

# The Smallest Automated Transmission Possible

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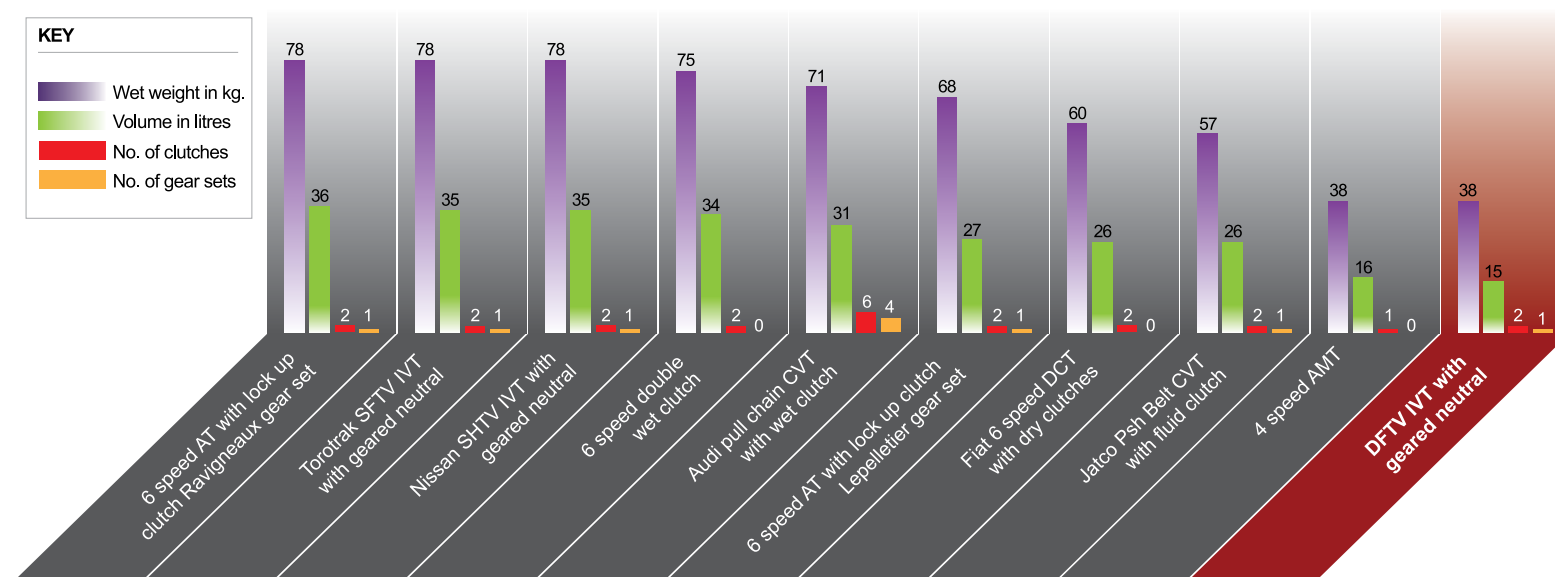
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The combination of the extremely compact Double Roller Full Toroidal Variator (DFTV) and a typical IVT with High Low regime produces a transmission that is smaller than any Automated transmission using a torque convertor as a starting device.



## Comparison of Size, Weight and Complexity of Various Transmission Types

*This chart was developed by Ultimate transmissions using information available about the size and mass of other forms of transmission. All transmissions are rated at 250Nm. input torque*

The torque convertor in a typical automatic transmission ( 250Nm. maximum input torque class) occupies over 6 litres of volume. Most automatics with more than 5 speeds also include a lock up clutch that occupies an additional 1 to 1.5 litres.

The volume of a DFTV CVT capable of handling over 400 Nm of input torque occupies less than 4 litres.

The DFTV-IVT requires 2 clutches a single planetary gear set and two fixed gears.

