CONTROL UNIT**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak current</td>
<td>60 A/10 A_RMS</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>≤ 105 °C</td>
</tr>
<tr>
<td>Vibration load</td>
<td>≤ 3 g</td>
</tr>
<tr>
<td>Construction kit hardware and software</td>
<td>Motronic 12 V</td>
</tr>
<tr>
<td>Safety level</td>
<td>ASIL-B</td>
</tr>
<tr>
<td>Diagnostic functions</td>
<td>OBD compliant</td>
</tr>
</tbody>
</table>
Transmission technology

Transmission sensors

PRODUCT BENEFITS
- Robust design
- High measuring precision and reliability
- For flexible use with different transmission types
- High media resistance

1. Transmission pressure sensor
2. Transmission speed sensor
Transmission technology

Transmission sensors

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TECHNICAL FEATURES TRANSMISSION SPEED SENSOR

<table>
<thead>
<tr>
<th>active</th>
<th>inductive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function principle</td>
<td>differential Hall (multiple Hall principle) with or without rotation direction recognition</td>
</tr>
<tr>
<td>Temperature range</td>
<td>−40 to +150 °C</td>
</tr>
<tr>
<td>Trigger wheel</td>
<td>steel or multipole trigger wheel</td>
</tr>
</tbody>
</table>

TECHNICAL FEATURES TRANSMISSION PRESSURE SENSOR

<table>
<thead>
<tr>
<th>high-pressure</th>
<th>medium-pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting place</td>
<td>in or on transmission</td>
</tr>
<tr>
<td>Technology</td>
<td>steel membrane with metal thin-film strain gauges on top and hermetic sealing</td>
</tr>
<tr>
<td>Circuit</td>
<td>digital</td>
</tr>
<tr>
<td>Output signal</td>
<td>analog (digital)</td>
</tr>
<tr>
<td>Connector</td>
<td>oil-tight</td>
</tr>
<tr>
<td>Characteristics</td>
<td>5 V</td>
</tr>
<tr>
<td>Pressure range</td>
<td>7 MPa</td>
</tr>
<tr>
<td>Fault diagnostics</td>
<td>by way of a signal range test</td>
</tr>
<tr>
<td>Sealing</td>
<td>O-ring</td>
</tr>
</tbody>
</table>

flexible design

of the transmission speed sensor for different installation space requirements

increased driving comfort

due to improved shifting and clutch reaction with the transmission pressure sensor

TASK
Transmission speed sensors detect the input, output or intermediate speed of the transmission and transmit this information to the transmission control unit (TCU). The TCU uses this signal to regulate the shifting pressure and to decide upon the gear to be engaged. The transmission pressure sensor measures the pressure of the hydraulic oil in different transmission applications and contributes to precisely and reliably realizing the shifting pressure.

FUNCTION
The transmission speed sensor is built as Hall or inductive sensor. The sensor performs contactless scanning of the steel or multipole trigger wheels. The sensor element of the transmission pressure sensor consists of a membrane, that is deformed by the applied pressure. The deformation will be converted into an electric voltage which is proportional to the pressure. The voltage is then amplified and digitalized by an electronic evaluation circuit.

VARIANTS
Transmission speed sensors from Bosch are available as active or inductive variants. The active variant is characterized by its high electromagnetic compatibility (EMC/ESD), a small and flexible design, low weight and an optional rotation direction recognition. The inductive variant convinces with a high output signal at low speed and a position-independent mounting (TIM).

For transmission pressure sensors different plug and hydraulic connections are possible. A mounting position inside or outside of transmission is possible.

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For transmission pressure sensors different plug and hydraulic connections are possible. A mounting position inside or outside of transmission is possible.
Transmission technology

Transmission control unit

PRODUCT BENEFITS
- High level of processing power and scalability for present and future requirements
- Variable software-sharing model
- Meets the requirements for functional safety (ISO 26262) up to ASIL D
- Hardware safety module for high level of access safety
- Comprehensive product range for all markets
drive comfortably

thanks to optimum transmission control in every driving situation

TASK
With many transmissions, the gear change is made by means of a hydraulic controller, which is activated by a transmission control unit. Intelligent control software adjusts the switching behavior of the transmission to the actual driving situation. By controlling the electrohydraulic or electromechanical transmission actuators, the transmission control unit enables comfortable and dynamic driving performance to be achieved. It also performs a diagnosis of the transmission and its components.

