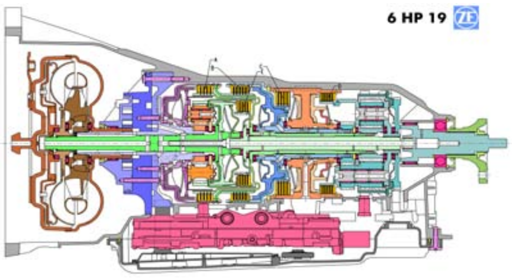
Introduction / note

This brief technical description is intended to supply the necessary technical information on the components, construction and function of the automatic transmission.

Information status: **June 01**

For amendments and additions to the technical data, please refer to the latest Technical After-Sales Service information.



6HP19 automatic transmission

6HP26 automatic transmission

6HP32 automatic transmission

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Brief description - general

.'he ZF 6HP26 automatic transmission has been developed for vehicles with an engine torque of up to 600 Newton-metres (Nm).

To match the installed position of the engine, the automatic transmission is also arranged longitudinally. It uses the planetary gear train principle, with hydraulic-electronic control; the hydraulic and electronic control units form a composite element that is installed as a single unit inside the automatic transmission and referred to as "Mechatronik".

A new feature is decoupling of the transmission when the vehicle is at a standstill, that is to say instead of the engine remaining connected to the converter and the vehicle being prevented from moving by applying the brake, the converter is disconnected and only a minimum rotating load remains. This has the effect of further reducing fuel consumption. The electronic transmission control uses a newly developed shift strategy known as "A S I S" (Adaptive Shift Strategy).
For this, please refer to the separate functional description.

The 6HP26 automatic transmission is about 13 % lighter than the previous 5-speed unit, accelerates 5 % faster and uses about 7 % less fuel.
It also contains fewer components:

- o 5-speed transmission app. 660 parts
- o 6-speed transmission app. 470 parts

The 6-speed automatic transmission is 5 centimetres shorter than the 5-speed transmission.
Engine power reaches the transmission via a hydrodynamic torque converter with integral converter lock-up clutch.
The input torque limits are:

6HP19	max. torque:	420 Nm
6HP26	max. torque:	600 Nm
6HP32	max. torque:	750 Nm

The 6 forward gears and 1 reverse gear are obtained from a single-web planetary gear set followed by a double planetary gear set.
Using these Lepelletier-type gear sets, it was possible to obtain 6 forward speeds.

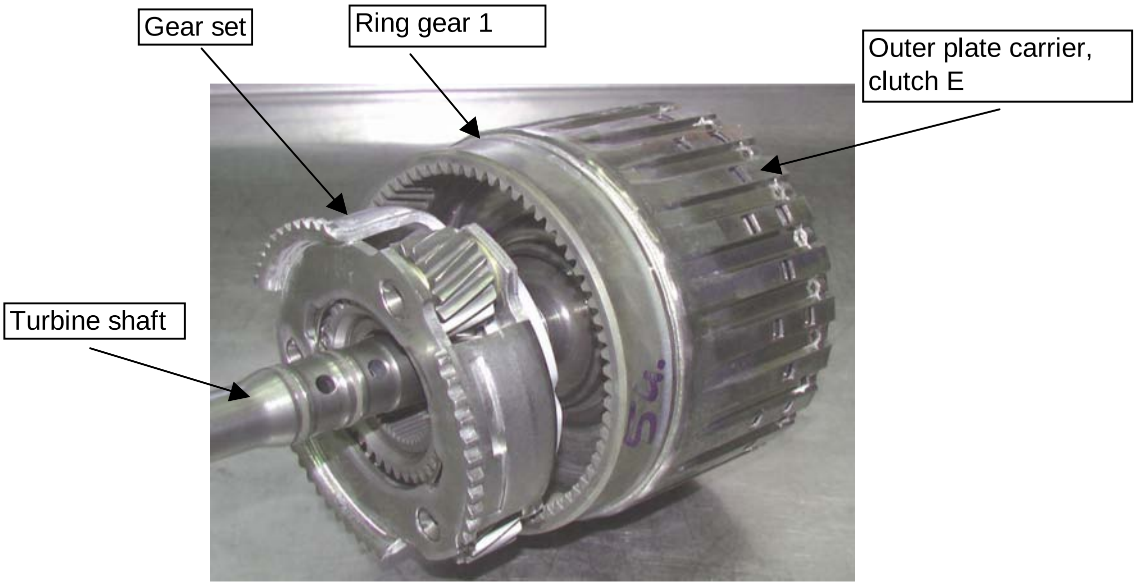
The single-web planetary gear set consists of:

1 sunwheel
4 planetary gears meshing with it
1 planetary gear carrier
1 ring gear or annulus

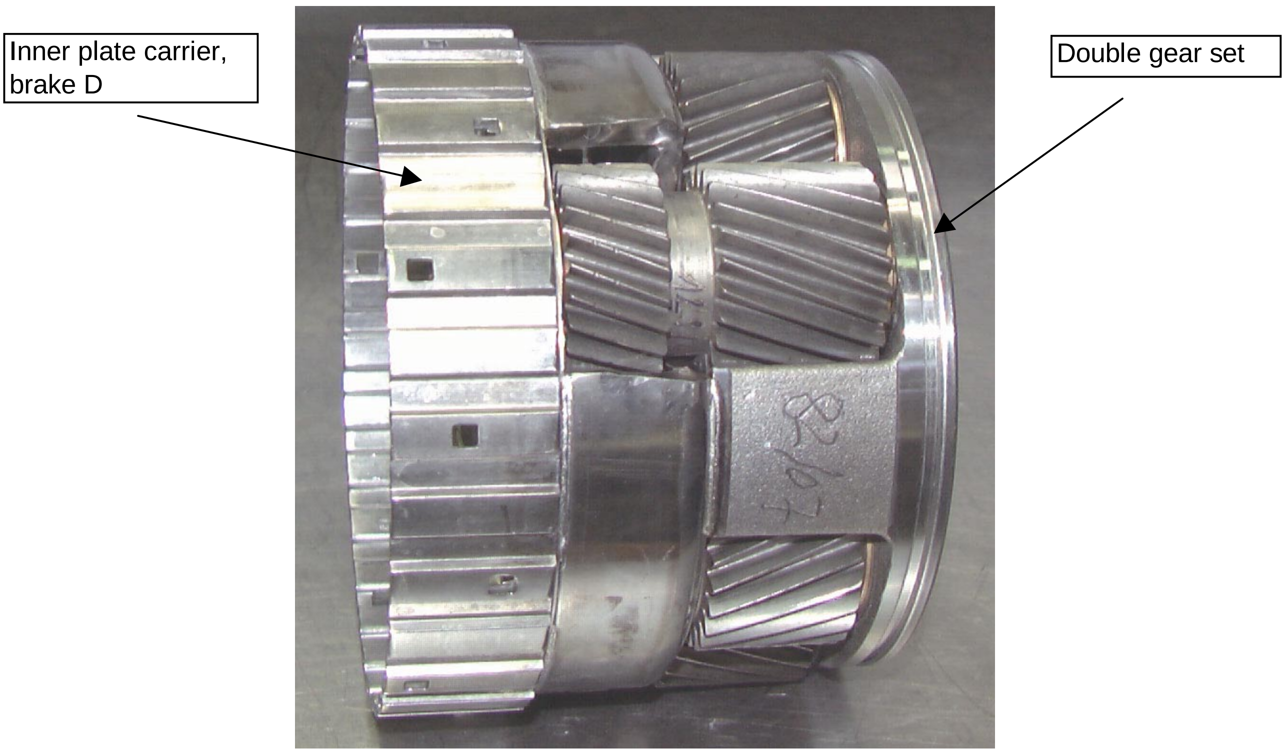
The following double planetary gear set consists of:

2 sunwheels of different sizes
3 short planetary gears meshing with them
3 long planetary gears meshing with them
1 planetary gear carrier
1 ring gear or annulus

Single-web planetary gear set



Rear double-web planetary gear set



Description of individual components

The hydrodynamic torque converter

Converter operating principle

The torque converter consists of the impeller, the turbine wheel, the reaction element (stator) and the oil content needed to transmit the torque.

The impeller, which is driven by the engine, imparts a circular flow to the oil in the converter.
This oil strikes the turbine wheel, which causes the flow to change its direction.

The oil flows out of the turbine wheel close to the hub and strikes the stator, where its direction is changed again to a direction suitable for re-entering the impeller.

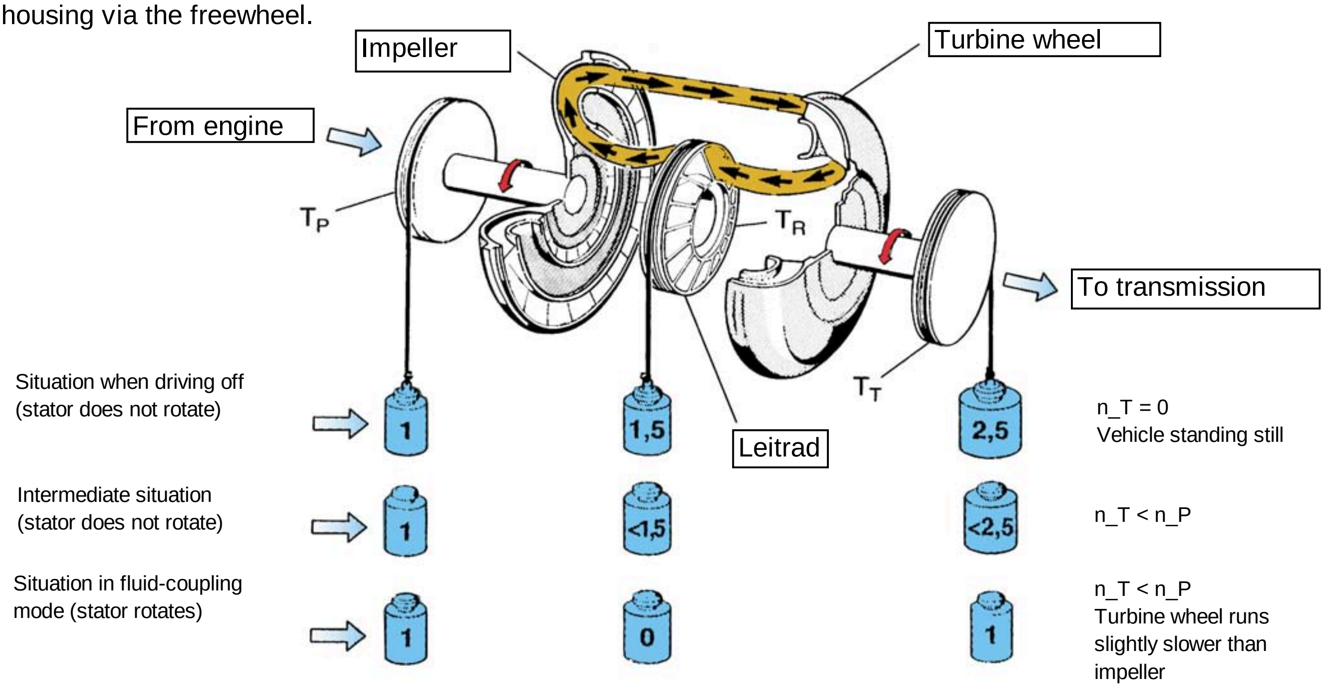
The change in direction at the stator generates a torque reaction that increases the torque reaching the turbine.

The ratio between turbine and impeller torque is referred to as torque multiplication or conversion.

The greater the difference in speeds of rotation at the impeller and turbine, the greater the increase in torque;
The maximum increase is obtained when the turbine wheel is stationary. As turbine wheel speed increases, the amount of torque multiplication gradually drops.

When the turbine wheel is rotating at about 85 % of the impeller speed, torque conversion reverts to 1, that is to say torque at the turbine wheel is no higher than at the impeller.

The stator, which is prevented from rotating backwards by a freewheel and the shaft in the transmission housing, runs freely in the oil flow and overruns the freewheel. From this point on, the converter acts only as a fluid coupling. During the torque conversion process, the stator ceases to rotate and bears against the housing via the freewheel.



