

Pressure regulator damper



Attach the Mechatronic to the Housing of the Gearbox

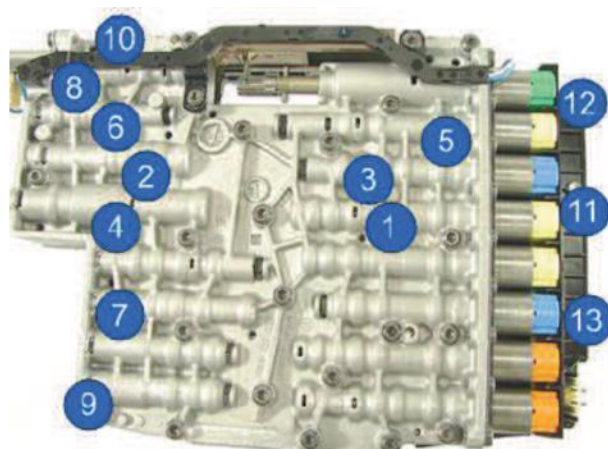
M-shift



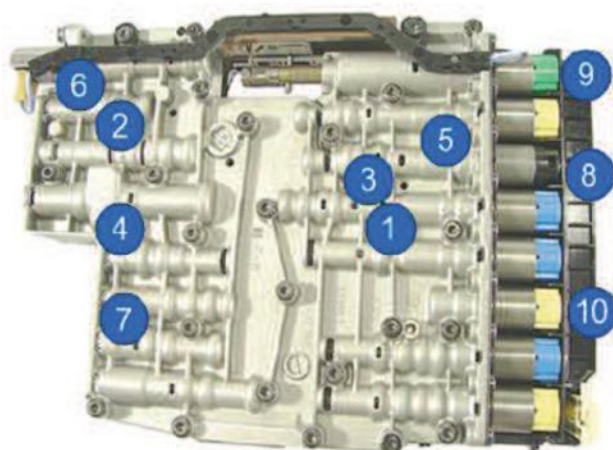
When mounting the mechatronic take care of the sensor for drive position. The picture shows a **not correctly installed** mechanism which would cause an error in the control unit. In this condition the car will not start.

Mechatronic Tightening Sequence

Torque to 8Nm



6HP19,26,32

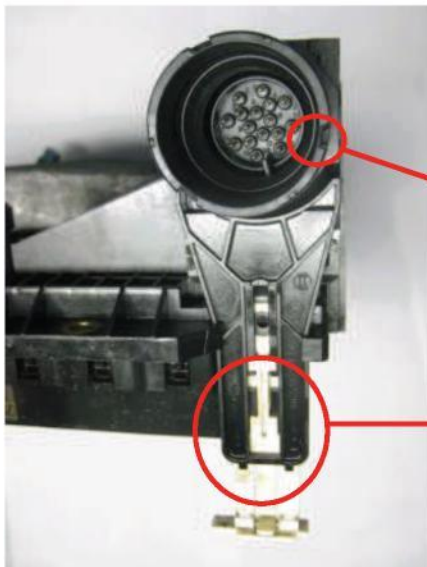


Mounting Connection Socket



Take care that the marked guide lug is mounted not exactly in vertical position

For orientation use the outside of the socket where the guidance for the plug is almost in horizontal position



After correct fitting close the locking mechanism carefully

Oil Change

Lifeguard Fluid 5 (yellow-red)



Used for:

- 5HP18 (depending on manufacturer)
- 5HP19
- 5HP24
- 5HP30 (depending on manufacturer)

Lifeguard Fluid 6 (yellow)

Used for

- 6HP19
- 6HP19X (except Audi Q7)
- 6HP/21/26/28 + X
- 6HP26A61 (except Audi W12)
- 6HP28A61
- 6HP32 + X, 6HP32A

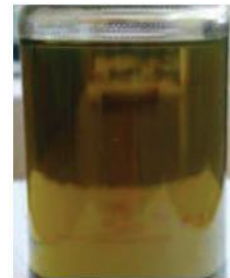


Lifeguard Fluid 8 (green)

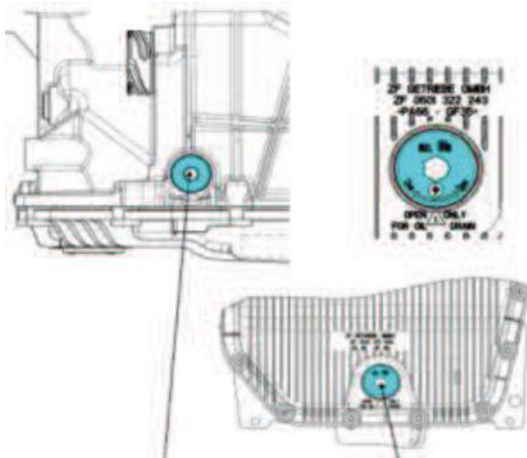


Used for

- 6HP19A
- 6HP19X (Audi Q7)
- 6HP28AF
- 8HP all



Fill in screw



BMW, Jaguar, Ford, Maserati,
Hyundai, Land Rover, Aston
Martin, Rolls Royce, Bentley

For:
6 HP 19/19X/26/26X/32/21/28/28X



Fill in screw

- Engine rpm 750 1/min
- Gearbox temperature between 35 and 40 °

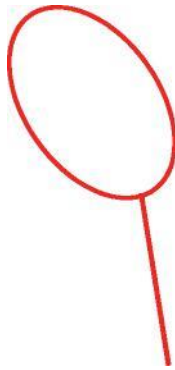
Oil level control (Audi)

- Gearbox temperature 35°
- Start engine
- Take screw B out
- Screw worn
- No fluid coming

fill up until ATF runs down



Bolted driveshaft



6 HP Automatic Transmissions Overhaul

Overhaul - introduction

Since the introduction of the 5HP series, ZF has aimed for a simplistic and streamlined design. Although the 6HP and the new 8HP series are extremely sophisticated and a technologically advanced, they are also smaller and lighter than the predecessors.

The 5HP introduced a simple 3 part design:

- Input, intermediate brake and output.

The 6Hp is no exception. Half of the reaction components are comprised and housed within the input section. Two brakes and a Ravigneaux planetary make up the other two reaction components.



Transmission
External ZF training

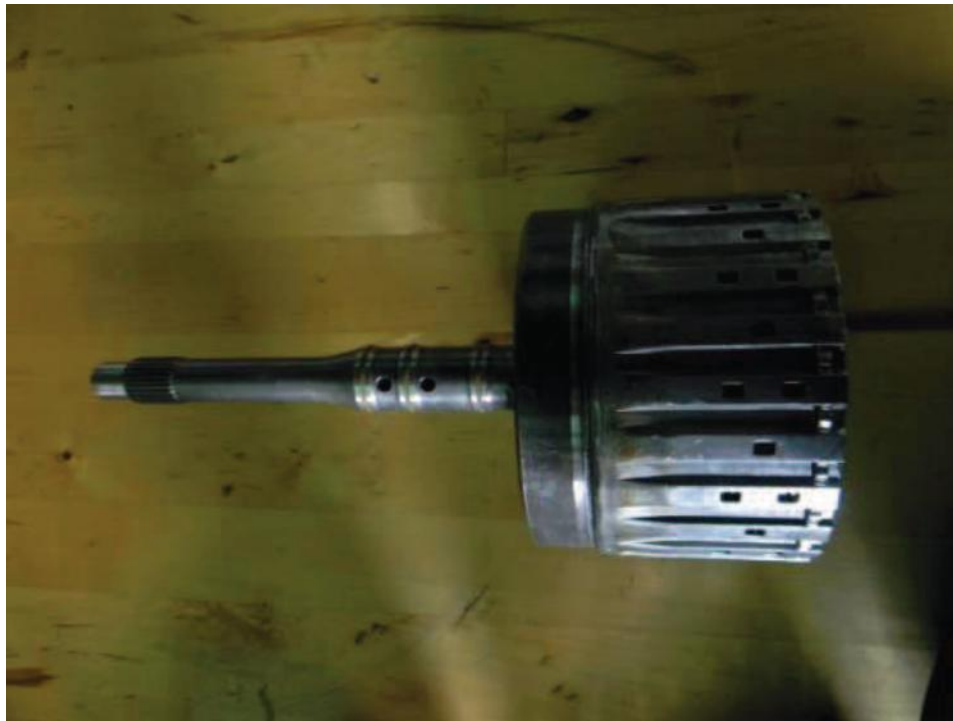


Input section – Oil pump

Front cover housing contains:

- Oil pump
- Torque converter stator support
- Single planetary' s Sun gear support
- Oil passages for TCC apply and release

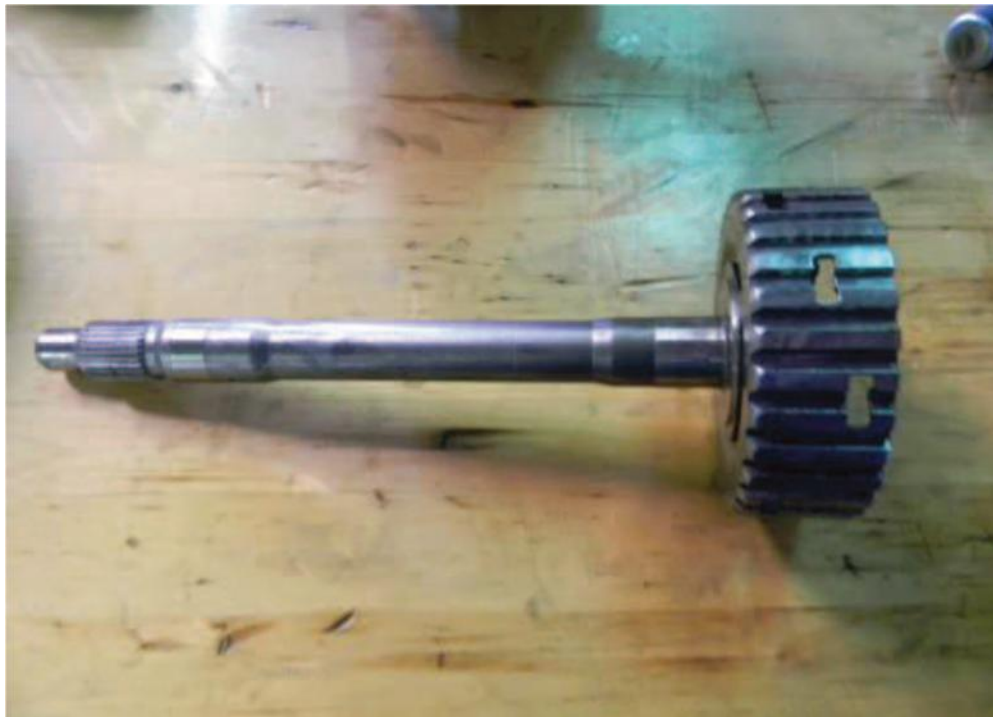
Input shaft



Input shaft contains:

- E Clutch
- Passage for TCC
- Passage for E clutch
- Single planetary ring gear
- Turbine splines

Intermediate shaft



Intermediate shaft connects:

- E clutch friction plates to Ravigneaux planetary carrier

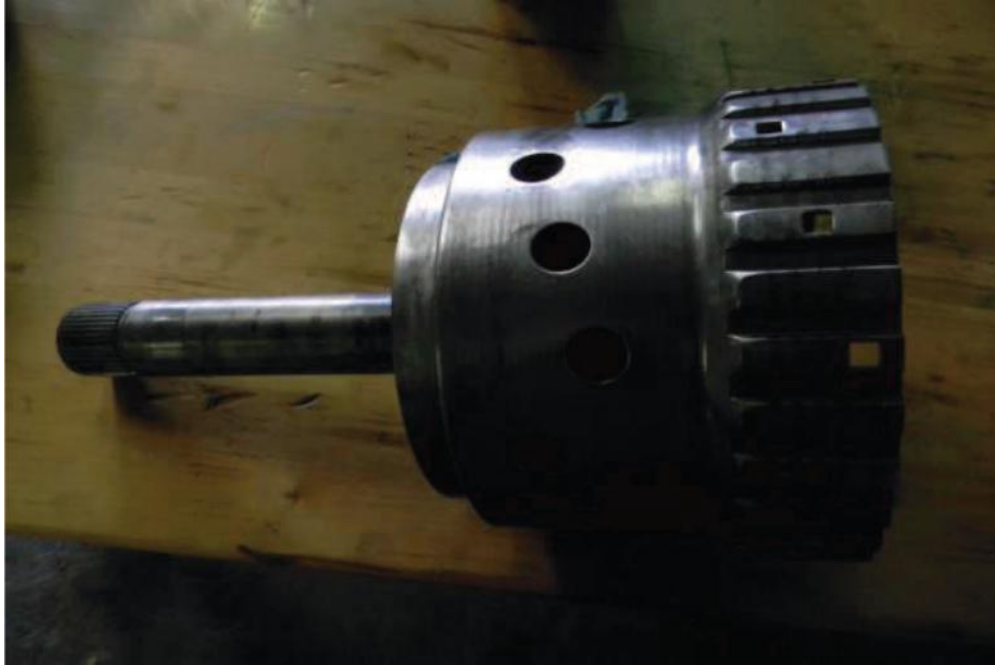
Clutch A



A clutch houses:

- Single planetary gear set carrier and planets

Sun gear shaft



Sun gear shaft contains:

- Engages A clutch friction plates
- Splines into Sun Gear 3

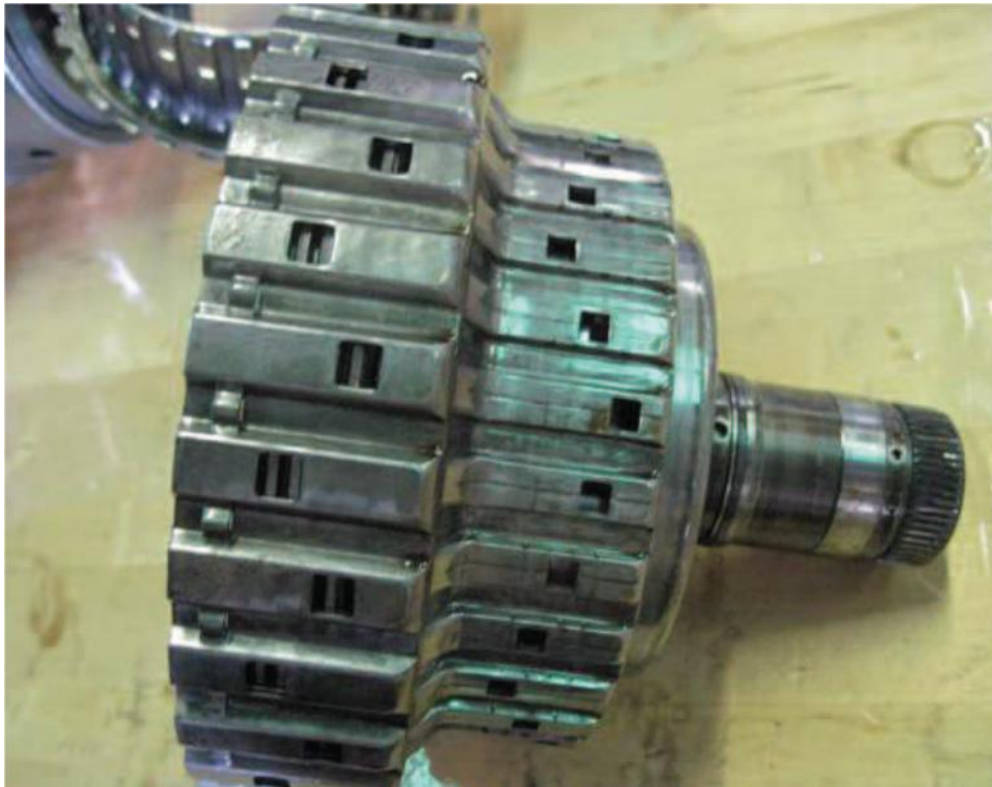
Disc carrier



Disc Carrier contains:

- Meshes with clutch A drum
- Friction plates of clutch B

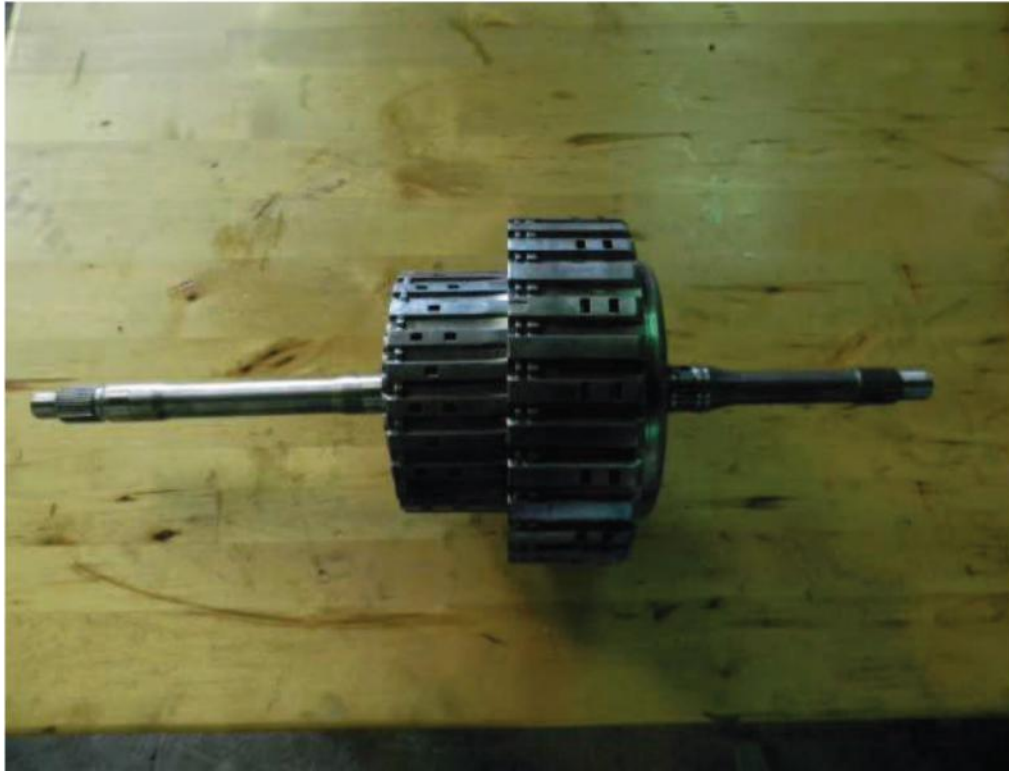
Clutch B



Clutch B contains:

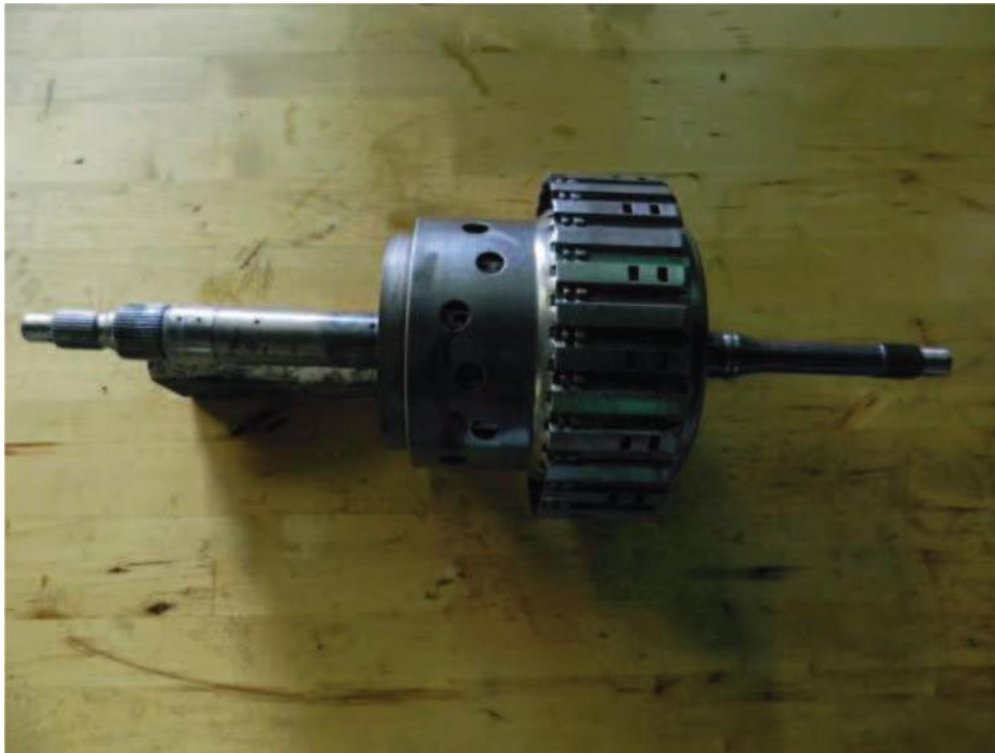
- Engages with Brake C friction plates
- Splines into Sun Gear 2