FUNCTION
The transmission control unit evaluates the relevant sensor signals and converts them by means of the software into control commands for the transmission actuators. The transmission control unit contains a microcontroller and integrated switching circuits (ASICs), which are optimized for specific applications, as well as inputs for the sensors and output stages for controlling the actuators. Modular software architecture facilitates the use of variable software-sharing models.

VARIANTS
The transmission control unit (TCU) is available as either integrated in the electronic module (iTCU), attached to the transmission (aTCU) or as a stand-alone version. In addition to this, the control unit is also available with a metal casing (ITCU-S) for applications up to 145°C.

drive economically
due to optimum selection of the transmission ratios

drive safely
due to state-of-the-art computer architecture (multicore in lock-step mode)

<table>
<thead>
<tr>
<th>TECHNICAL CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microcontroller</td>
</tr>
<tr>
<td>55 nm / 65 nm technology (multicore optional)</td>
</tr>
<tr>
<td>Communication interfaces</td>
</tr>
<tr>
<td>e.g. CAN-FD, FlexRay, Ethernet</td>
</tr>
<tr>
<td>Power control</td>
</tr>
<tr>
<td>ASIC with variable control concepts</td>
</tr>
<tr>
<td>Basic software</td>
</tr>
<tr>
<td>AUTOSAR 4.0</td>
</tr>
</tbody>
</table>
Transmission technology

Linear force solenoid

PRODUCT BENEFITS

- High accuracy
- High level of flexibility due to the adjustable force curve of the solenoid and variable mechanical and electrical interfaces
- Low hysteresis

Pin
Connector
very high accuracy

for optimum ease of gear shift

due to variable interfaces and the adjustable force curve of the solenoid

TASK
The linear force solenoid (LFS) is a direct electric shift control for automatic transmission. It is used to control clutch couplings by regulating the pressure on the coupling. In automatic step transmissions, it controls the main pressure, triggers the gear change, modulates the switching pressure and switches the lock-up clutch. In addition to this, the linear force solenoid assists in various safety functions.

FUNCTION
The linear force solenoid activates clutch couplings without the use of an amplification slider. As regards its positioning accuracy, it meets the highest requirements for direct electric shift controls. It is also particularly suitable for robust use in transmission oil. Thanks to the adjustable force curve of the solenoid and the variable mechanical and electrical interfaces, it can be used in a wide range of applications.

<table>
<thead>
<tr>
<th>TECHNICAL CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas of use</td>
</tr>
<tr>
<td>Operating current</td>
</tr>
<tr>
<td>Resistance range</td>
</tr>
<tr>
<td>Diameter</td>
</tr>
<tr>
<td>Length</td>
</tr>
<tr>
<td>Stroke</td>
</tr>
<tr>
<td>Force</td>
</tr>
</tbody>
</table>
Transmission technology

Pushbelt

PRODUCT BENEFITS
- High efficiency
- No interruption of tractive force by shifting
- Highly suitable for combination with hybrid powertrains
- Compact packaging, light weight
- Easily scaled to power requirements
- High power density and optimal NVH properties (noise, vibration, harshness)
- Proven quality thanks to high maturity level
proven quality
The pushbelt has been produced in high volumes since 1985 and is of tried-and-proven design.

VERSATILE USAGE
The pushbelt is available for all segments (value to high-feature).

TECHNICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Element width/number of rings</th>
<th>CVT torque range (Nm)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>24/6</td>
<td>&lt;150</td>
</tr>
<tr>
<td>24/9</td>
<td>150 – 200</td>
</tr>
<tr>
<td>24/12</td>
<td>200 – 250</td>
</tr>
<tr>
<td>30/10</td>
<td>250 – 350</td>
</tr>
<tr>
<td>30/12</td>
<td>350 – 400</td>
</tr>
<tr>
<td>28/12</td>
<td>&gt;400</td>
</tr>
</tbody>
</table>

*Exact load and speed limits depend on the application

TASK
The pushbelt is a core element of any continuously variable transmission. In such a CVT, it transmits the engine output to the drive axle.