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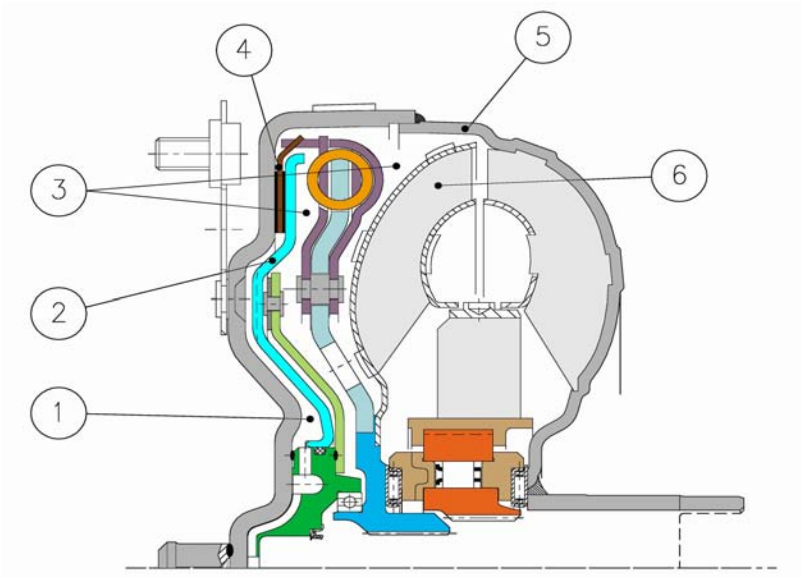
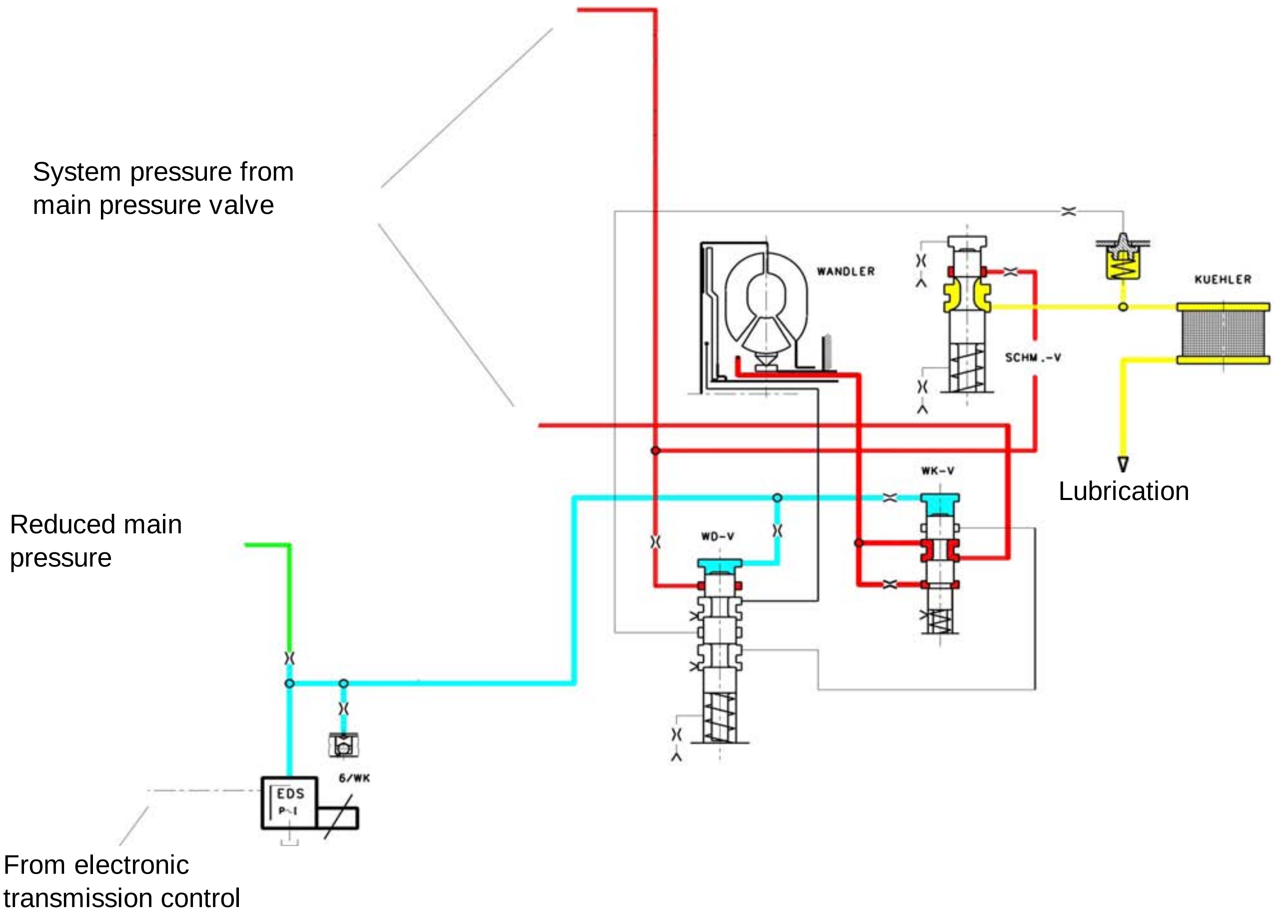
Hydraulic and mechanical flow in converter

WK_zu   n_Mot = n_Turbine

To engage the lock-up clutch (4) the direction of oil flow in changed (reversed) by a valve in the hydraulic control unit. At the same time the space behind the lock-up clutch piston (1) is vented.
Oil pressure extends from the turbine area (3) to the lock-up clutch piston and presses it against cover (5) (outer shell of converter). This locks the turbine wheel (6) by way of the lined disc between the piston and the cover and enables the drive to pass either without slip or with limited slip to the planetary gear train in normal operating conditions.



Oil flow   WK_engaged



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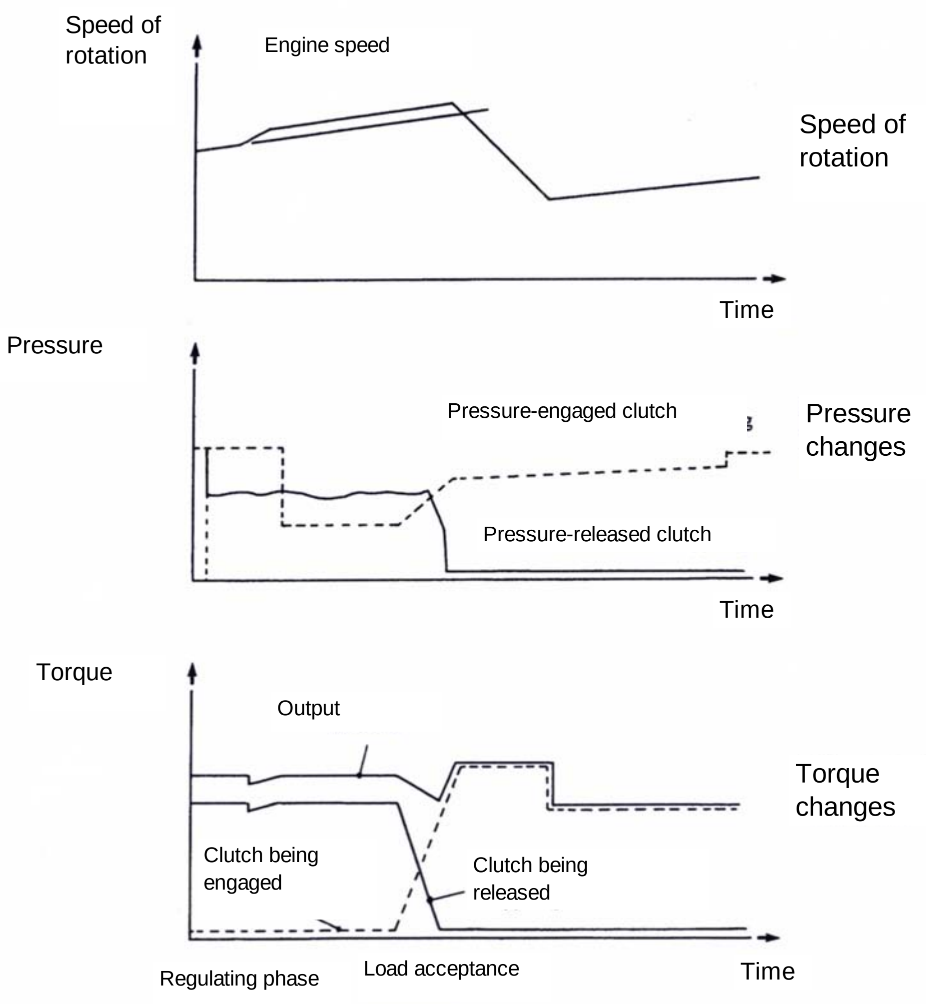
Shift overlap control

