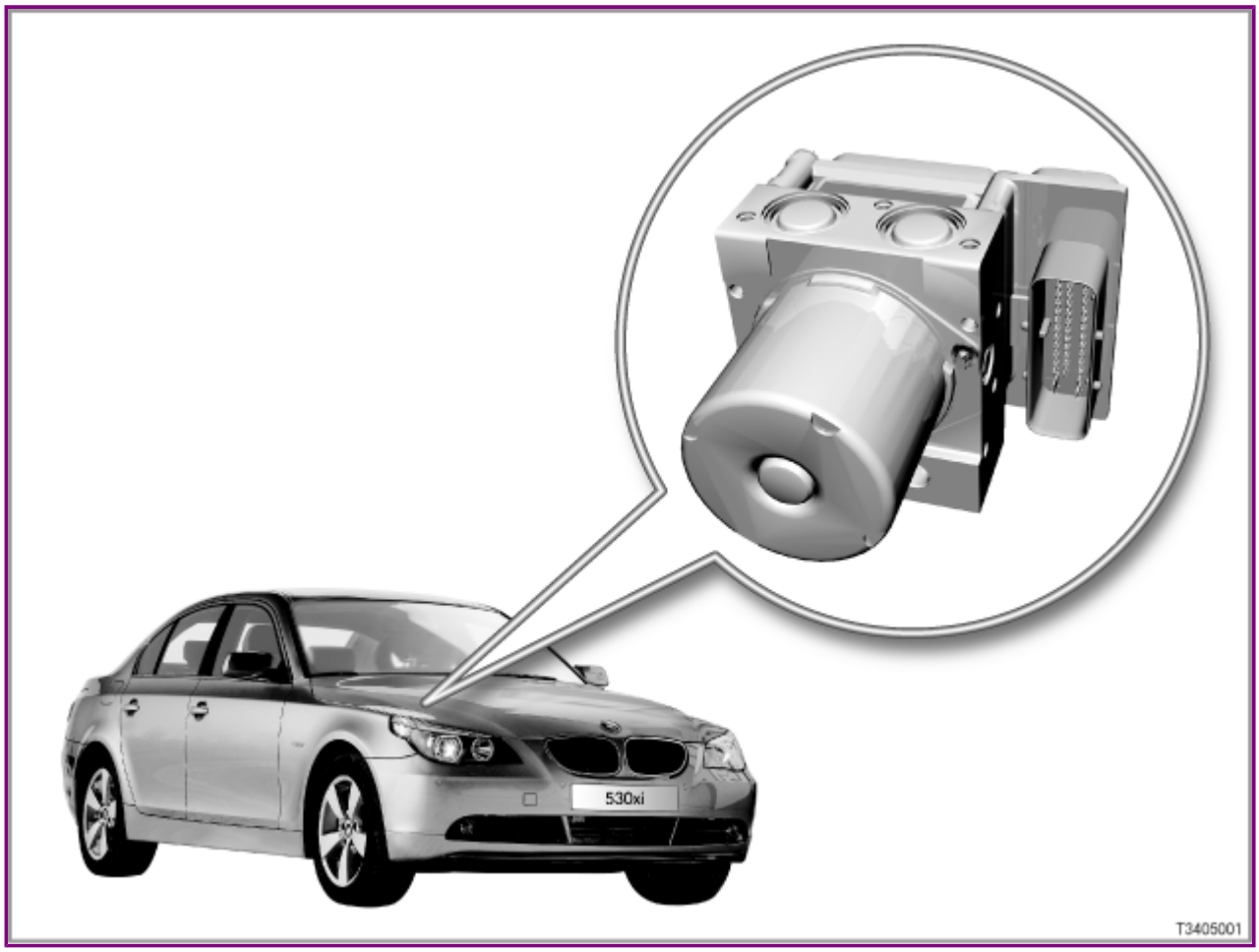
FTD-FTD-SBT2005-340105126 FTD-FTD-SBT2005-340105126 - Dynamic Stability Control 8Plus E60, E61, E63, E64, E83, E90, E91, E92 - V.1, VIN: [redacted]