Assembled



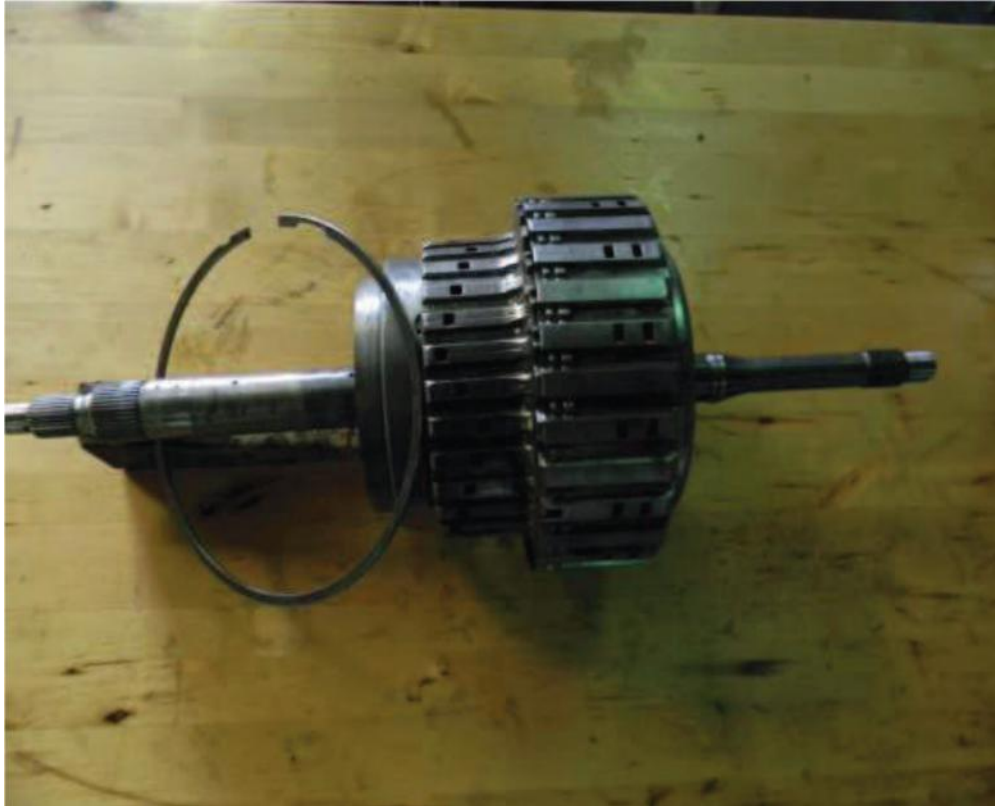
Input shaft, clutch A, clutch E and Intermediate shaft assembled

Assembled



Sun Gear shaft added to previous assembly

Assembled



Complete Input assembly

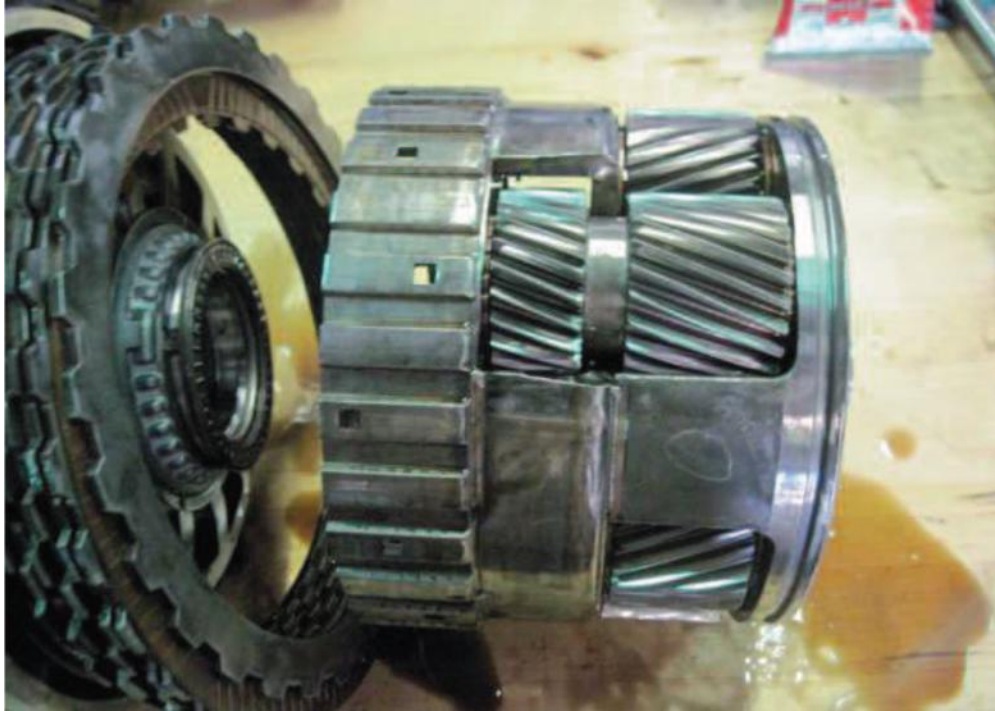
Intermediate Brakes



C and D assembly contains:

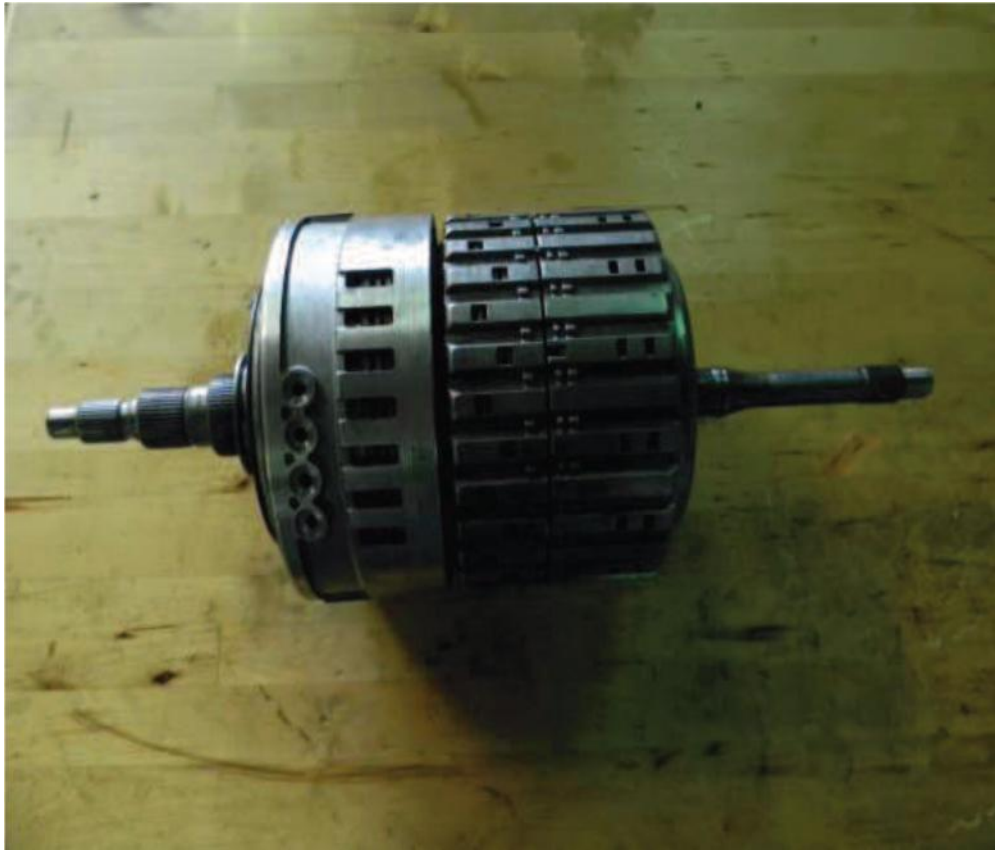
- C Brake
- D Brake
- Passages for C and D brakes
- Passage for B clutch