Vhen overlap gear shifts take place, freewheels are not used but are replaced by suitable actuation of the relevant clutches (electronic-hydraulically). This enables both weight and space to be saved.
The electronic-hydraulic shift action is obtained by means of various valves in the hydraulic control unit, actuated by pressure regulators.
They engage or disengage the relevant clutches or brakes at the correct moments.
The electronic control unit is combined with the hydraulic control unit and installed as a single unit in the transmission (Mechatronik).

Schematic diagram of shift overlap control



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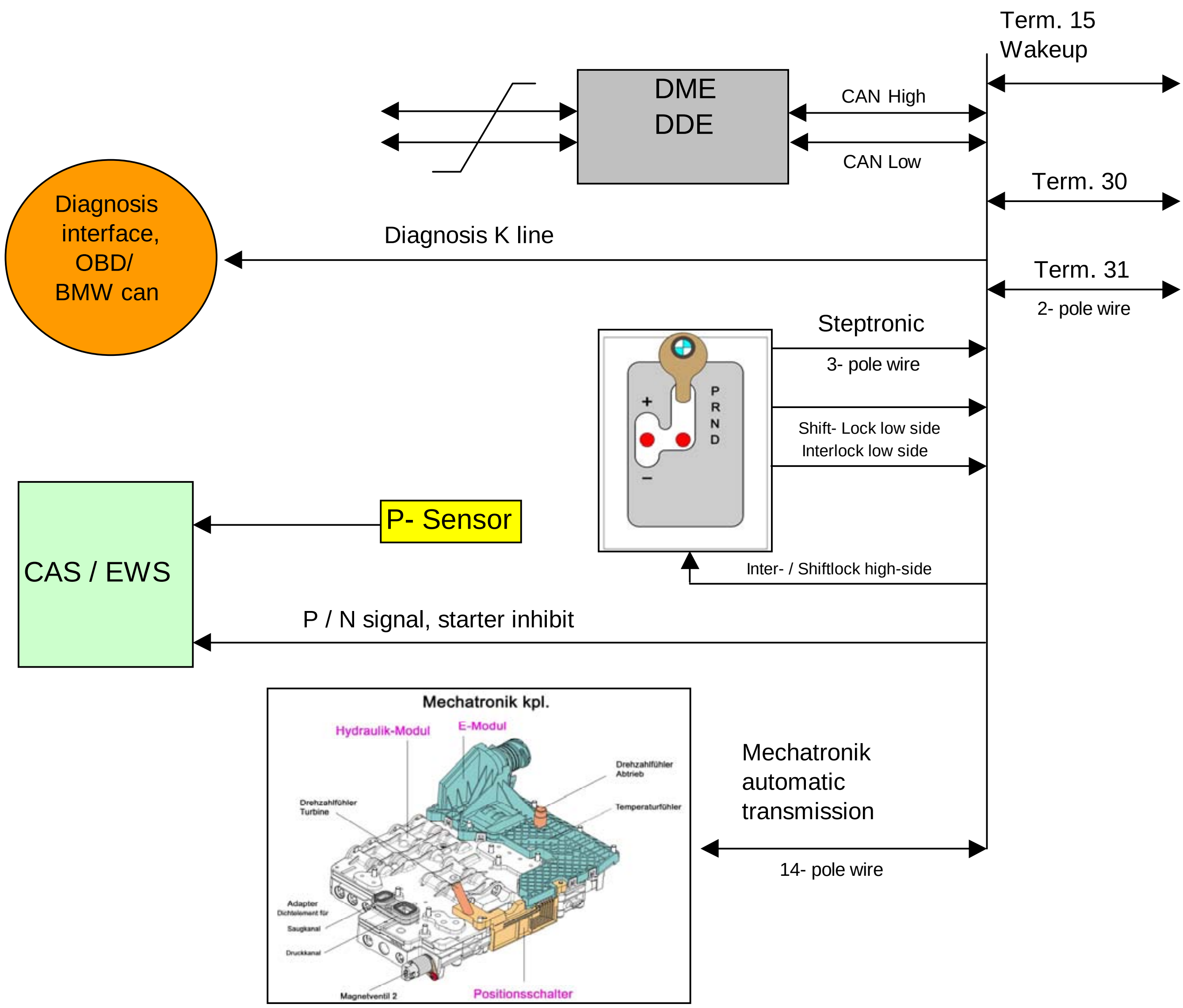
Transmission control area - BMW

Controls and gear shift display

There are various forms of control available for the 6-speed automatic transmissions.
They are as specified by individual customers and either electrically or mechanically operated.
The selector lever can be either on the centre console or on the steering column.