ISTA system version	**4.05.31.20245**	Data version	**R4.05.31**	Programming data	**-**
VIN	[redacted]	Vehicle	**5'/E60/SEDAN/523i/N52/AUTO/ECE/LL/2007/05**		
Int.lev.works	**-**	Int.lev. (cur.)	**-**	Int.lev.(tar.)	**-**
Mileage	**0 km**				

34 01 05 (126)

Dynamic Stability Control 8Plus

E60, E61, E63, E64, E83, E90, E91, E92



Note: Vehicles with DSC 8Plus:

This SBT describes DSC 8Plus, which is installed on the following model series:

> E60, E61, E63, E64 (rear and all-wheel drive)

> E83

> E90, E91, E92 (all-wheel drive only)

Introduction

The **xDrive** all-wheel drive system was introduced on the BMW 5-Series in 03/2005. From this time on, these vehicles are equipped as standard with Dynamic Stability Control (DSC) 8Plus.
DSC 8Plus is an advanced development of DSC 8.

The DSC unit (comprising DSC control unit and hydraulic unit) is even more powerful.
The newly developed switchover valves allow a more precise regulation, especially at low brake pressure. DSC 8Plus is supplied by Bosch.

> E60, E61 from 03/2005 up to 09/2005 (all-wheel drive) [system overview ...]
> E60, E61, E63, E64 from 09/2005 (rear and all-wheel drive) [system overview ...]
> E83 from 09/2006 [system overview ...]
> E90, E91 from 09/2005 and E92 from 06/2006 (all-wheel drive) [system overview ...]
> Hydraulic circuit diagram with electrically actuated valves [system overview ...]

The principal new features of DSC 8Plus are:

- Additional functions:
  - Brake Standby through precautionary pre-tensioning of the brakes in an emergency
  - Brake disc drying on wet roads
  - Detection of fading and increase in brake pressure during fading
  - Start-off assistant
  - Soft stop when braking to standstill

Note: New soft stop function not available on BMW 3-Series all-wheel drive or E83.
For technical reasons, the soft stop function has not been incorporated on BMW 3-Series all-wheel drive or on E83 vehicles.

- 2 additional brake pressure sensors, only in combination with Active Cruise Control (ACC)

New from 09/2005:

> E60, E61, E63, E64

Introduction of DSC 8Plus on the BMW 5-Series and 6-Series **with rear-wheel drive**.
From this point time on, the body gateway module (KGM) is the gateway to the PT-CAN.

> E90, E91

Introduction of DSC 8Plus on the BMW 3-Series **with all-wheel drive**.
In these vehicles, the junction box electronics (JBE) is the gateway to the PT-CAN.

New from 06/2006:

> E92

Introduction of DSC 8Plus on BMW 3-Series Coupé **with all-wheel drive**.

New from 09/2006:

> E83

Introduction of DSC 8Plus on E83.

DSC is a control system that maintains dynamic stability within physical limits when the car is being driven close to the limits of performance and handling.
It also improves traction.

DSC needs the following input signals in order to discharge its control functions:

- Rate of yaw (measure of movement of the car about its vertical axis)
- Lateral acceleration

- Wheel speeds (measure of the car's roadspeed)
- Steering angle
- Brake pressure

The measured values available are used to calculate how the car is moving at any given instant. The actual condition is compared with nominal values (values in stable driving conditions) that are calculated in the DSC control unit. If the actual condition differs from the nominal values, DSC is activated and initiates brake actions and/or engine control functions.

The advantages:

The intervention of DSC in the engine control and brakes provides outstanding driving stability and traction in all driving situations.

DSC combats negative, dynamic driving forces. This means DSC brings about maximum active safety within the physical limits. DSC thus enhances driving comfort by allowing more relaxed driving.

Brief description of components

The following components are described for the Dynamic Stability Control (DSC):

- **DSC unit**

  The DSC unit consists of the components DSC control unit and hydraulic unit.

  The DSC control unit regulates the pressure in the brake system via the hydraulic unit (comprises valve block and pump motor).
  [more ...]

- **Brake light switch**

  The brake light switch tells the DSC when the brake pedal has been pressed.

- **4 wheel-speed sensors**

  The active wheel-speed sensors register the speed of an individual wheel at their circumference. Moreover, the wheel-speed sensors also recognise the direction of rotation (forwards or backwards).
  When a wheel is stationary, the wheel-speed sensor emits a pulse every 0.75 seconds.
  [more ...]