Output components



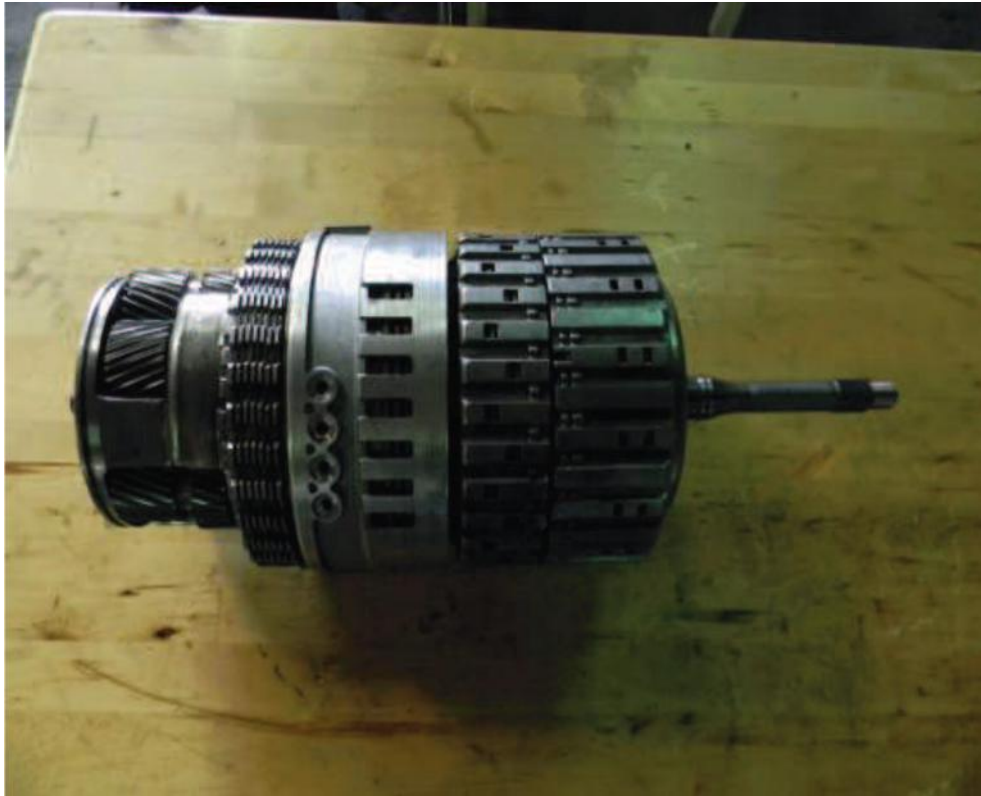
Ravigneaux planetary gear set and D brake frictions and steels

Assembled



Input assembly and intermediate assembly (C brake)

Assembled



D brake and Ravigneaux planetary added to previous assembly

A Clutch disassemble



Clutch A is the most unconventional assembly to disassemble.

In order to remove the piston, the single planetary gear set has to be removed from the drum. Underneath the planets and towards the center of the carrier lies a snap ring that holds the planetary carrier to the drum.

Push slightly towards the center and at the same time lift the carrier.

Disassemble



Snap ring can be seen at the four openings in the carrier, right above the planets.

Disassemble



Once the carrier is removed the tabs can be seen

E clutch failure



Most common fault code / failure is for E clutch.
Quite often due to pressure losses at front pump bushing.

Oil pressure is fed through front cover (pump) through input shaft's third port.
Unfortunately there's only 1 Teflon ring that seals the input shaft to the pump.
The other end of this chamber is sealed by the interference of the shaft and the bushing.

As the bushing wears the clearances become too large and pressure is lost beyond the point of adaptations.

Mechatronics' Separator failure



More often than E clutch failure is the separator, double D, failure. Stress, heat cycles and environmental conditions causes the separator to develop small to obviously large cracks and the rubber seals at the end to shrink or get hard and brittle.

Any of these conditions will cause a working or main pressure loss. These losses are reflected as adaptation faults, delayed gear engagement and, in the E Mechatronics' version, as a parking fault. Along with the separator seal, the 4 ports seals are also prone to shrinking and failure. All of these parts should be replaced.



8 HP Automatic Transmissions

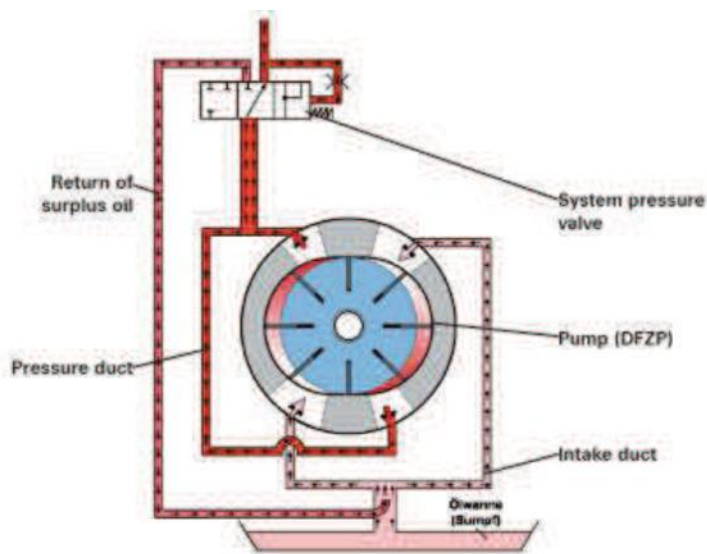
Modular construction system



Torque converter

Sealing gearbox input shaft

ATF-Oil pump



data:
 em pressure 5.5 to 17.5 bar
 elivery rate 7 to 22 l/min
 p speed 550 to 8600 rpm



ATF-Cooling

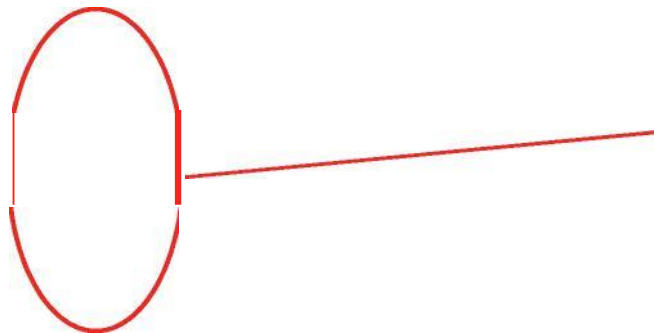
E-shift Mechatronic (Audi)

Parking brake emergency release (Audi)



Parking brake emergency release lever (Audi – under driver seat)

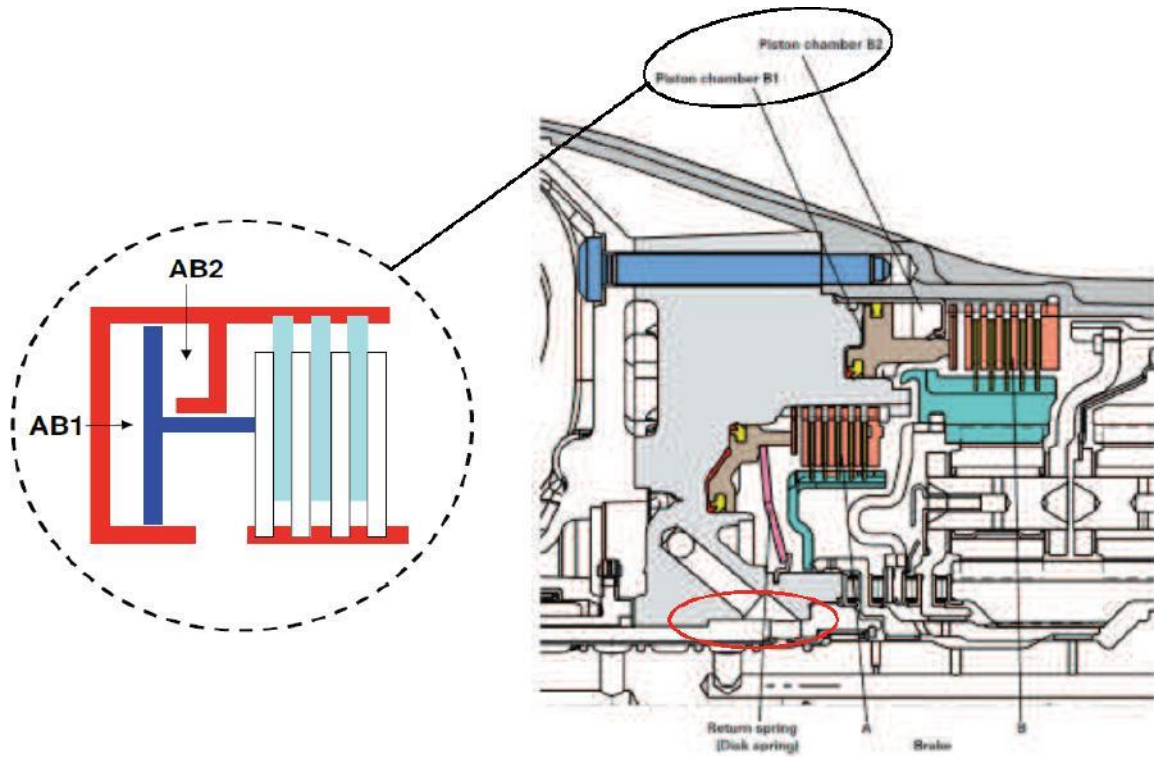
Parking brake emergency release (BMW)



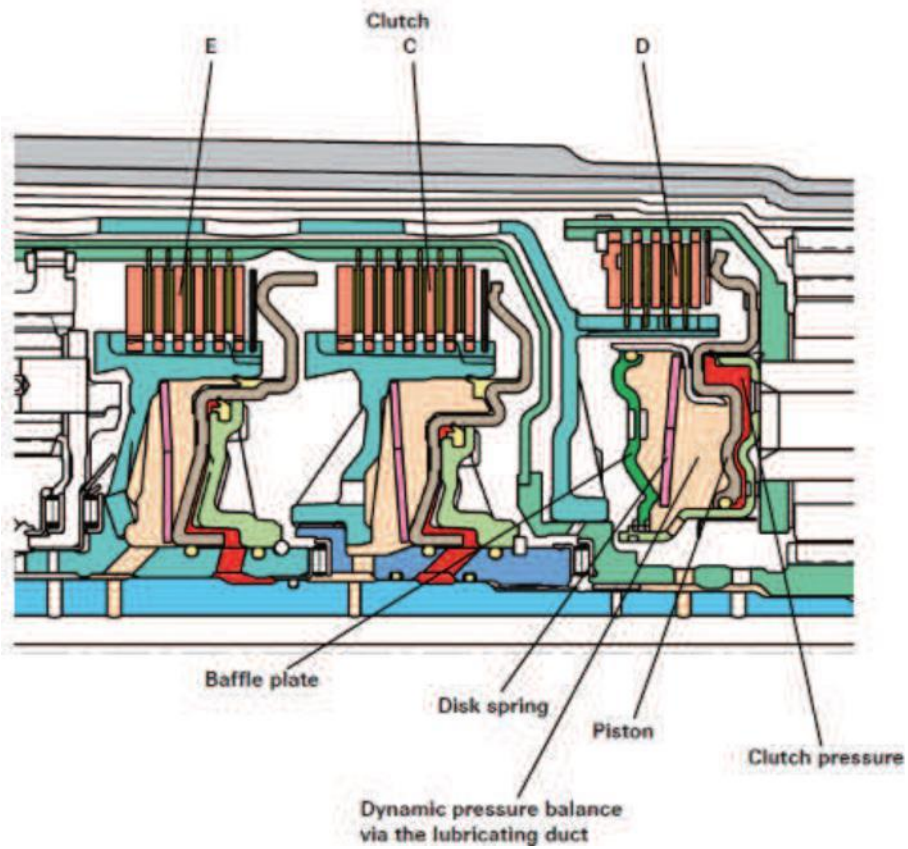
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Shift elements Brake B