1. Mechanical shift (BMW wiring)

* Automatic transmission with Mechatronik
* Digital Motor / Diesel Electronics (DME / DDE)
* Car Access System (CAS) - a development of the electronic immobiliser (EWS)
* With Steptronic, selector lever on centre console



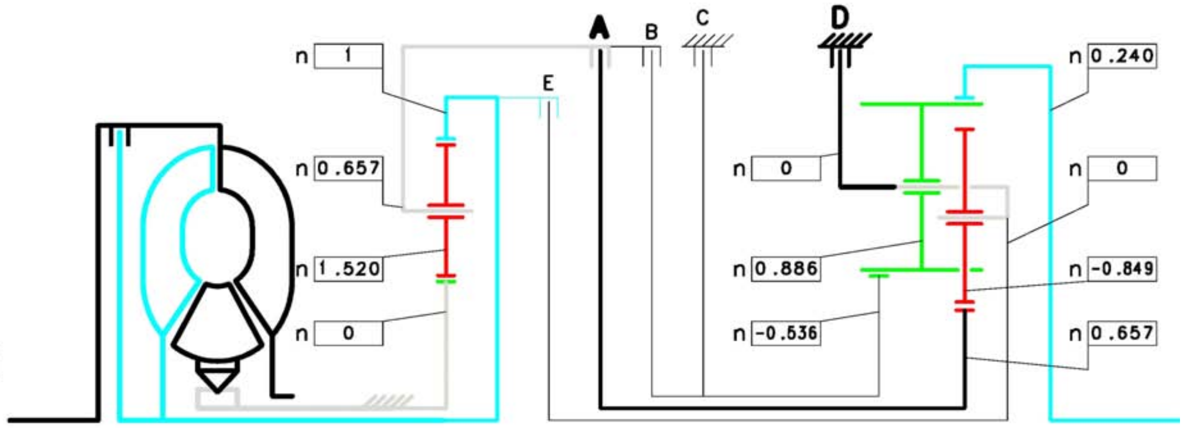
Description of gears / power flow

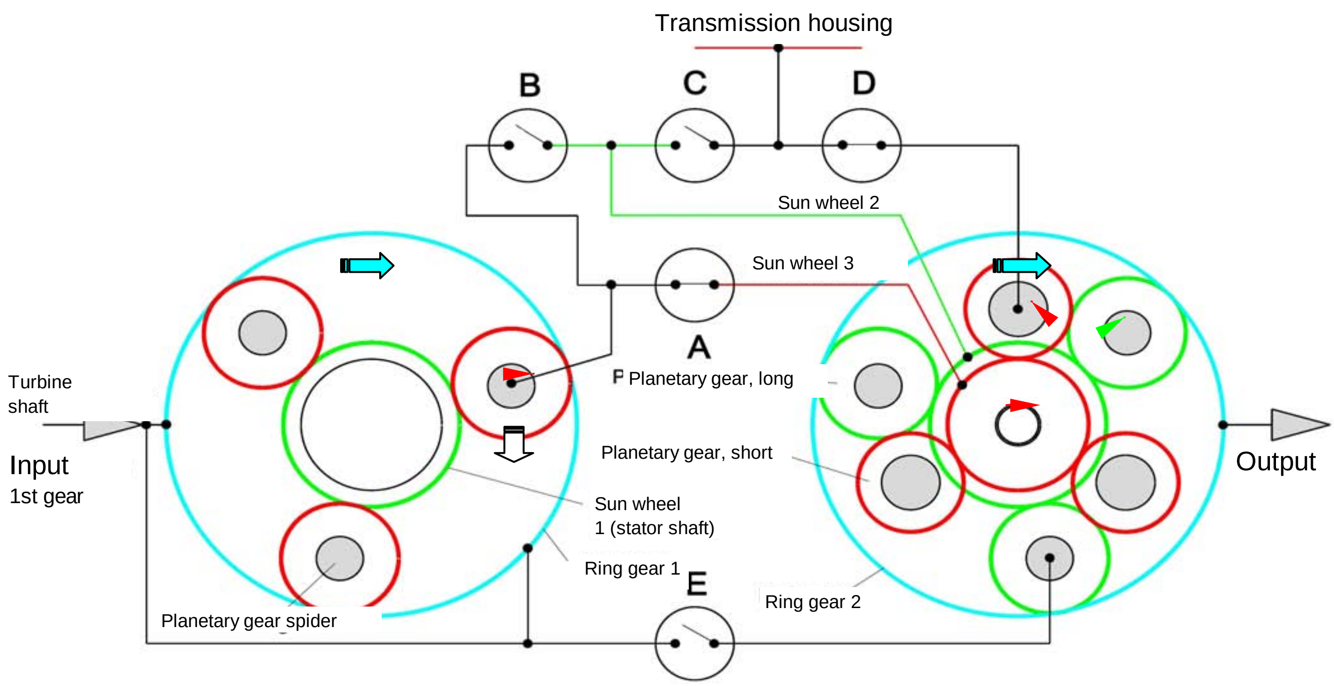
Power flow in 1st gear

Shift elements: **Clutch** **A**
Brake **D**

1st gear

i = 4. 171





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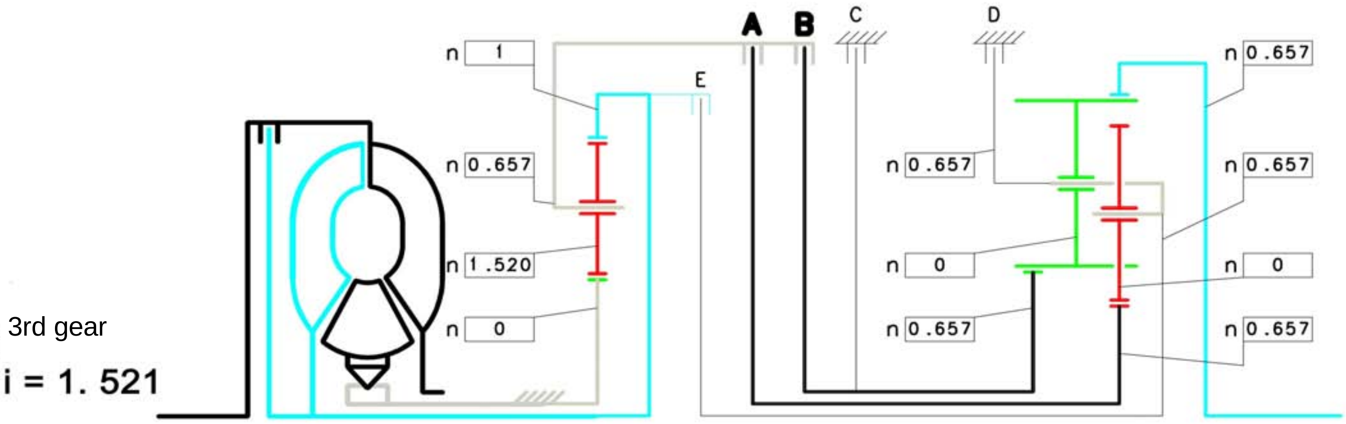
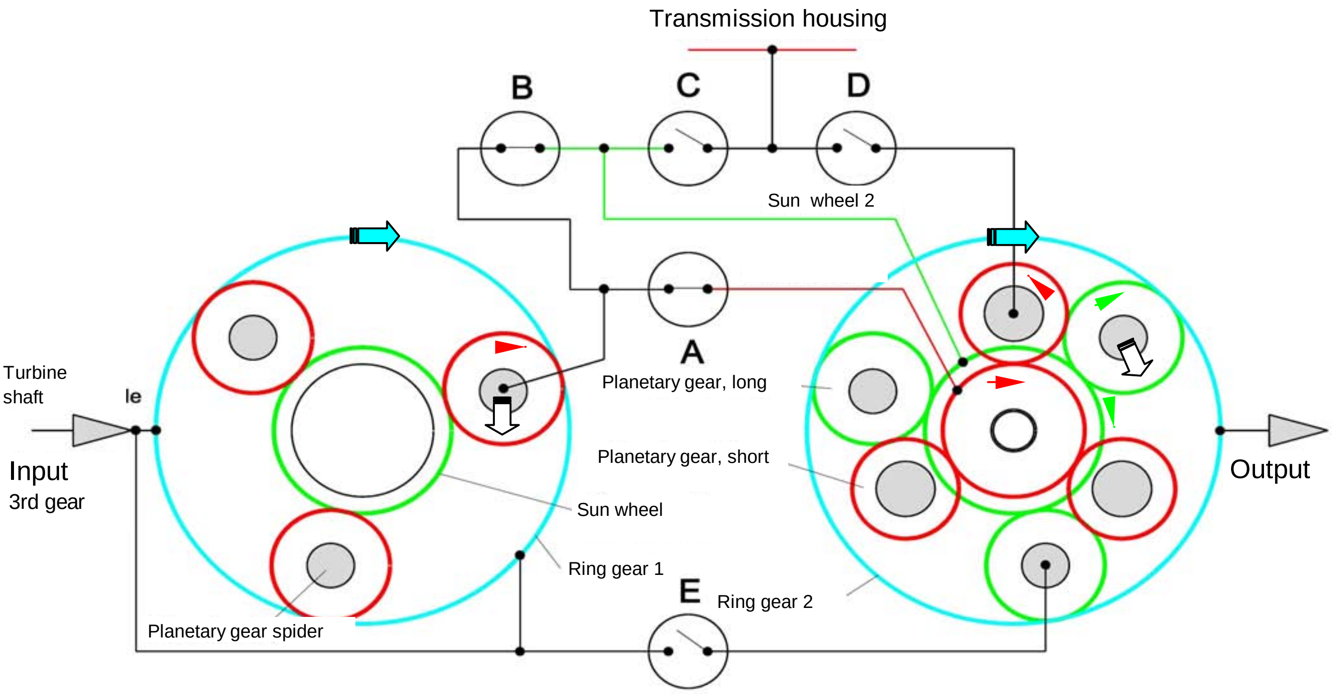
›ower flow in 3rd gear