- **DSC sensor**

  The DSC sensor measures:

  - Vehicle rotation around the vertical axis (yaw rate)
  - Lateral acceleration of vehicle
  - Longitudinal acceleration of vehicle

  > E60, E61, E63, E64

  The DSC sensor is linked to the DSC control unit by the F-CAN (chassis CAN).

  The DSC sensor is secured to the floor assembly under the front-passenger seat.

  > E83

  The DSC sensor is connected to the DSC control unit via the PT-CAN (powertrain CAN).
  The DSC sensor is secured to the retainer plate for the parking brake lever.

> E90, E91, E92

The DSC sensor is linked to the DSC control unit by the F-CAN (chassis CAN).

The DSC sensor is located on the seat cross member under the driver's seat.

- **Steering-angle sensor**

  The steering-angle sensor registers the movements of the steering wheel.

  > E60, E61, E63, E64

  The steering-angle sensor is part of the steering column switch cluster (SZL).

  The steering column switch cluster is connected to the F-CAN (chassis CAN) and to the PT-CAN (powertrain CAN).

  > E90, E91, E92

  The steering-angle sensor is part of the steering column switch cluster (SZL).

  The steering column switch cluster is connected to the F-CAN (chassis CAN).

  > E83

  The steering-angle sensor is fitted to the steering spindle. The steering angle sensor is connected to the PT-CAN (powertrain CAN).

- **Internal brake pressure sensor**

  The DSC unit incorporates a brake-pressure sensor. This brake pressure sensor registers the braking pressure applied by the brake pedal and the brake booster.

- **2 brake pad wear sensors**

  The brake pad wear sensors (front left and rear right in the inner brake pads) provide additional information about the thickness of the brake pads. This additional information (2 reference points) is compared to the value calculated by the DSC.

  A critical brake lining thickness will be indicated in the instrument cluster by the ”Next Service” indicator (Condition Based Service, CBS) and by the general brake warning lamp lighting up red.

- **DTC button**

  The DTC button has the letters ”DTC”. The DTC button can be used to select 3 switch states:

  - DTC button not pressed after terminal change: DSC in operation (default)
  - DTC button briefly pressed: DTC in operation (DTC indicator light lights up in instrument cluster)
  - DTC button pressed and held: DSC and ASC deactivated, ABS and ABD-X on all wheel drive vehicles remain active (indicator lamp in instrument cluster lights up permanently)

  > E60, E61, E63, E64

  The DTC button is in the centre console switch cluster (SZM) The signal is transmitted on the K-CAN **and** via a separate wire. The signal on the separate wire is decisive.

> E83

The DTC button is in the centre console switch cluster (SZM) The signal is transmitted via a separate wire.

> E90, E91, E92

The DTC button is connected to the junction box electronics (JBE). The JBE transmits a bus signal.

- **Brake-fluid-level switch**

  Insufficient brake fluid is detected and a signal sent to the DSC control unit.

  If there is insufficient brake fluid, this will be indicated in the instrument cluster by the general brake warning lamp lighting up red.

The DSC control unit also communicates with the following control units:

- **DME or DDE: Digital engine electronics or digital diesel electronics**

  The DME or DDE, as applicable, controls engine adaptation (for example, reduction in engine output to prevent spin at the driven wheels). The DME or DDE also receives the converted wheel speed signal from the rear right wheel. This signal is used to check the plausibility of engine misfires (DME). The signal on the PT-CAN is redundant.

- **RLS: Rain-light sensor**

  The signal from the rain-light sensor is used to brake the brake discs dry on a wet road surface. In addition, it is important for a wiper stage to be switched on.

  > E60, E61, E63, E64

  The rain-light sensor supplies the signal on the CAN bus.

  > E83

  The rain-light sensor supplies the signal on the K-bus.

  > E90, E91, E92

  The rain-light sensor is connected to the roof control panel (FZD) via the LIN bus.

- **CAS and M-ASK/CCC: Car Access System and multi-audio system controller/Car Communication Computer**

  The CAS control unit and M-ASK/CCC receive the converted wheel speed signal from the rear left wheel.

