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# M Complete Vehicles

**Model: All Current M models**

**Production: From Start of Production**

# OBJECTIVES

After completion of this module you will be able to:

- Familiarize yourself with the M5, M6 and M3 vehicles
- Understand the operation of the active backrest width adjustment system

## E60 M5

The BMW M5 was launched in October 2005 in the US market. It is currently the most powerful M5 of all time and the first to exhibit this power potential at first glance.

The basic M concept, however, remains unchanged. The E60 M5 combines the qualities of a luxury class sedan with the power potential of a sports car. However, its visual appearance is intentionally somewhat less discreet as its predecessor. The front and rear aprons are now slightly more prominent and, together with the rear spoiler, 4-pipe exhaust system and 19" wheels, and the M5 characteristic side gills unmistakably identify the M5 at first glance, even from the side.

The highlight of the M5 is the V10 engine derived from BMW-Williams Formula 1. With the governed limit at 8,250 rpm, it not only provides Formula 1 performance but also develops that typical Formula 1 sound.

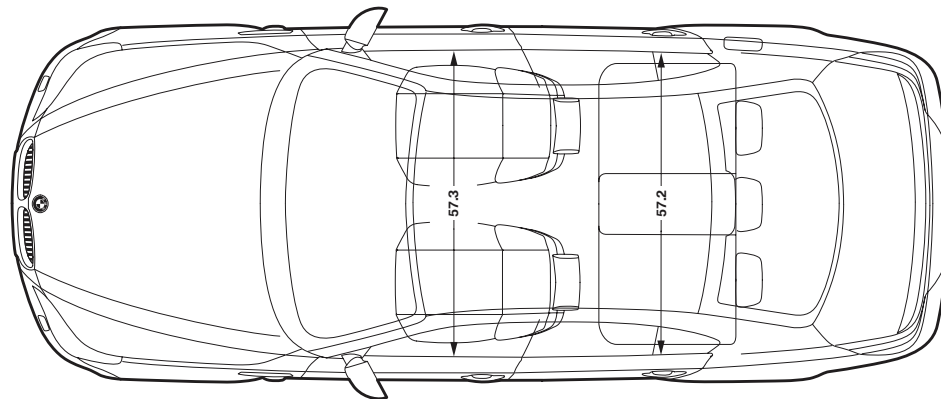
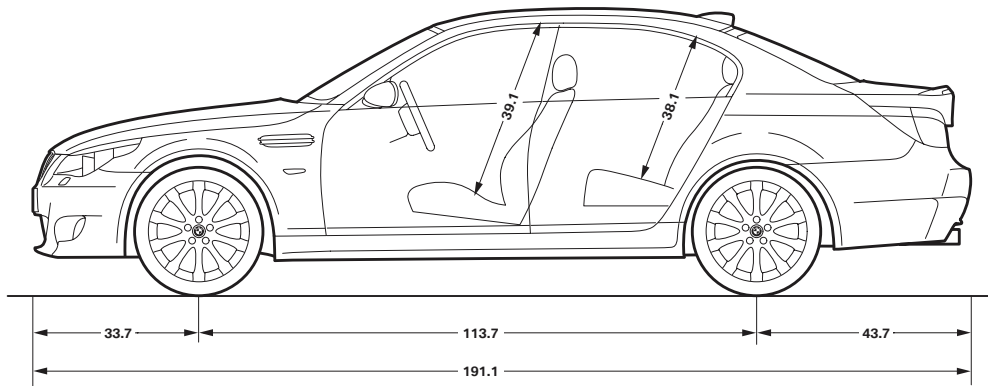
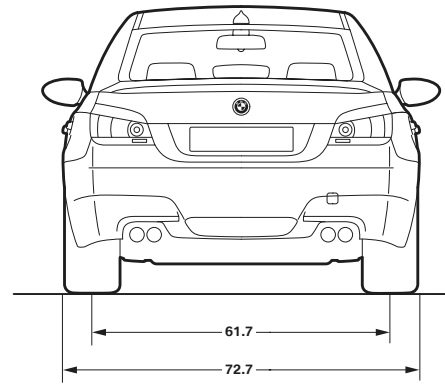
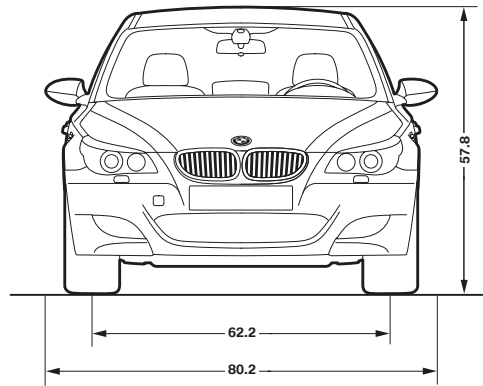
Despite these features, the M5 still remains an understatement-product. Its exterior conveys a powerful yet still reserved appearance. At no point has its everyday suitability gained from the E60 series been lost.