›hift elements: **Clutch** **A**
Clutch **B**





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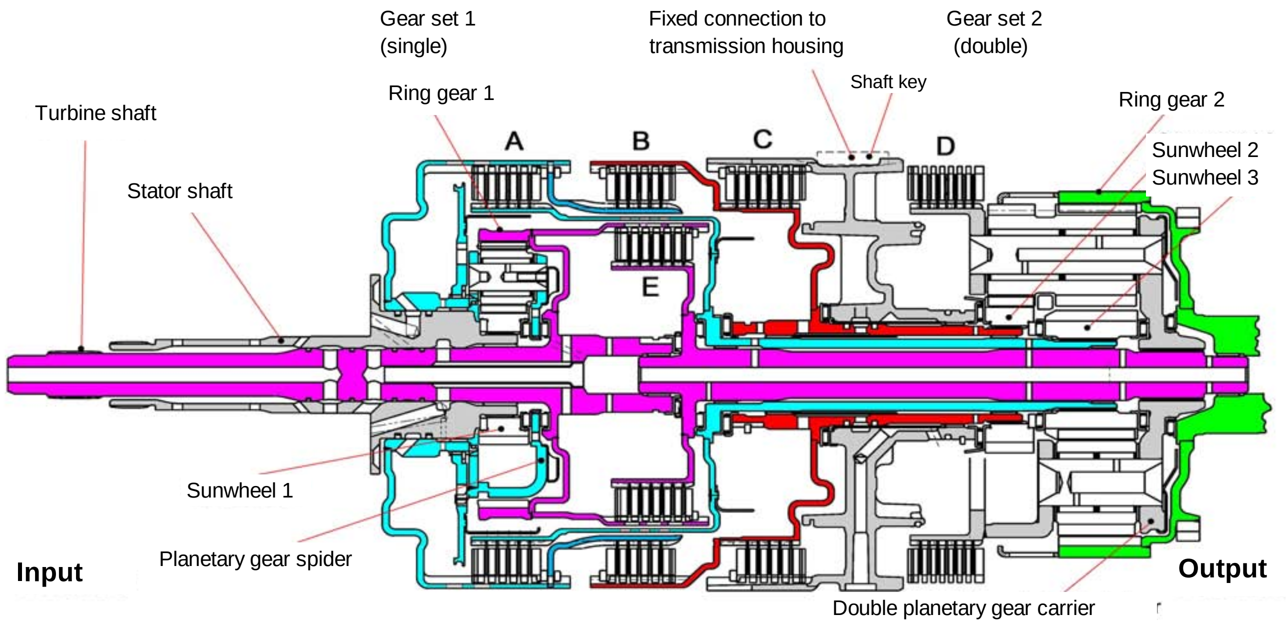
Description of 6th gear power flow

The turbine shaft drives ring gear 1 and the outer plate carrier of clutch "E".

Clutches "A" and "B" are released, so that the front planetary gear set has no effect.

Sunwheel 2 is locked to the transmission housing via brake "C", which is applied.

The double planetary gear spider is driven via engaged clutch "E", so that the long planetary gears roll round fixed sunwheel 2 and ring gear 2 is driven in the direction of engine rotation.