FUNCTION
The transmission ratio is continuously variable as the pushbelt rotates between two pulleys consisting of two conical sheaves located on the input and output shaft. These pairs of conical sheaves adjust the running radius of the pushbelt according to speed and torque. This results in an optimal ratio of demanded torque and engine speed at all times. Accordingly, the engine permanently operates under optimal operating conditions. Fuel consumption and CO₂ emissions are reduced. The pushbelt is made up of hundreds of individual, specially designed steel elements, which are stringed together along two high-alloy steel ring packs. By the number of rings in the packs and the width of the steel elements, the pushbelt can be adjusted to the power demand.

Input from engine
Output to wheels
Secondary pulley
Primary pulley
Pushbelt
Transmission technology

Variable-force transmission solenoid

PRODUCT BENEFITS
- Meets the highest requirements for robustness
- High level of flexibility for mechanical and electrical interfaces
- Outstanding quality at high production volume

1. Bleed type of variable-force transmission solenoid
2. Spool type of variable-force transmission solenoid
TASK
The variable-force transmission solenoid (VTS) controls the pilot pressure in automatic transmissions.

FUNCTION
The VTS is a pressure regulator in slider (spool VTS) or flat-seat construction (bleed VTS). In automatic step transmissions, the VTS controls the main pressure, modulates the switching pressure, switches the lock-up clutch and assists the safety functions. In continuously variable transmissions, it is used mainly for shifting the transmission ratio, regulating the belt tension and controlling the lock-up clutch.

The VTS has a vent-controlled pilot valve for automatic transmission, as well as a Teflon-coated anchor bearing. The pilot pressure is subsequently amplified in the hydraulic control plate to operate the clutch couplings. The VTS is available in versions with a rising or falling characteristic curve.

TECHNICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>Bleed VTS</th>
<th>Spool VTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas of use</td>
<td>automatic step transmission, continuously variable transmission, dual-clutch transmission</td>
<td></td>
</tr>
<tr>
<td>Inlet pressure</td>
<td>≤ 900 kPa</td>
<td>≤ 2,500 kPa</td>
</tr>
<tr>
<td>Control pressure</td>
<td>0 – 94% $P_{\text{sup}}$</td>
<td>0 – 48% $P_{\text{sup}}$</td>
</tr>
<tr>
<td>Operating current</td>
<td>0 – 1.2 A</td>
<td>0 – 1.2 A</td>
</tr>
<tr>
<td>Leakage</td>
<td>0.1 l/min, at CE position</td>
<td>150 ml at 100°C and 15 bar</td>
</tr>
<tr>
<td>Flow rate</td>
<td>≤ 1.4 l/min</td>
<td>≤ 3.5 l/min</td>
</tr>
<tr>
<td>Max. diameter</td>
<td>23 mm</td>
<td>23 mm</td>
</tr>
</tbody>
</table>
Always in the optimal gear with automatic transmission

COMFORTABLE, DYNAMIC AND SAFE
Being mobile is a prerequisite for comfort and quality of life. For this, the automatic transmission is more comfortable and safe at all and the same time more flexible and, consequently, also more attractive. With an automatic transmission the driver is in a position to actuate a clutch pedal, engage in a shift and go full throttle in seconds. The driver can focus further entirely on the driving pleasure to fully concentrate on driving.

Depending on the transmission type vehicles with automatic transmission offer more comfort and less driving noise, since they cannot be leveraged in the optimal operating point. Already the first stage of automation with an electronic clutch saves CO₂ but also reduces noise.

Inclusive with automatic transmission order for driver comfort. Too. Thus, the accident risk due to unintentional rolling backwards is reduced. The driver can easily change the gear with control software and drive the car off even without actuating the clutch pedal despite changing driving modes. Thus, all services given are automatically shifted by way of shifting programs stored on the control unit. On some vehicles, the driver can additionally change the gear with control software just to drive the car off.

AUTOMATED MANUAL TRANSMISSION (AMT)
In some contexts of all for the transmission, and the clutch engagement is carried out by actuators. The automation of the clutch transmission completely alters the economic efficiency by automatically unlocking the optimum shifting point and comfort by directly controlling the clutch pedal.

AUTOMATIC START TRANSMISSION (AT)
The left-hand drive gives a dynamism with DFA shifting points. Thus, all shifting programs, which allows the emotional drive virtual with manual shifting. Mostly in Europe and US in the higher vehicle classes up to six tons. The portfolio contains key components like control units, electronic modules, actuators, sensors and hydraulic systems.

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)
The CVT is an automatic transmission without fixed shifting points. It offers additional driving comfort since the transmission operates with a continuous variable of shifting points. This enables particularly fast shifting of the vehicle. The CVT allows a smooth driving off even for engines with low torque.