  Both these control units use this signal to ascertain whether the car is moving or at a standstill.

- **SGM: Safety and gateway module**

  > E60, E61, E63, E64 up to 09/2005

  The SGM is the data interface (= gateway) between:

  - PT-CAN
  - K-CAN
  - **Byteflight**
  - Diagnosis wire to diagnosis socket

- **KGM: Body gateway module**

  > E60, E61, E63, E64 from 09/2005

The vehicle electrical system was changed from 09/2005. As a result of the change, several control units were discontinued and some control unit functions were integrated into new control units.
The new body gateway module supersedes the safety and gateway module (SGM) previously fitted.

The KGM is the data interface (= gateway) between:

- PT-CAN
- K-CAN
- Diagnosis wire to diagnosis socket

- **JBE: Junction box electronics**

  > E90, E91 from 09/2005 and
  > E92 from 06/2006

  The JBE is the data interface (= gateway) between:

  - PT-CAN
  - K-CAN
  - Diagnosis wire to diagnosis socket

  Signals from the chassis CAN (F-CAN) are simply looped through.

- **ACC: Active Cruise Control**

  DSC receives requests from Active Cruise Control (ACC) via the PT-CAN. In response, DSC reduces speed by applying the brakes at all four wheels.

  > E60, E61, E63, E64

  [for further information, please refer to SI Technology (SBT) 66 01 04 067]

  > E90, E91 from 09/2005 and
  E92 from 06/2006

  The request for brake application is given by the LDM control unit (LDM: longitudinal dynamics management).

  [for further information, please refer to SI Technology (SBT) 66 03 04 086]

- **LM: Light module**

  > E60, E61, E63, E64

  As required by law, the brake lights are activated in the event of automatic braking when the Electronically Controlled Deceleration function (ECD) is triggered by the ACC.

  To do this, a signal must be sent from the DSC to the light module (LM) via the K-CAN.

- **FRM: Footwell module**

  > E90, E91, E92

  As required by law, the brake lights are activated in the event of automatic braking when the Electronically Controlled Deceleration function (ECD) is triggered by the ACC.

  To do this, a signal must be sent from the DSC to the footwell module via the PT-CAN.

- **KOMBI: Instrument cluster**

  The DSC control unit actuates the indicator and warning lights for the individual DSC functions via the instrument cluster (signal via CAN bus).

> E83

The instrument cluster is the data interface (= gateway) between:

- PT-CAN
- K-bus

- **EGS: Electronic gearbox control (vehicles with automatic transmission)**

  The transmission control (EGS) receives the wheel-speed signals via the PT-CAN.

  The gearbox controller responds by adapting the gearshift characteristics for cornering and ascents. In addition, the gearshift characteristics are adapted to winter conditions (high wheel slip).

  Moreover, gearshifts are suppressed during DSC control.

- **CID and CON: Central Information Display and controller**

  The detailed texts for the Check-Control messages are shown in the Central Information Display (CID).

  CID and controller are also used to initialise the Run Flat Indicator (RPA).

  With xDrive an additional function can be activated to reduce speed when driving downhill: Hill descent control (HDC)

- **TCU or ULF: Telephone control unit with GPS antenna**

  If the car is **not fitted with a navigation system**, the telephone control unit receives the converted wheel speed signals from the front left and right wheels.

  The telephone control unit uses these signals to pinpoint the car's position by dead reckoning.

- **GM: General module**

  > E83

  The general module supplies input signals with respect to terminal control.

System functions

The dynamic stability control system (DSC) controls longitudinal and transverse dynamics by means of engine and brake system intervention.

DSC 8Plus includes the following **new** functions.

- Brake Standby through pre-tensioning of the brakes in an emergency
- Brake disc drying on wet roads
- Fading compensation
- Soft stop when braking to standstill (not on BMW 3-Series all-wheel drive or E83)
- Start-off assistant

DSC 8Plus includes the following **familiar** functions.