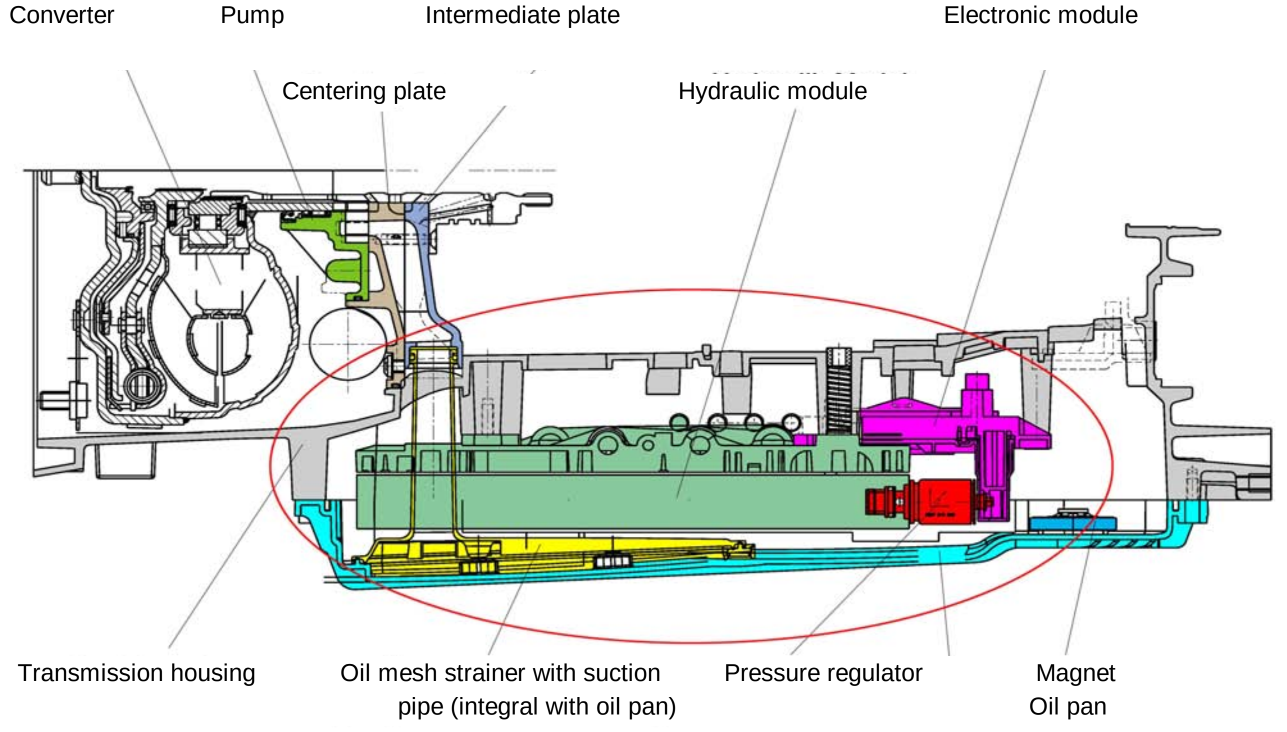
Mechatronik module

Hydraulic and electronic control units

General:

The Mechatronik module is a combination of hydraulic and electronic control units.
Both these modules are installed in the transmission, in the oil pan area.
This technical principle has the following advantages:

--- minimum tolerances
--- better coordination of gear shifts
--- increased refinement
--- optimised shift quality
--- good reliability, since the number of plug connections and interfaces is reduced



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Identification of components and assemblies exposed to electrostatic discharge risk

Assemblies containing components exposed to electrostatic discharge risk must be marked with a warning symbol as a reminder that they need special handling.
Self-adhesive labels should not be attached directly to electrostatic discharge risk components, since this could increase the risk of electrostatic discharge occurring.
In such cases, the warning must be attached to the packaging material.

Identification mark

ELECTROSTATIC DISACHARGE
RISK

Identification of protection zones

Electrostatic discharge protection zones must be indicated by suitable signs (see illustration).
The sign must be attached where it is easily visible. Its minimum size must be 300 mm x 150 mm.
The background colour is yellow, with black artwork.

Identification sign

Translation:
WARNING:
ELECTROSTATIC DISCHARGE
RISK ZONE
NOTE HANDLING
INSTRUCTIONS FOR
COMPONENTS EXPOSED TO
ELECTROSTATIC DISCHARGE
RISK

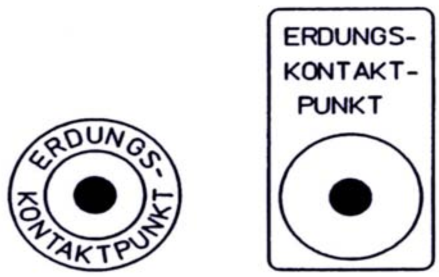
ESD earthing (grounding) equipment

All ESD earthing (grounding) devices installed in electrostatic discharge protection zones must be marked to identify them, using suitable symbols that call for suitable protective measures to be taken.
The markings must make the intended purpose clear, but any additional information that is provided must not distract attention from the basic warning.

Specimen signs for earthing (grounding) points

Translation:

EARTHING (GROUNDING) CONTACT POINT



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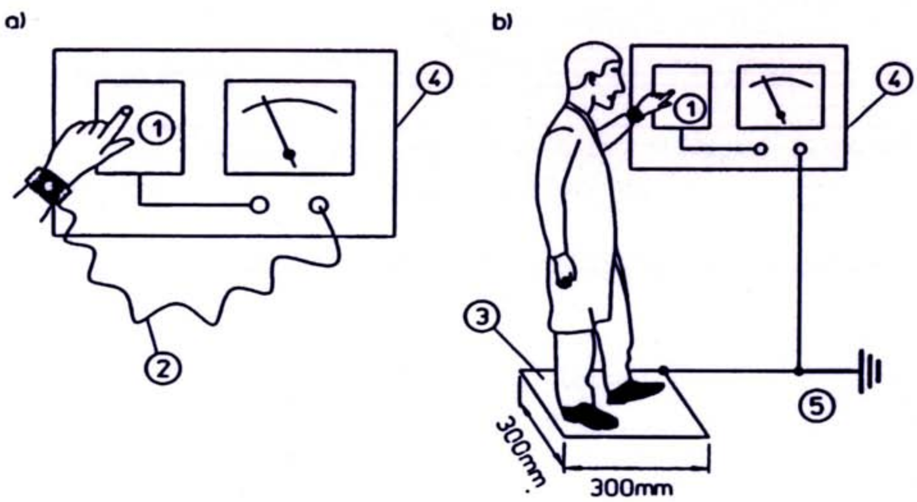
Shoes and foot earthing (grounding) straps

Electrically conductive shoes should be worn by persons who mainly work standing up or either standing or sitting in electrostatic discharge (ESD) protection zones, particularly if wrist band earthing (grounding) is impracticable. The standard calls for ESD shoes to record values between 0 and 35 MOhm resistance. However, for antistatic working shoes resistance values between 0.1 and 1000 MOhm are called for, and a through-conducting resistance for protective shoes of 0.1 to 100 MOhm. A lower limit value of not less than 0.1 MOhm must be maintained on account of the contact voltage risk.
For this reason the minimum value has been set contrary to the standard at the higher figure of 0.75 MOhm.