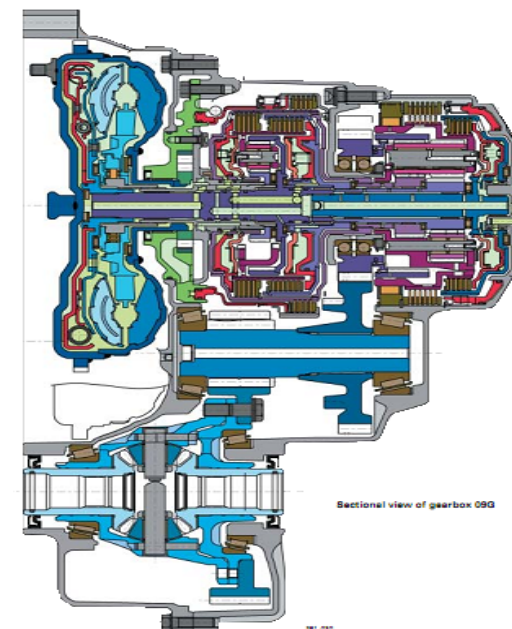
A 5 speed automatic typically requires 5 active clutches two one way clutches, three planetary gear sets plus a lockup clutch if efficiency is planned to comply with most regulations.

## Aisin Automatic Transmission Typical Front Wheel Drive

6 Speed AT 09G Specifications		
Developer Manufacturer	Aisin	
Factory Designation	TF 605 N	
Audi AG A0250-6F		
Gearbox type	6 speed electro-hydraulically controlled with hydrodynamic torque convertor and slip controlled lock up clutch	
Maximum transferrable torque	300Nm. +	
Range of ratios	First	4.148
	Second	2.370
	Third	1.556
	Fourth	1.155
	Fifth	0.859
	Sixth	0.686
	Reverse	3.394
Spread	6.05	
Ratio of auxiliary reduction gear step	1.061:1	
Final drive ratio	4.067 or 3.867	
ATF specifications	7.0 litres of G 052 025 A2	
Gross weight without flywheel	82 kg	
Overall length	350 mm.	
Volume	34 litres	

**This is an extremely compact transmission using the Lepelletier Gear set in place of the bulkier Ravigneaux Gear set**

If prorated back to 250Nm. this transmission will have a volume of 27 litres and a mass of 68kg.



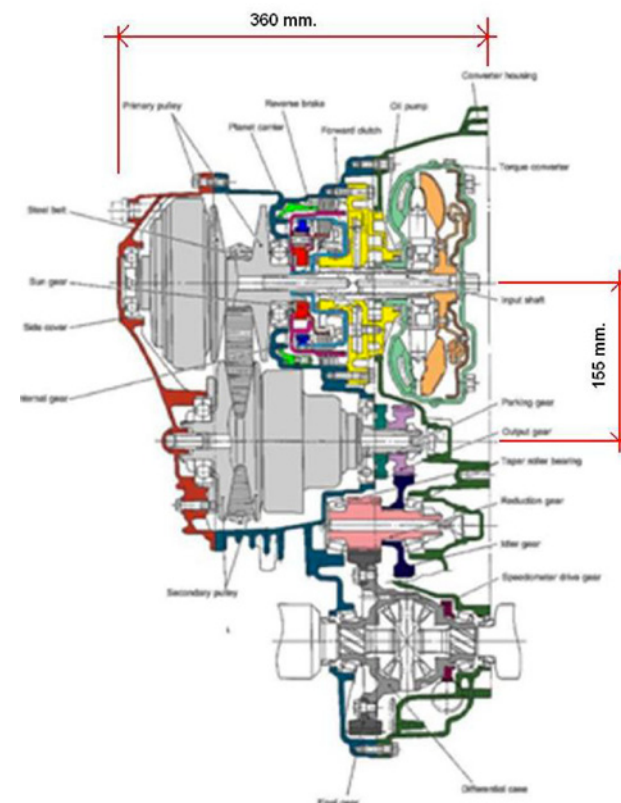
## Jatco Push Belt Cvt - Front Wheel Drive

This transmission has a torque capacity of 210Nm. using a torque convertor launching mechanism. It has a volume of 22 litres and a wet weight of 50kg.

