DCT Applications for Performance Cars

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1. Overview and Motivation for DCTs
2. Performance DCT 1.0
3. Performance DCT 2.0
4. Performance DCT 3.0
5. Summary
Overview and Motivation for DCTs
Why a DCT in a sporty vehicle?

DCT amplifies the sporty character
- Perfect match of ratios and overall spread
- Driving experience during gear change applicable in a broad range
- Drive feels directly linked to the crankshaft

Minimized parasitic losses by DCT
- Low difference speed in open clutches
- Clutch torque (in contrast to AT) limited to engine torque
- Actuation on demand systems available
Segmentation of Performance DCTs

Performance DCT 1.0
- Carry-over DCT for top end variants of a vehicle line
- New software feature for sporty application
- High volume base

Performance DCT 2.0
- All new DCT for performance cars
- Mass production technologies used for components and sub systems
  - Specification requires high performance features

Performance DCT 3.0
- All new DCT for high performance cars
- Layout and design of system and components focus on maximal performance
- Low volumes
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GETTRAG DCTs in Performance Cars

Performance DCT 1.0

Performance DCT 2.0

Performance DCT 3.0

Experience the DCT performance and emotion during your test drive.
Performance
DCT 1.0
6DCT250 in Renault Clio RS

- DCT based on high volume 6DCT250 layout for performance derivatives of a vehicle line
- Modified software functionalities to differentiate from base variant
- Minor mechanical changes to fulfill increased load requirements
- Electromechanical clutch and gear actuation remains unchanged
- Identical outer interfaces ease vehicle integration and handling in production plants

<table>
<thead>
<tr>
<th>Model</th>
<th>Power (kW)</th>
<th>Torque (Nm)</th>
<th>0-100 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renault Clio</td>
<td>88 (120)</td>
<td>190</td>
<td>9.4 sec</td>
</tr>
<tr>
<td>Renault Clio RS</td>
<td>162 (220)</td>
<td>280</td>
<td>6.6 sec</td>
</tr>
</tbody>
</table>
Key Data of 6DCT250

- Input torque: 280 Nm
- Max. engine speed: 6,500 rpm
- Overall ratio: 6,5

- Dry dual-clutch system electro-mechanically actuated
- Shift actuation by electric driven shift drums
- Most efficient actuation system
- Fastest sub-compact car and benchmark on Nürburgring Nordschleife (8:23 lap-time)
Features of 6DCT250 in Clio RS

- Driving modes: Normal, Sport, Race
- Launch control
- Reduced shift time in Sport & Race mode
- Different shift pattern in Sport mode including multi downshifts during braking (stepwise increase of engine speed)
- Multiple power downshifts (e.g. 6-2) possible
- Sportive feedback during shifts, e.g. clutch boost or tie-up strategy

Shifts ca. 110 ms faster in Sport mode
Performance
DCT 2.0
Performance DCT 2.0 – 7DCI700

7DCI700 in BMW M2

- Specifically developed for high performance variants of mass production vehicles
- Fully integrated hydraulic actuation system
- Consideration of vehicle constraints
  - Package
  - Cooling system
  - Electrical interfaces
- Proven series technology, but adapted to new requirements
Key Data of 7DCI700

- **Input torque:** 700 Nm
- **Max. engine speed:** 9,000 rpm
- **Overall ratio:** up to 7,2
- **Compact gear set with output constant drive**

- Concentric wet clutch system
- Mechatronic module for high performance transmission control
  - Hydraulic valve control plates
  - Hydraulic shift actuator
  - TCU with integrated sensor cluster
  - Direct controlled valves
Race start:
- Control of clutches and engine optimized for maximal acceleration
- Upshift from 1st to 2nd gear fully integrated in race start functionality
- Wheel spin at lowest possible level

Smokey burn-out:
- Speed threshold for burn-out increased
Performance
DCT 3.0
Performance DCT 3.0 – 7DCL750

7DCL750 in AMG GTR

• Specifically developed for low-volume high performance sport cars
• Separated hydraulic actuation systems for clutches and gear shift to improve performance and responsiveness
• Powertrain developed in parallel to vehicle platform reflecting specific requirements of DCT system
• Low volume requires and allows special features and technical solutions

AMG GTR
430 kW (585 PS) / 700 Nm
0-100 km/h in 3.6 sec
Key Data of 7DCL750

- Input torque: 790 Nm
- Max. engine speed: 9,500 rpm
- Overall ratio: up to 5,6
- Parallel wet clutch system
- Split hydraulic actuator for clutches and shift system for maximum performance transmission control
- Direct controlled valves
- Integrated, hydraulically controlled limited slip differential
- Stand-alone TCU
Split actuator improves system reaction significantly due to short hydraulic lines from valve to actuator

- Clutch control plate (CCP): Hydraulic control unit for clutch and e-Diff including
  - dual clutch module
  - sensors and wiring harness
  - high pressure pump and suction filter
- Shift actuation plate (SAP): Hydraulic control unit for shift actuator and park lock including
  - Sensors and wiring harness
Summary
GETRAG DCTs for Sports Cars

- DCTs are applicable to specific needs of sports cars
  - ratios and overall spread
  - shift behavior depending on different driving situations and OEM needs
- Depending on vehicle segments mass production DCTs with adapted software application or customized high-end DCT architectures are available
- According to performance targets clutch and shift actuation could vary from electro-mechanic to fully hydraulically controlled systems
- All DCTs benefits from system immanent advantages regarding low parasitic losses

The DCT is the perfect fit for a two-pedal transmission in a sports car
THANK YOU
FOR YOUR ATTENTION
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