- **Foot earthing (grounding) straps**
  Persons working temporarily in ESD risk zones (or for example visitors) must be provided with foot earthing straps.
  The total **discharge resistance of each person** by way of these shoes or earthing (grounding) straps, measured between hand and earth (ground) potential, must be between 0.75 and 35 MOhm.

Tools

Tools used in ESD protection zones should if possible be made of **electrostatically conductive** material.



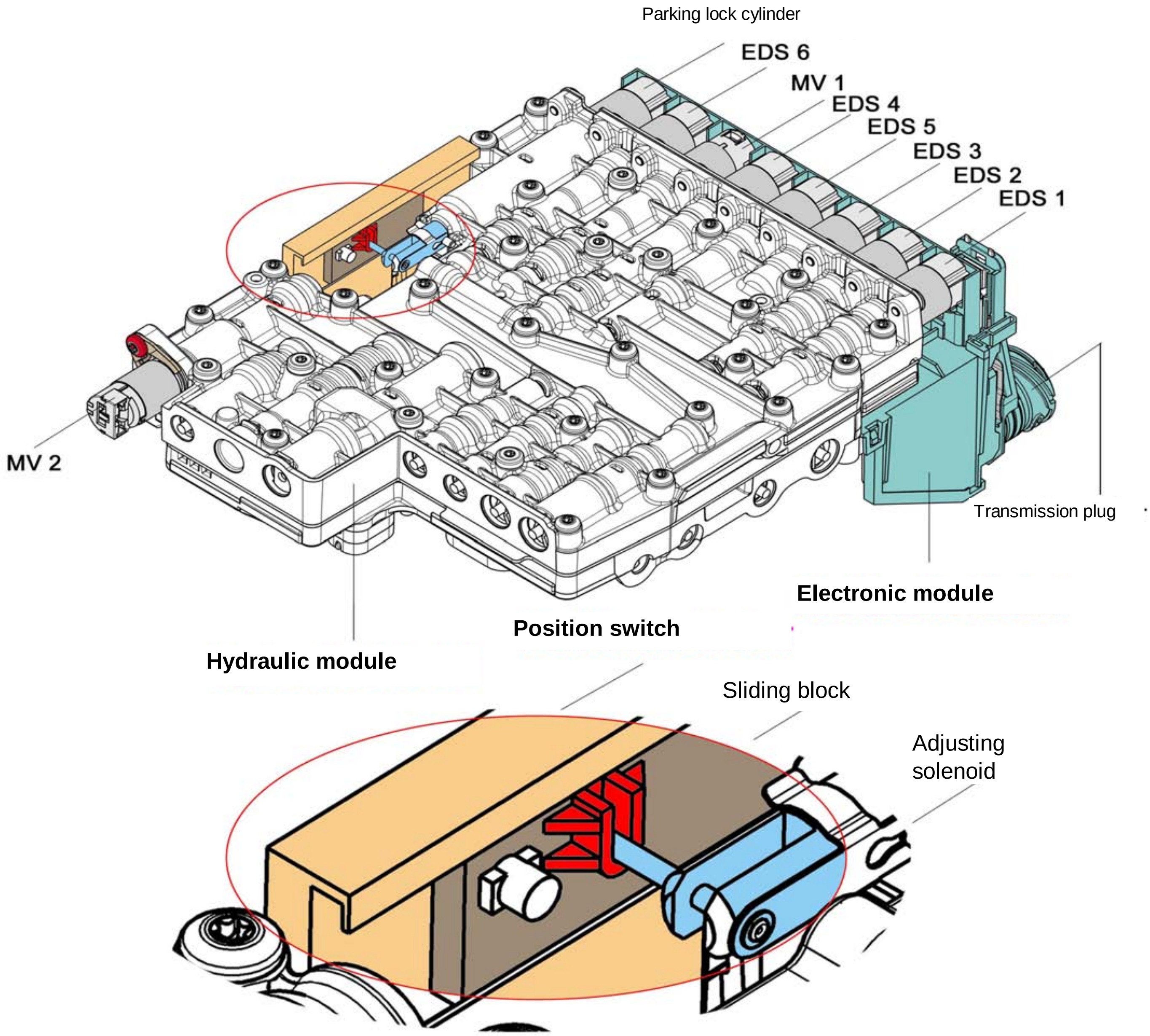
a	If a wrist earthing (grounding) band is worn
b	If ESD protective shoes are worn
1	Hand contact plate
2	Wrist earthing (grounding) band
3	Footplate
4	Resistance measuring device
5	ESD earthing (grounding) system

Electrical circuit

When installing the two modules

(hydraulic and electronic)

make sure in particular that the piston of the parking lock cylinder is connected to the position switch - see sketch.



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Brief description of valves (M and E shift)

ìelector spool valve (WS) only with M shift

The selector spool valve is used by the driver to select the direction of travel (forward or reverse), the parking lock position or neutral.

Parking lock cylinder (PS- ZYL) only with E shift

The parking lock is engaged electrically by the parking lock cylinder. For a detailed description, see page 22, "Parking lock".

Parking lock valve (PS- V) only with E shift

The purpose of the parking lock cylinder is to shift the parking lock cylinder to the Nneutral or Park positions. The PS-V is actuated by solenoid valve 2.

MV2 active = neutral position
MV2 inactive = park position

Shift valve 1-SHV1 (emergency-run valve)

The task of this valve is to keep the gear actually selected in use if the power should fail while driving. If the car is restarted and the EGS is in the emergency program (no power at E actuators), a predetermined gear is selected.
The shift valve's self-sustaining function is cancelled if the car is restarted, but re-activated by the EGS.

Shift valve 2 (SHV2)

Shift valve 2 is actuated by solenoid valve 2 and supplies system pressure to operate the relevant clutches.

Retaining valves, brake D, clutches A,B,E, (HV- D, HV-A, HV- B, HV-E)

The retaining valves actuate the clutch valves, that is to say the regulating function of the clutch valve is shut down by the retaining valve during the shift at the appropriate time, so that clutch pressure rises to the system pressure. Both valves (clutch and retaining valves) are regulated by the corresponding pressure regulator (EDS).

Clutch valves-Clutches A, B, E, brake C, D1,D2, (KV- A, B, E, C, D1, D2)

The clutch valves are variable pressure reducing valves. They are controlled by the relevant electronic pressure control valve (EDS) and determine clutch pressure during the shift.

Pressure reducing valve (Dr.Red.- V)

The pressure reducing valve lowers system pressure to app. 5 bar, which is then applied to the downstream pressure control circuits (EDS1- 6) and solenoid valves (MV1- 2). The pressure control circuits and solenoid valves need a constant feed pressure if they are to function correctly.