B is controlled by two pistons

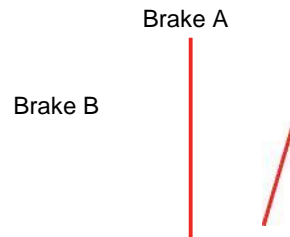


Clutch C, D and E





Planetary Gear sets / Shift elements



Clutch E

Clutch C

Clutch D

Gear description in 1st gear

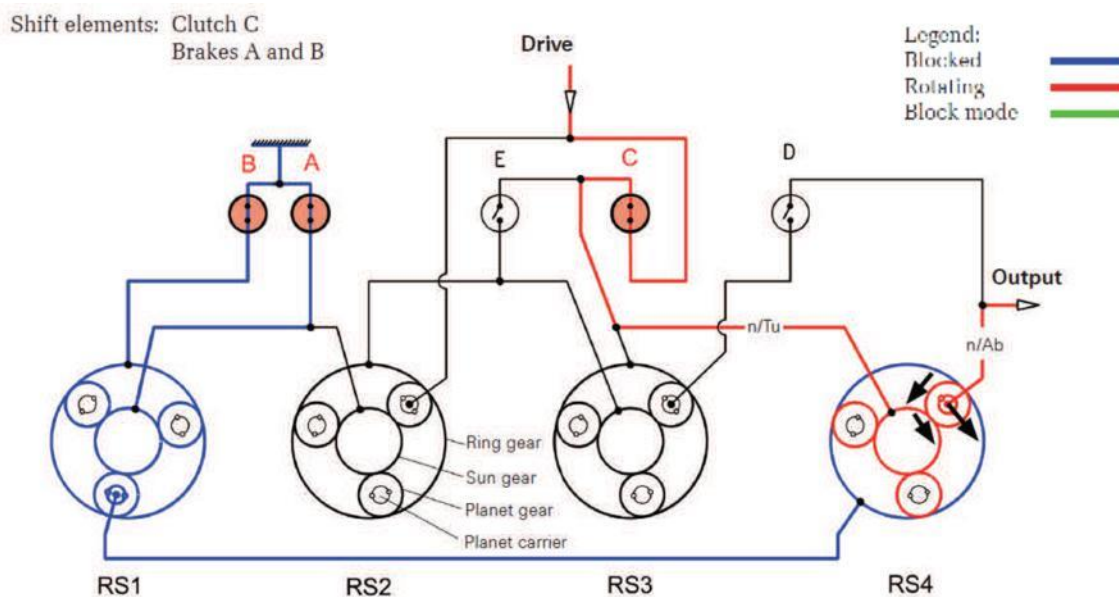
In 1st gear, internal ring gear H1 is fixed by the multidisc brake B and the double sun gear S1/S2 via the multidisc brake A against the housing (blocking position on planetary gear train RS1).

The connection of the planet carrier P1 and internal ring gear H4 means that this internal ring gear is also fixed.

The drive shaft provides the driving force via the closed multidisc clutch C to the sun gear S4. This drives sun gear S4 at the same speed as the turbine.

The fixed internal ring gear H4 means that the planetary gears under the internal ring gear turn and drive the planet carrier P4 in the direction of engine rotation.

Planet carrier P4 also acts as the output shaft.



Gear description in 2nd gear

In 2nd gear, internal ring gear H1 is fixed by the multidisc brake B and the double sun gear S1/S2 via the multidisc brake A against the housing (blocking position on planetary gear train RS1).

The connection of the planet carrier P1 and internal ring gear H4 means that this gear is also fixed.

The drive shaft provides the driving force which drives the planet carrier P2 at the same speed as the turbine.

This rolls over the fixed double sun gear S1/S2. This drives the internal ring gear H2 in the direction of engine rotation which in turn drives the sun gear S4 via the closed multidisc clutch E.

The fixed internal ring gear H4 means that the planetary gears under the internal ring gear turn and drive the planet carrier P4 in the direction of engine rotation.

Planet carrier P4 also acts as the output shaft.

Gear description in 3rd gear

In 3rd gear the internal ring gear H1 is fixed against the housing by multidisc brake B.

The drive shaft provides the driving force to the planet carrier P2 and via the closed multidisc clutch C to the sun gear S4. Both are driven at the same speed as the turbine.

The closed multidisc clutch E connects sun gear S4 and internal ring gear H2 and drives them at the same speed in the direction of engine rotation (block mode on planet gear set RS2).

The block position on planetary gear train RS2 means that the double sun gear S1/S2 can drive the planetary gears 1 at the same speed as the turbine which makes them roll under the fixed internal ring gear H1.

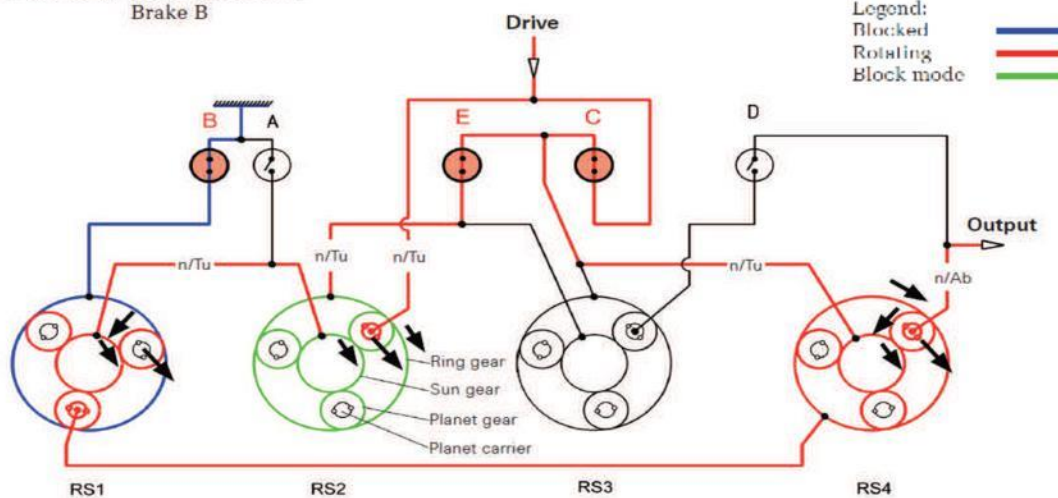
This drives planet carrier P1 at lower speed in the direction of engine rotation.

The fixed connection between planet carrier P1 and internal ring gear H4 produces the same direction of rotation and speed at internal ring gear H4.

Sun gear S4 drives at the same speed as the turbine which means that planet carrier P4 experiences an increase in speed compared to 2nd gear.

Planet carrier P4 also acts as the output shaft.

Shift elements: Clutches C and E
Brake B



Gear description in 4th gear

In 4th gear the internal ring gear H1 is fixed against the housing by multidisc brake B.

The closed multidisc clutch E short circuits internal gear H3 and sun gear S3 on the planetary gear train RS3 which produces block mode on planetary gear train RS3.

The closed clutch D produces a fixed connection between planet carrier P3 and the output shaft. This means that planetary gear train RS3 is driven in full at output speed in the same direction as the engine.

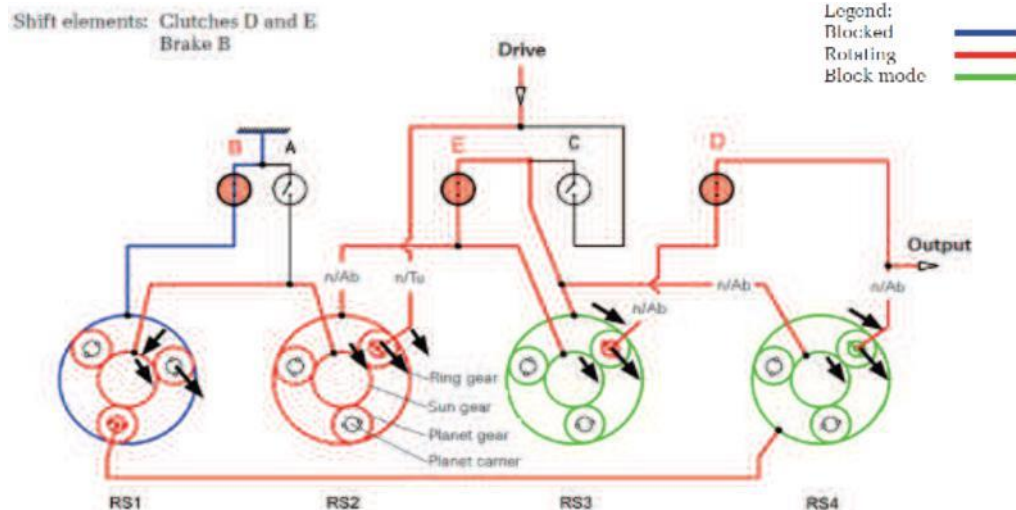
The fixed connection of internal ring gear H3 and sun gear S4 and between sun gear S3 and internal ring gear H2 means that internal ring gear H2 and sun gear S4 are also driven at output speed.