- ABS: Anti-lock braking system
- EBV: Electronic brake force distribution
- CBC: Cornering brake control
- DTC: Dynamic traction control

- ASC: Automatic stability control
- MSR: Engine drag torque control
- DBC: Dynamic brake control
- Trailer stabilisation control
- HDC: Hill descent control
- ECD: Electronically controlled deceleration (only in conjunction with ACC)
- All-wheel control
- RPA: Run Flat Indicator
- CBS: Condition Based Service

New functions for DSC:

Brake Standby through pre-tensioning of the brakes in an emergency

Pre-tensioning the brakes shortens the brakes' response time.

If the accelerator pedal is rapidly released (accelerator pedal angle), the brakes are immediately pretensioned.

DSC generates a low brake pressure without a measurable deceleration taking place.

The clearance between the brake pads and brake discs is eliminated. If the brakes are not applied within half a second, the brake pressure that was generated early is reduced again. The pre-tensioning of the brakes depends is active at speeds greater than 70 km/h.

Brake disc drying on wet roads

Braking dry removes moisture that gathers on the brake discs during journeys on wet roads or in rain.

The brake pads are lightly applied. This function also shortens the brakes' response time.

Depending on the signal from the rain sensor and the position of the wiper switch, DSC cyclically generates a low brake pressure. This creates no measurable deceleration on the vehicle. The brake pads are cyclically applied. This means that the brake disc are regularly wiped down. How often and how long the brake pads are applied depends on:

- The intensity of the rain, e.g. the speed of the windscreen wiper
- Road speed greater than 70 km/h

Fading compensation

Fading means: braking effect deteriorates as a result of high brake-disc temperatures.

If fading is detected, DSC reacts by increasing the brake pressure above that specified by the driver.

At very high brake-disc temperatures, fading compensation is indicated by the following:

- General brake warning lamp lighting up yellow
- Check-Control symbol in LCD display in instrument cluster lighting up yellow (not E83)

DSC detects fading as follows: DSC compares the current vehicle deceleration with a nominal value based on the current brake pressure.

DSC increases brake pressure until the nominal deceleration is achieved or until all wheels are subject to ABS control. The process is ended when the brake pedal is no longer depressed or when the speed drops below a certain threshold.

Soft stop when braking to standstill (not on BMW 3-Series all-wheel drive or E83)

Soft stop prevents the vehicle from jolting to a stop (e.g. with an inexperienced driver).

When the vehicle is braked to a standstill, there is no uncomfortable jerk (causing the occupants to ”lurch” forward). DSC calculates the moment that standstill can be expected from the current road speed and deceleration.

Just before standstill is achieved, the brake pressure on the rear axle is reduced so that the vehicle stops with practically no jerking.

Soft stop is only active for light braking, so that the shortest possible stopping distance can still be achieved in emergency braking situations.

Start-off assistant

When pulling away on a slope, it is necessary to move your foot from the brake pedal to the accelerator pedal. The start-off assistant prevents the vehicle from rolling downhill in the following situations:

- uphill in forward gear
- uphill in reverse gear

It does this by maintaining the brake pressure needed to hold the vehicle. The gradient is recorded by the longitudinal-acceleration sensor in the DSC control unit.

The braking torque and engine torque needed is calculated from the gradient. When pulling away is detected, brake pressure is reduced as soon as the available engine torque is sufficient to move the vehicle in the direction required. The start-off assistant is deactivated when the parking brake is applied. If no move is made to pull away within 2 seconds of the brake pedal being released, the start-off assistant will be deactivated.

Familiar functions for DSC:

DSC: Dynamic Stability Control

Dynamic Stability Control (DSC) detects the current status of the vehicle by evaluating the sensor signals.

This status is compared with the nominal values derived from a computational model.

In this way, the system recognises incipient instabilities.

The vehicle is stabilised as soon as a deviation overshoots the control threshold stored in the DSC control unit. Stabilisation (within the limits imposed by the laws of physics) is achieved by reducing engine power and by braking individual wheels.

DSC actions are superimposed on the ABS and ASC functions.

The DSC function can be deactivated by means of the DTC button.

ABS: Anti-lock braking system

The anti-lock braking system (ABS) stops the wheels locking during braking.

Advantage: Shorter stopping distances, the car retains its directional stability and remains steerable.

Brake pressure is regulated at all wheels to ensure that each wheel runs in the best possible slip range.