For 250 Nm. the volume will be 26litres and a mass of 57kg.

The volume is composed of the following segments for a 250Nm. capacity transmission.

Component	Volume ltr.	Mass kg.
Torque convertor	6	11
Power hydraulics	2	4.5
Hydraulic control	1	2.5
Forward Reverse gear set and clutches	3	8
CVT pulleys belt and actuators	10	21
Final reduction and differential	4	10
<b>Total</b>	<b>26</b>	<b>57</b>



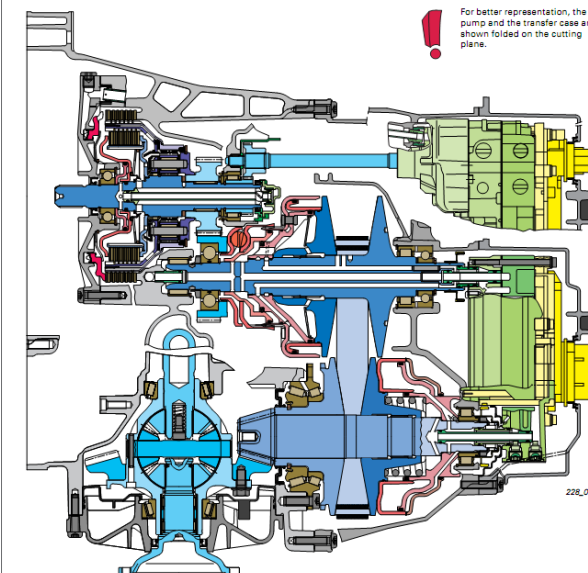
## Multitronic Pull-Chain Cvt By Audi

Some automatics use a wet friction clutch as the starting device. This reduces the mechanical volume by 2 – 3 litres but increases the complexity of the controls. It is used in combination with a Chain type variable pulley CVT by Audi called a Multitronic. The result in the case of the Audi “Multitronic” CVT has a mechanical volume of approximately 38 litres and a mass (wet) of 88kg.

This transmission has a maximum torque rating of 310Nm. Using a prorated calculation a 250Nm rated transmission would have a volume of 31 litres and a mass of 71 kg.

**Pull Chain CVT transmission used by Audi has the following characteristics.**

Multitronic Specifications	
Designation	01J
Factory Designation	VL30
Code	OZN
Maximum transferrable torque	310Nm.
Range of ratios	2.4 – 0.4
Spread	6
Ratio of auxiliary reduction gear step	1.109:1
Final drive ratio	4.778:1
Operating pressure of oil pump	50 bar
Delivery rate of oil pump	10litres/min 1,000 RPM
ATF for multitronic	7.5 litres of G 052 180 A2
Differentialoil	1.3 litres of G 052 180 A2
Gross weight without flywheel	88 kg
Overall length	610 mm.
Volume	38 litres



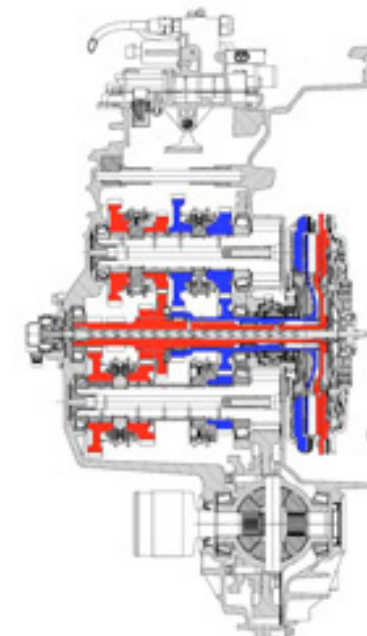
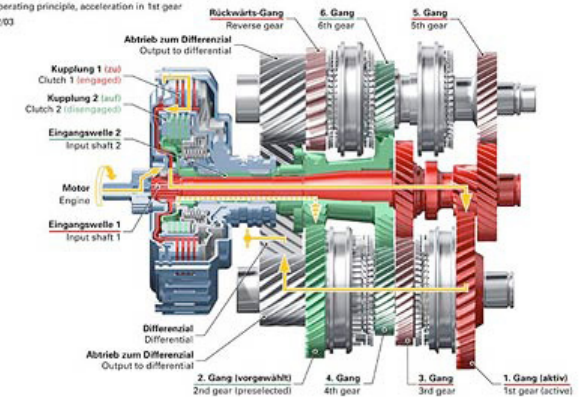