The drive shaft provides the driving force to planet carrier P2 which rolls under the internal ring gear H2 which rotates at output speed.

The double sun gear S1/S2 is driven accordingly at the speed of planetary gears 2 which means that planetary gears 1 roll under the fixed internal ring gear H1 and drive the planet carrier P1 in the same direction as the engine.

The planetary gear train RS4 is locked against the output shaft by the connection of the sun gear S and the planet carrier P4. This produces block mode on planetary gear train RS4. The planet carrier P1 is firmly connected to internal ring gear H4 which means that the planetary gear train is driven as a block.

Planet carrier P4 also acts as the output shaft.



Gear description in 5th gear

In 5th gear the internal ring gear H1 is fixed against the housing by multidisc brake B. The drive shaft provides the driving force to the planet carrier P2 and via the closed multidisc clutch C to the internal ring gear H3 and sun gear S4.

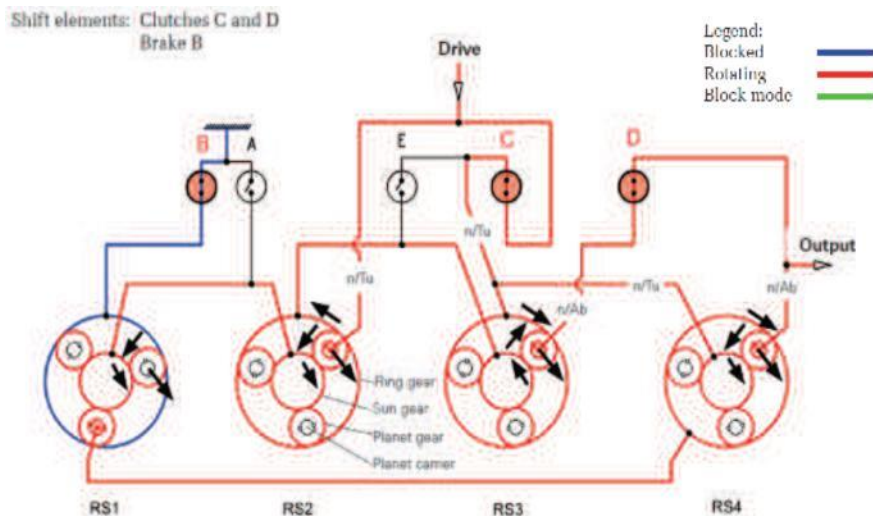
Planet carrier P2, internal ring gear H3 and sun gear S4 are driven in the direction of engine rotation at the same speed as the turbine. The closed multidisc clutch D produces a fixed connection between planet carrier P3 and the output shaft. This drives the planet carrier P3 at output speed in the same direction as the engine so that it rolls under the internal ring gear H3 which is rotating at the same speed as the turbine.

Sun gear S3 is driven in the opposite direction to the engine. The fixed connection between sun gear S3 and internal ring gear H2 rotates internal ring gear H2 in the opposite direction to planet carrier P2 which is driven by the drive shaft.

The double sun gear S1/S2 is therefore driven in the same direction as the engine by planetary gears 2. This results in planetary gears 1 rolling under the fixed internal ring gear H1 and drive the planet carrier P1 in the same direction as the engine.

Internal ring gear H4 has the same speed due to its fixed connection with planet carrier P1. This produces a speed ratio on planetary gear train RS4 between the sun gear S4 turning at the same speed as the turbine and internal ring gear H4 turning at the same speed as planet carrier P1.

This speed ratio produces a resulting peripheral speed of planet carrier P4. Planet carrier P4 also acts as the output shaft.



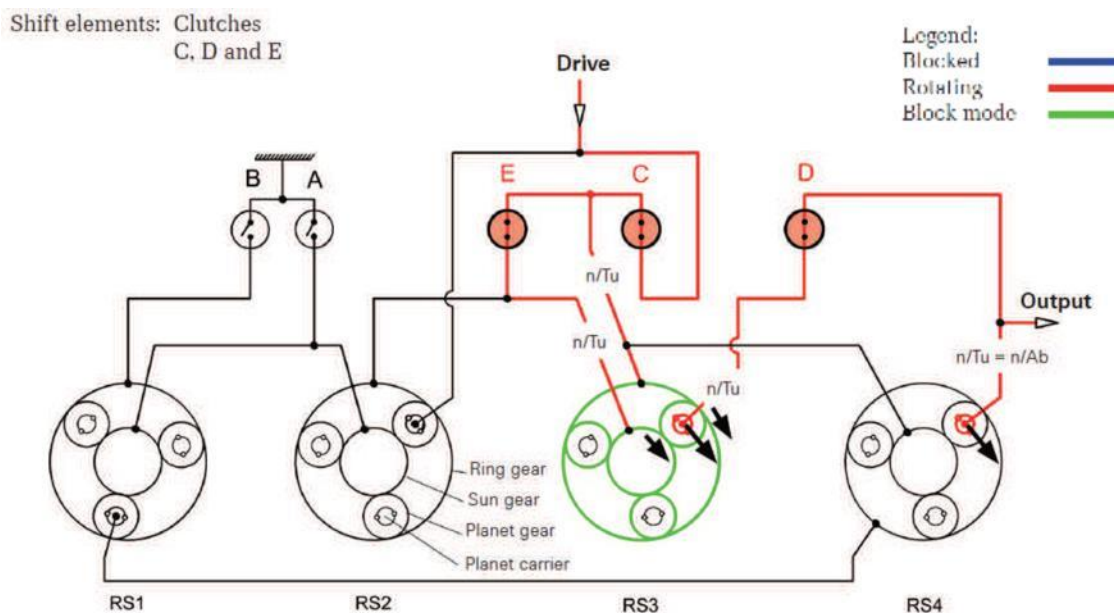
Gear description in 6th gear

The driving force from the drive shaft in 6th gear drives the closed multidisk clutches 0 and E. The closed multidisk clutch 0 initiates the propulsion of the engine into the planetary gear set.

The closed multidisk clutch E short circuits internal ring gear H3 and sun gear S3. Both of these, sun gear S3 and internal ring gear H3 are driven at the same speed as the turbine which produces block mode on planetary gear train RS3.

Planet carrier P3 is connected to planet carrier P4 by the closed multidisk clutch D. This results in the same speed in the same direction as the engine on planet carrier P4.

Planet carrier P4 also acts as the output shaft.



Gear description in 7th gear

In 7th gear the double sun gear S1/S2 is fixed against the transmission housing by the closed multidisc brake A.

The drive shaft provides the driving force to the planet carrier P2 and via the closed multidisc clutch C to the internal ring gear H3. Both, planet carrier P2 and internal ring gear H3, are driven at the same speed as the turbine.

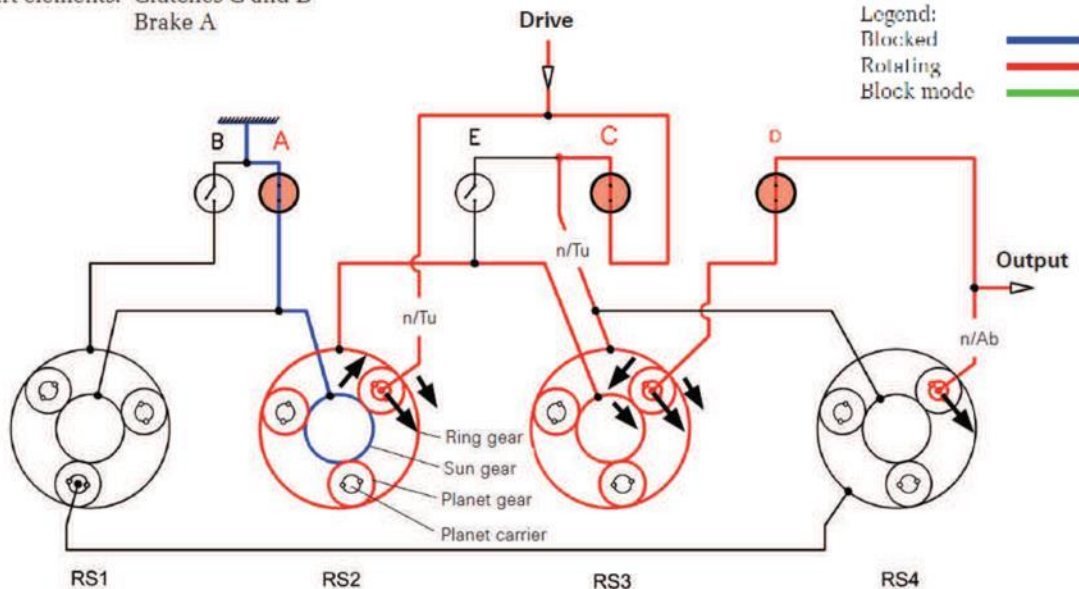
As a result of driving the planet carrier P2 the planetary gears 2 roll over the fixed double sun gear S1/S2 and drive the internal ring gear H2 at the corresponding speed in the same direction as the engine.

The internal ring gear H3 drives planet carrier P3 at the same speed as the turbine and sun gear S3 at a correspondingly higher speed due to the connection with internal ring gear H2. This drives the planet carrier P3 via planetary gears 3 in the same direction as the engine.

Planet carrier P3 has a fixed connection with planet carrier P4 via the close multidisc clutch D which results in the same speed in the same direction as the engine at planet carrier P4.

Planet carrier P4 also acts as the output shaft.

Shift elements: Clutches C and D
Brake A



Gear description in 8th gear

In 8th gear the double sun gear S1/S2 is fixed against the transmission housing by the closed multidisc brake A.

Internal ring gear H3 and sun gear S3 are short circuited by the closed multidisc clutch E which produces block mode on planetary gear train RS3.