When this happens, slip is controlled so that the maximum possible braking and lateral stability forces can be transmitted.

ABS alone is available for braking if a sensor for DSC fails or if a bus fault occurs (PT-CAN and chassis CAN). ABS is the surviving safety function in circumstances in which DSC control is no longer possible.

EBV: Electronic brake force distribution

Electronic brake force distribution (EBV) is a component of the ABS. EBV regulates the brake force

distribution between the front and rear axles, depending on vehicle load.

Advantage: Regardless of the load state of the vehicle, the best possible braking distance is achieved while driving stability is maintained. The brake pads wear more evenly.

If the ABS fails, the EBV function is sustained for as long as possible.

The signals from at least two wheel-speed sensors are needed for the EBV function.

CBC: Cornering brake control

Cornering brake control (CBC) is an extension of ABS. CBC increases driving stability when the brakes are applied as the car corners (”cornering logic”).

Advantage: Optimum driving stability if brakes are partially applied when cornering.

The shift in wheel loads as the car corners (the onset of this phenomenon requires no more than light application of the brakes) can result in a reduction in handling stability. If required, CBC generates a stabilising load moment when the brakes are applied lightly outside the ABS intervention range.

DTC: Dynamic traction control

DTC is a version of DSC that has been optimised for forward momentum in certain road conditions.

Dynamic traction control (DTC) offers better traction as a trade-off against a reduction in stability in some circumstances. Consequently, its use should be reserved for exceptional conditions. It is advisable to briefly activate DTC in the following exceptional circumstances:

- To rock the vehicle free or pull away in deep snow or on a loose surface.
- When driving on snowy uphill stretches, in slush and on roads that have not been cleared
- When driving with snow chains.

The DTC function approximates to that of DSC with a slightly modified control strategy.

DTC can be activated by deactivating DSC (DTC button). DTC intervenes in the braking actions to imitate the function of a conventional differential lock. This effect of this is to increase the input torque on those wheels that are on a higher-friction surface.

Advantage: Higher traction is available with DTC.

Vehicle stabilisation intervention (e.g. reduced power output) is made slightly later than with DSC. In certain situation, the driver has to intervene more intensively himself to stabilise the vehicle.

ASC: Automatic stability control

Automatic stability control (ASC) prevents the wheels spinning during acceleration by intervention in brake and engine operations.

Advantage: More traction and better driving stability.

If the wheels on the driven axle have a different level of grip, the wheel that tends to spin is braked. If necessary, the engine's power output is also reduced.

MSR: Engine drag torque control

The engine drag torque control (MSR) counteracts the tendency of the wheels to lock on smooth surfaces. The engine's drag torque generated by downshifts or abrupt load changes can lock the driven wheels (especially on surfaces with a low coefficient of friction).

The wheel-speed sensors tell MSR as soon as the wheels are about to lock. MSR then briefly reduces the engine's drag torque by opening the throttle slightly.

Advantage: The drive wheels retain their lateral stability in overrun mode.

DBC: Dynamic brake control

Dynamic brake control (DBC) assists in emergency braking situations by automatically increasing the brake pressure.

Advantage: Shortest possible braking distances in emergency braking situations by achieving ABS regulation on all four wheels.

The brake pedal is frequently not depressed strongly enough in emergency braking situations. ABS regulation is then not activated.

In the following situations, the return pump increases the brake pressure until ABS regulation is activated:

- When the brake pedal is rapidly depressed with insufficient pedal force
- When the brake pedal is depressed slowly and the demand for deceleration is subsequently high, after one wheel reaches the ABS control threshold.

  Which wheel locks first depends on load and coefficient of friction of the road surface.

  Example of a typical situation:

  The traffic slows, making light braking necessary at first, but then demands as short a stopping distance as possible.

Trailer stabilisation control

Trailer stabilising control detects when a trailer is rocking about its vertical axis. The system functions at a speed of about 65 km/h when the trailer socket is in use.

With the aid of the DSC sensors, Dynamic Stability Control (DSC) monitors the vehicle's yaw behaviour.

If the trailer's rocking motion exceeds the limit, the engine output is reduced. In addition, DSC brakes all four wheels automatically.

If DSC is deactivated or faulty, then the trailer stabilising control does not work either.