SPLIT-CLUTCH TRANSMISSION (SCT)
In grade of a DCT the gears are engaged either for shifting. Thus, all shifting programs, which allows the emotional drive virtual with manual shifting. Mostly in Europe and US in the higher vehicle classes up to six tons. The portfolio contains key components like control units, electronic modules, actuators, sensors and hydraulic systems.

DUAL-CLUTCH TRANSMISSION (DCT)
In grade of a DCT the gears are engaged either for shifting. Thus, all shifting programs, which allows the emotional drive virtual with manual shifting. Mostly in Europe and US in the higher vehicle classes up to six tons. The portfolio contains key components like control units, electronic modules, actuators, sensors and hydraulic systems.

CONTINUOUS VARIABLE TRANSMISSION (CVT)
The CVT is an automatic transmission without fixed shifting points. It offers additional driving comfort since the transmission operates with a continuous variable of shifting points. This enables particularly fast shifting of the vehicle. The CVT allows a smooth driving off even for engines with low torque.

CONTINUOUS OPTIMIZATION FOR HIGH QUALITY AND ECONOMIC TRANSMISSION TECHNOLOGY
Bosch continuously works on improvements to ensure maximum customer satisfaction. The Bosch portfolio offers best customer satisfaction and quality standards by the new generation of automatic transmissions. Bosch offers a comprehensive portfolio from single key components up to system solutions for automatic transmissions of all types and for all vehicle classes as well as for hybrid and electric vehicles.

Bosch is committed to research and development and is able to meet the local market conditions, but also the culture and the reengineering programs stored in the control unit. On some vehicles the driver can additionally change the gear with control elements at the steering wheel. The DCT allows a smooth driving off even for engines with low torque.

Bosch delivers services such as transmission simulations, calibrations and simulations of the hydraulic systems and the entire powertrain. Bosch assists its customers in making the right decision for a specific application. Bosch can offer the entire range of services from single key components up to system solutions for automatic transmissions of all types and for all vehicle classes as well as for hybrid and electric vehicles.

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Bosch offers a wide range of services in the areas of transmission development and manufacture of components for all vehicle classes up to six tons. The portfolio comprises tailormade components for both manually actuated and electronically actuated and controlled automatic transmissions.

AUTOMATED DRIVING AND ELECTRIC DRIVES
Quality and reliability. The push to and mobility of electric vehicles implies high quality transmission technology. Bosch continuously works on improvements to ensure maximum customer satisfaction. The Bosch portfolio offers best customer satisfaction and quality standards by the new generation of automatic transmissions. Bosch is committed to research and development and is able to meet the local market conditions, but also the culture and the reengineering programs stored in the control unit. On some vehicles the driver can additionally change the gear with control elements at the steering wheel. The DCT allows a smooth driving off even for engines with low torque.

Bosch Mobility Solutions

Bosch – your strong partner for transmission technology

GLOBALLY PRESENT FOR YOUR LOCAL MARKET REQUIREMENTS

Bosch presents itself with its expertise for transmission technology globally close to its customers on Europe, India, Latin America, Turkey, Hungary, Poland, and as well as in North, China, South Korea, Japan, Brazil and Australia. With its own production plants, development centers and sales companies, Bosch is close to the customer from the first idea to the final product. Bosch collection have been found to reduce costs, but also ensure perfect matching of all transmission technologies.

Bosch offers a comprehensive portfolio from single key components up to system solutions for automatic transmissions. Bosch assists its customers in making the right decision for a specific application. Bosch can offer the entire range of services from single key components up to system solutions for automatic transmissions of all types and for all vehicle classes as well as for hybrid and electric vehicles.

Bosch delivers services such as transmission simulations, calibrations and simulations of the hydraulic systems and the entire powertrain. Bosch assists its customers in making the right decision for a specific application. Bosch can offer the entire range of services from single key components up to system solutions for automatic transmissions of all types and for all vehicle classes as well as for hybrid and electric vehicles.

Bosch can deliver a broad spectrum of transmission technologies: from single key components up to system solutions for automatic transmission. Bosch can additionally change the gear with control elements at the steering wheel. The DCT allows a smooth driving off even for engines with low torque.

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LONG-TERM AND CLOSE COOPERATION FROM JOINT DEVELOPMENT UP TO DELIVERY

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