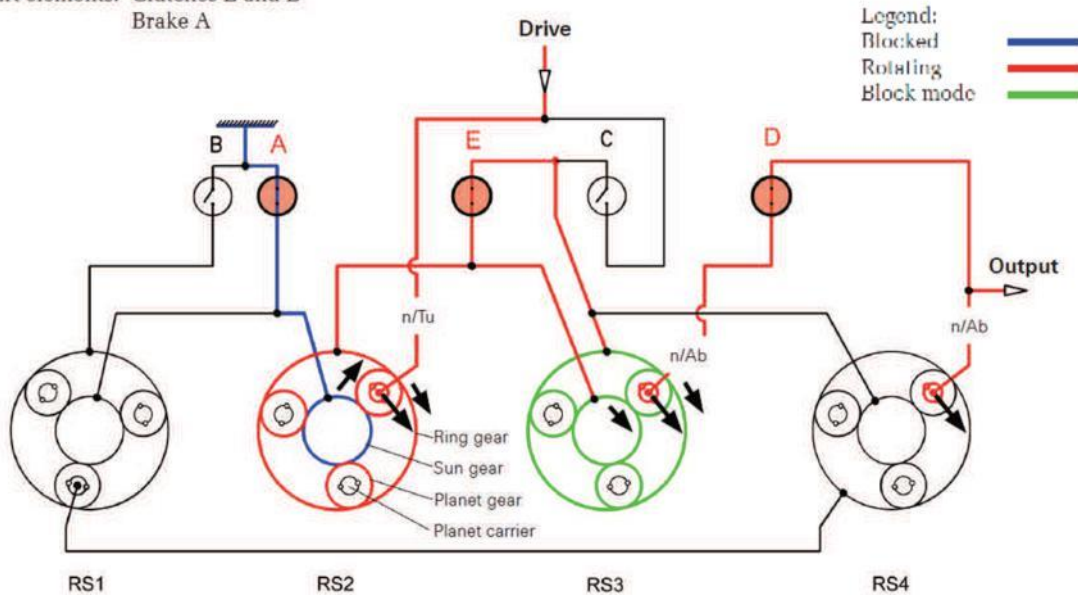
The drive shaft provides the drive direct to planet carrier P2. As a result of driving the planet carrier P2 the planetary gears 2 roll over the fixed double sun gear S1/S2 and drive the internal ring gear H2 at the corresponding speed in the same direction as the engine.

Internal ring gear H2 drives sun gear S3 and internal ring gear H3 via the closed multidisc clutch E (block mode on planetary gear train RS3).

Planet carrier P3 has a fixed connection with planet carrier P4 via the close multidisc clutch D which results in the same speed at planet carrier P4.

Planet carrier P4 also acts as the output shaft.

Shift elements: Clutches E and D
Brake A



Gear description for reverse gear (R)

In reverse gear, the ring gear H1 is secured to the transmission housing using the closed multidisc brake B, and the double sun gear S1/S2 is secured to the transmission housing using the closed multidisc brake A.

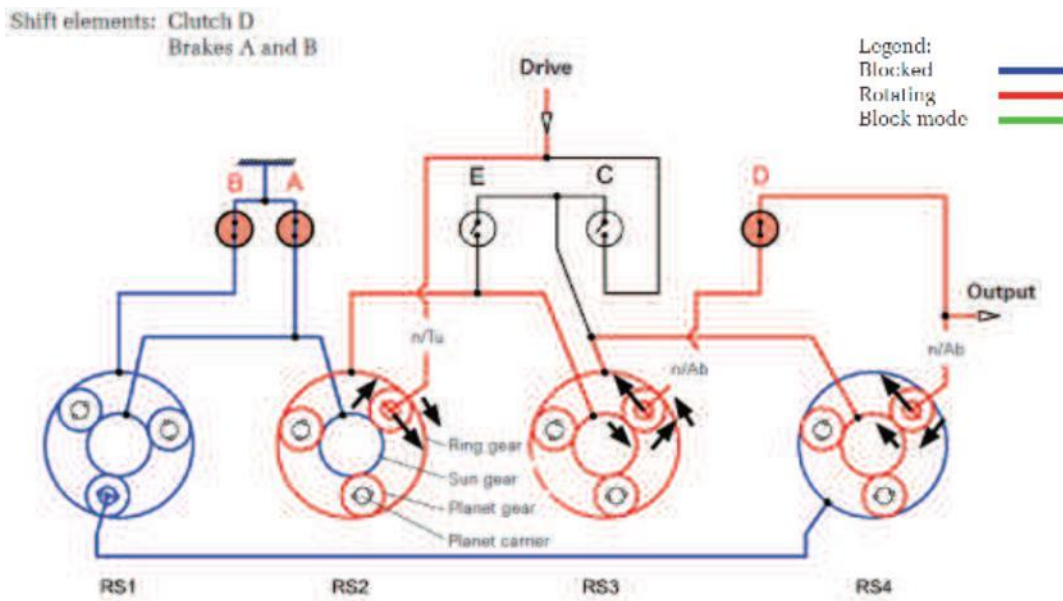
The planet carrier P1 is linked with the ring gear H4 and thus is likewise secured to the housing. The planet carriers P3 and P4 are firmly linked to one another by means of the closed multidisc clutch D.

Drive takes place directly from the drive shaft to the planet carrier, whereby planetary gears 2 roll onto the stationary double sun gear S1/S2 and take the internal ring gear H2 in the direction of engine rotation.

The internal ring gear H2 and the sun gear S3 are firmly connected to one another. In this way, the sun gear 3 drives the internal ring gear H3 against the direction of engine rotation. The internal ring gear H3 is firmly connected with the sun gear S4, whereby the same rotational direction is achieved on sun gear S4.

The sun gear S4 drives the planetary gears 4 against the direction of engine rotation, which roll beneath the stationary ring gear H4 against the direction of engine rotation and take the planet carrier P4 with them.

Planet carrier P4 also acts as the output shaft.





Ratio

Gear:	1.	2.	3.	4.	5.	6.	7.	8.	R
Transmission ratio:	4.7	3.13	2.1	1.67	1.29	1	0.84	0.67	R
Ratio spacing:	1.5	1.49	1.26	1.3	1.29	1.19	1.25		-3.3
Total:	7,05								

Mechatronic E-Shift

Controller Matrix E-Shift

Position	1	2	3	4	5	6	7	8
P-EDS	EDS 1	EDS 4	EDS 2	EDS 5	EDS 3	EDS 6	EDS 7	MV 1
Responsible	Brake A	Clutch D	Brake B	Clutch E	Clutch C	Cc	System p.	Solenoid v.
Character	A	A	A	A	y	A	y	
Parking	1	0	1	0	1	0	-x-	0
Neutral	1	0	1	0	1	0	-x-	1
R-gear	1	1	1	0	1	0	-x-	1
1st gear	1	0	1	0	0	-x-	-x-	1
2nd gear	1	0	1	1	1	-x-	-x-	1
3rd gear	0	0	1	1	0	-x-	-x-	1
4th gear	0	1	1	1	1	-x-	-x-	1
5th gear	0	1	1	0	0	-x-	-x-	1
6th gear	0	1	0	1	0	-x-	-x-	1
7th gear	1	1	0	0	0	-x-	-x-	1
8th gear	1	1	0	1	1	-x-	-x-	1

	Brake closed
	Clutch closed

EDS-Types

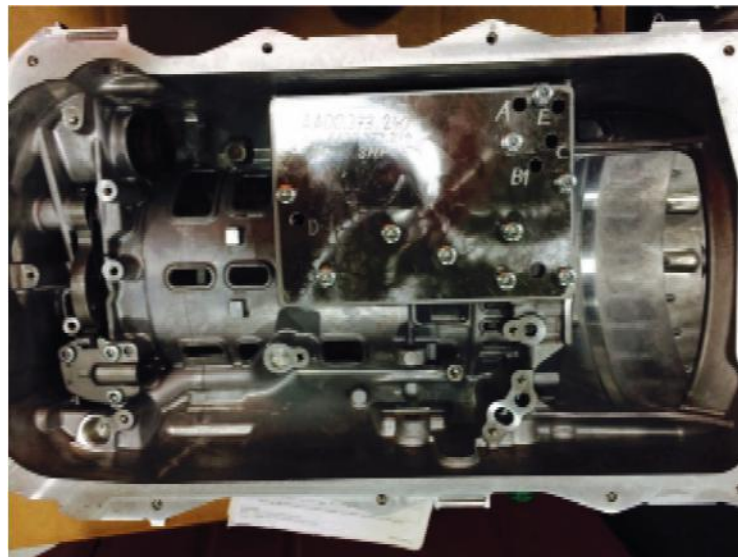


Position of the Mechatronic pressure channel

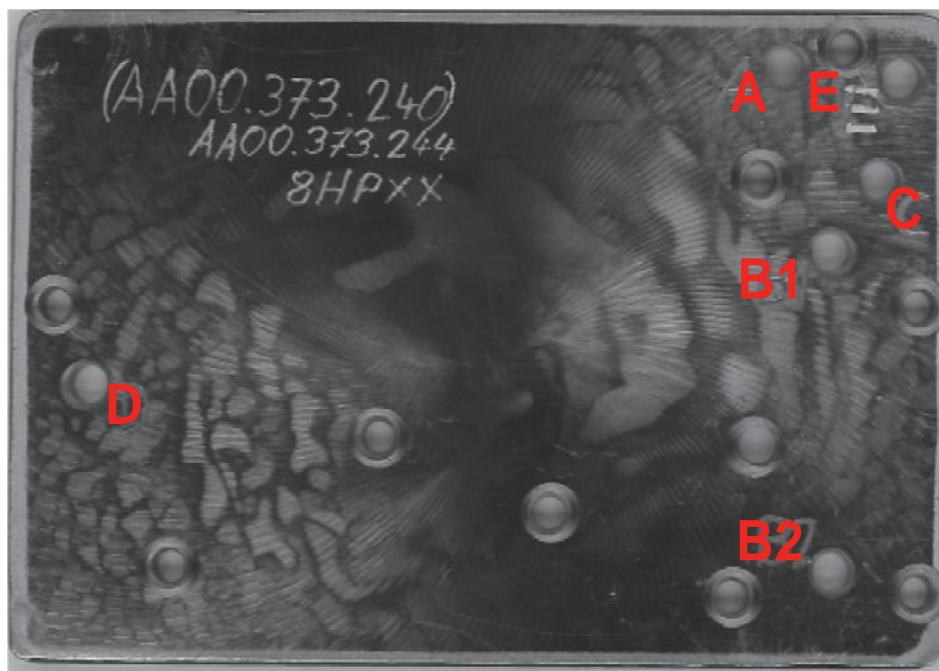
Check clutches and brakes



Check clutches and brakes



Check clutches and brakes





Template for the

Parts to changing the Mechatronic Example Audi



Parts needed

- Connection socket
- Oil reflux cartridge
- Sealing ring oil approach cartridge
- Sealing cartridge