## Double Clutch Transmission With Wet (Audi) and Dry Clutch (Fiat)

Double clutch transmissions create very compact transmissions that rival the most compact automatic transmissions. Fiat has brought out a double clutch transmission that uses dry clutches while Audi use wet clutches.

### Audi TT 3.2 quattro

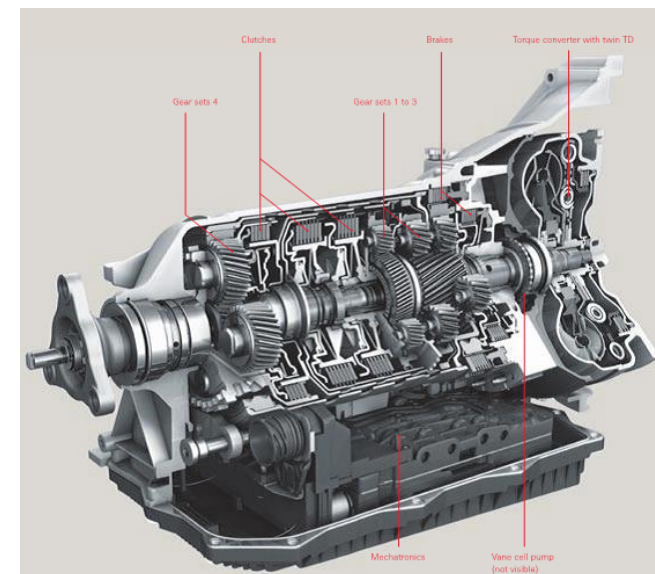
mit neuartigem Direktschaltgetriebe DSG  
Funktionsprinzip, Beschleunigung im 1. Gang  
with the new Direct Shift Gearbox DSG  
Operating principle, acceleration in 1st gear  
02/03



## Multi Speed Automatic Transmissions Using Lepelletier Gear Set

The most recent 8 speed ZF transmissions utilizes a new type of planetary gear set called a Lepelletier Gear Set. Earlier automatic transmissions (with 4 or more ratios) used a system called a Ravigneaux Gear set. The Lepelletier system allows more gear ratios to be created without greatly increasing the parts count or physical volume.

- a. This 8 speed transmission is designed for rear wheel drive, luxury, high power vehicles.  
This transmission is capable of dealing with 600Nm. of torque and ZF quotes its weight as being 90 kg dry.  
It does not include a differential, hydraulic pump or fluids. Ultimate Transmissions estimate its weight as 120kg with these included.  
If scaled back to 250Nm. Its weight would be 50 kg. and volume around 40 litres.



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## Double Roller Full Toroidal Full Toroidal Variator Infinitely Variable Transmission (DFTV – IVT)

A DFTV – IVT transmission with a capacity of 250Nm will have the following characteristics.

DFTV – IVT Specifications	
Developer	Ultimate Transmissions
Factory Designation	DFTV - IVT 250
Gearbox type	Infinitely Variable with geared neutral twin range.
Maximum transferrable torque	250Nm. +
Range of ratios	Low gear Synchronous 1.43 Top 0.36 Reverse 9.21
Spread	
Ratio of auxiliary reduction gear step	NA
Final drive ratio	2.6
ATF specifications	3.0 litres of Santotrak traction fluid
Gross weight without flywheel	37.5 kg
Overall length	344 mm.
Overall depth	188mm.
Volume	15 litres