HDC: Hill Descent Control

Hill descent control (HDC) is an automatic cruise control system on **all-wheel-drive vehicles** for driving downhill.

HDC automatically reduces the vehicle's speed. The brakes are applied on all four wheels to reduce road speed to just above walking pace. This allows stable downhill driving on steep and slippery surfaces.

HDC holds this speed constant (all DSC functions remain active).

The vehicle's road speed can be continuously varied within the specified values by depressing the accelerator pedal and brake pedal or the cruise-control system steering-column stalk.

> E60, E61

HDC can be switched on and off at the Central Information Display (CID): ”Settings” menu and ”Vehicle settings” submenu.

At the factory, HDC is assigned to the lower freely programmable button on the multi-function steering wheel.

> E83 and E90, E91, E92

HDC can be activated and deactivated via a separate button in the SZM (centre console switch cluster).

Electronically controlled deceleration

The electronically controlled deceleration (ECD) reacts to a demand from Active Cruise Control (ACC).

When the ACC system requires deceleration, DSC responds by applying the disc brakes on all four wheels (maximum rate of retardation 2.5 m/s^2).

When the car is on a decent with the speed preset by the driver, ECD automatically applies the brakes in order to keep the car's speed constant at the preset value.

When the brakes are applied automatically in this way, the bake lights are activated in accordance with the requirements of road-safety legislation.

The light module does not activate the brake lights unless the vehicle's rate of deceleration is greater than 1m/s^2. This prevents the brake lights from flickering on and off.

All-wheel control

Dynamic Stability Control (DSC) specifies the nominal value for xDrive all-wheel control. The DSC control unit calculates the locking moment for the multi-plate clutch in the transfer box.

The nominal value depends on the vehicle's tendency to oversteer or understeer and wheelslip. The nominal value is sent via the PT-CAN to the VTG control unit.

The VTG control unit reports the actual set locking moment back to the DSC control unit.

The DSC control unit calculates the locking torque for the multi-plate clutch as follows:

- Pre-activation = driver's command
- Driving dynamic control
- Detection of different tyre rolling circumferences

[for further information, please refer to SI Technology (SBT) 27 01 05 128]

RPA: Run Flat Indicator

The Run Flat Indicator (RPA) is not a dynamic driving control function.

RPA is integrated into the DSC control unit as 4 wheel-speed signals are needed for this function.

By comparing the speed signals for all four wheels, the system detects differences in rolling circumference at the individual wheels. This enables a gradual drop in pressure to be detected.

[for further information, please refer to SI Technology (SBT) 36 01 04 078]

CBS: Condition Based Service

CBS is not a driving dynamic function.

Condition Based Service, as the name suggests, is a means of ensuring that the car is serviced as and when necessary. CBS comprises various maintenance operations, e.g. engine oil, spark plugs and brake pads.

The remaining distance for the front and back brake pads are calculated separately in the DSC control unit.

When making the calculation, the condition of the brake pad wear sensors is taken into account (reference point at 6 mm and 4 mm).

[for further information, please refer to SI Technology (SBT) 00 01 04 070]

Operation

> E60, E61, E63, E64 and E83
The DTC button is located in the centre console switch cluster (SZM).

> E90, E91, E92
The DTC button is located between the central air vents in the instrument panel.

The DTC button has 2 functions that can be set by pressing the button for different lengths of time.

Press button	Function	Remarks
short	DTC function activated.	DTC indicator light on.

< 3 seconds		DSC indicator and warning light on.
long > 3 seconds	DSC is completely deactivated	DSC indicator and warning light on. This mode is intended for service work (e.g. brake dynamometer).

Note: Reactivating DSC

Briefly pressing the button again reactivates the DSC function. The DSC indicator and warning light goes out (unless a fault has developed in the system).

If the DTC button is pressed for longer than 10 seconds (e.g. by a handbag on the centre console), DSC will recognise an operating error. The DSC function remains active and cannot be deactivated until the ignition has been switched off and on again.

Preconditions for activation

DSC is in ready mode after each engine start.

Notes for service staff

The following information is available for service staff:

- General information: [more ...]
- Diagnosis: [more ...]
- Encoding/programming: [more ...]

Subject to change.