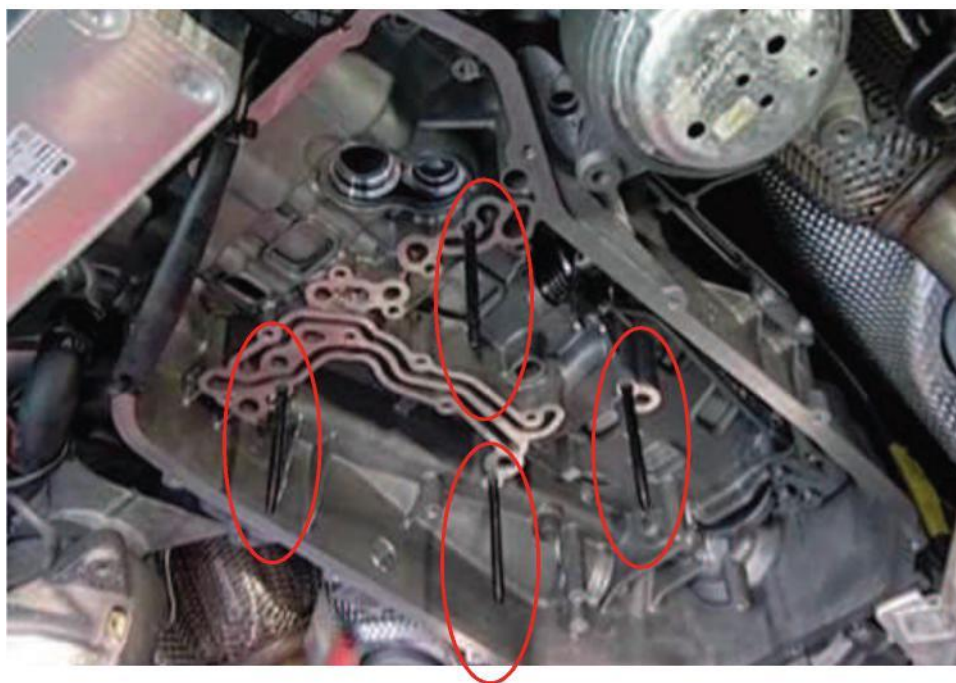
Sealing oil pipes



Sealing cartridge



Guiding pins for mounting the mechatronic

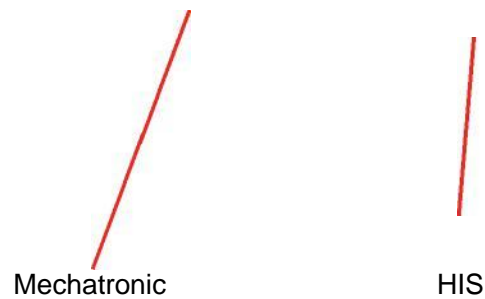


Oil level control



- Gearbox temperature 35°
- Start engine
- Take screw B out
- Screw worn
- No fluid coming fill up until ATF runs down

The hydraulic impulse oil storage – HIS



Some customer-specific versions of the new generation 8-speed automatic transmission from ZF will have an integral hydraulic impulse oil storage system.

This supplies hydraulic oil to the shift elements of the transmission required for starting. In turn this makes it possible to move off quickly if the engine has been stopped – as required for a start-stop function.

The car is ready to move away just 350 milliseconds after the engine has been started.

The hydraulic impulse oil storage – HIS

The “HIS” hydraulic impulse oil storage is a spring piston accumulator which fills with oil as the car is being driven, thus tensioning a spring.

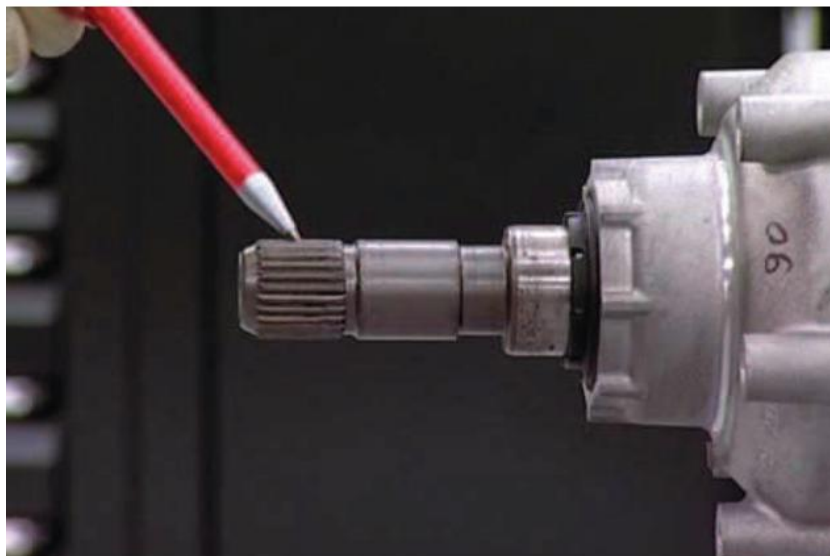
This “reserve” has a capacity of around 100 centiliters which is fed back into the hydraulic system lightning-quick by the spring when the engine is started to supply oil to the shift elements in the transmission required for moving away.

This means that the car is ready to move away just 350 milliseconds after the engine has been started. Without the bridging created by the hydraulic impulse oil storage system this would take around 800 milliseconds which would therefore mean a perceptible loss of driving dynamics for

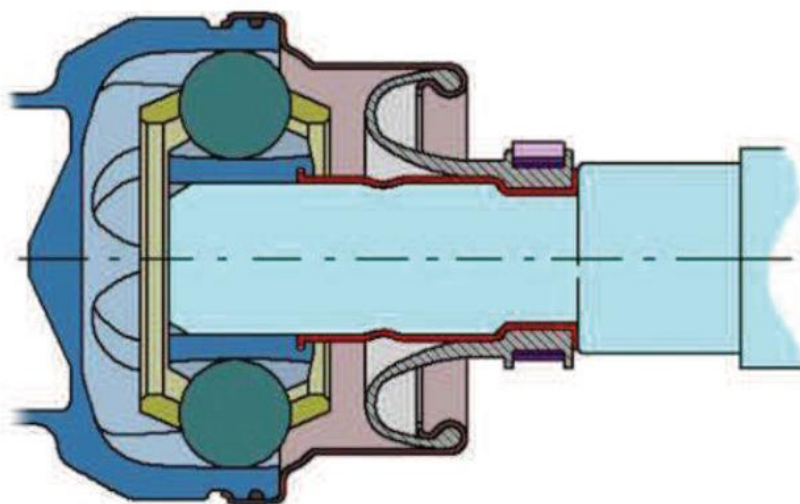


The hydraulic impulse oil storage – HIS

Audi plugged driveshaft



Audi plugged driveshaft





Vehicle for 8HP Transmission

BMW group



Jaguar & Land Rover

Fiat group

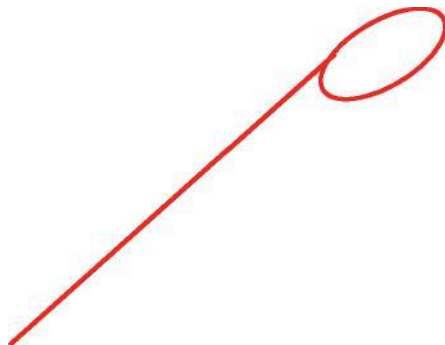


Volkswagen group

[illegible]

Troubleshooting

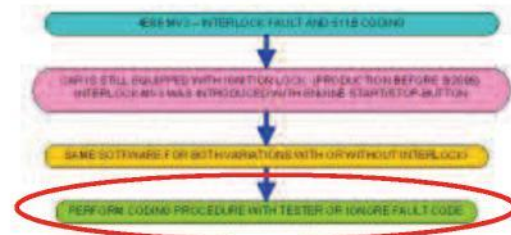
While freewheeling and changing from second into first gear (for example when approaching traffic lights) a kick happens.



Check play on the flex disc

4E86 MV3 – Interlock fault Saved code in the ECU

4E86_101 (Service) > 530 H52 (03) (2005/03 - 2007/03) > 4E86 MV3 Interlock and 551B Coding (Prod. before 9/2005)



E 60 Prod. before 9/2005



E 60 Prod. after 9/2005



Towing in case of breakdown

Audi towing

The vehicle can be towed at a maximum vehicle speed of **50 km/h** over a maximum distance of **50 km** using the drive wheels. The transmission must be mechanically unlocked.

That means:

The parking lock must be released by means of a Bowden cable. The automatic transmission can be seriously damaged if the above-mentioned boundary values are not maintained.

BMW towing

The precondition for towing a vehicle with an unraised drive axle is that the parking lock be opened by means of a Bowden cable emergency release. If this is the case, towing with a maximum speed of **50 km/h** over a maximum distance of **50 km** is possible.

The automatic transmission can be seriously damaged if the above-mentioned boundary values are not maintained.

Vehicles on which the parking lock must be opened with an unlocking screw cannot be towed. In case of breakdown, the vehicle must be raised with a crane and delivered to the workshop for repair on a flatbed tow truck.

Four-wheel-driven vehicles

Vehicles with four-wheel drive must not be towed with one axle lifted.



Pushing

The engine cannot **be started** by pushing the vehicle. That is to say, if the engine is stopped, there is no transmission of power from the hydrodynamic coupling of the engine and transmission and the pressure-less shift elements.