## Technical Data

	<b>BMW M5 (E60)</b>	<b>BMW M5 (E39)</b>
Length (in / mm)	191.1 / 4,854	188.3 / 4,783
Width (in / mm)	72.7 / 1,846	70.9 / 1,800
Height (in / mm)	57.8 / 1,469	56.6 / 1,437
Wheelbase (in / mm)	113.7 / 2889	111.4 / 2,830
Track, front (in / mm)	62.2 / 1,580	59.6 / 1,515
Track, rear (in / mm)	61.7 / 1,566	60.1 / 1,527
Unladen weight (lbs / kg)	4,012 / 1,820	3,946 / 1,790
Weight distribution (front / rear %)	52.2 / 47.8	52.1 / 47.9
Luggage compartment capacity (cu. ft / l)	17.7 / 500	16.2 / 460
Engine / Valves per cylinder	V10 / 4	V8 / 4
Compression ratio	12 : 1	11 : 1
Displacement (ccm)	4999	4941
Engine output (bhp)	500 @7,750 rpm	394 @6,600rpm
Maximum torque (lb-ft / Nm)	383 / 520 @6,100 rpm	368 / 500 @3,800rpm
Governed engine speed (rpm)	8,250	7,000
Max speed (mph)	155 (governed)	155 (governed)
0 - 60 mph	4.5 seconds	4.8 seconds
Fuel tank capacity (gal / l)	18.5 / 70	18.5 / 70
Transmission	7-speed SMG gearbox	6-speed Manual gearbox
Wheels and tires	Front: 255/40 Z R 19 on 8.5 J x 19  Rear: 285/35 Z R19 on 9.5 J x 19	Front: 245/40 Z R18 on 8J x 18  Rear: 275/35 R18 on 9.5 J x 18

# Vehicle Data Views



M Complete Vehicles

## Body

The E60 M5 combines the qualities of a luxury class sedan with the power potential of a sports car. Its visual appearance is intentionally somewhat less discreet as its predecessor.

Features that make the E60 M5 stand out when compared to the 5 Series sedan are:

- A rear spoiler has been added
- Rear diffuser
- The signature twin dual pipe exhaust system
- Front and rear bumpers are now slightly more prominent
- 19" wheels
- M5-characteristic side gills



Despite these features, the M5 still remains an understatement-product. Its exterior conveys a powerful yet still reserved appearance.

The body structure of the M5 is taken from the production 5 Series vehicle. It utilizes GRAV technology (the entire front end of the vehicle is made of aluminum, not steel).





## Exterior Design

The exterior design of the M5 has a number of spectacular original features in comparison to the production version.

Air inlets in the bumpers instead of fog lights.

Lowered apron has an integrated front spoiler.



In conjunction with sealing the engine compartment, the front bumper reduces lift on the M5's front axle by 50% in comparison to the standard car.

The front spoiler, the diffuser, the rear spoiler lip and the special underside paneling provide the required down force in the M5.

The highly visible and stylish grills in the side panel at the front are more than mere decoration and serve to create a through-flow of air.



A special M-design door mirror.



The sills also emphasize the sporty line as they wrap around and tie in with the front and rear bumpers.



Special, extra-wide 285/35 ZR 19" tires on specifically styled 9-1/2 inch rims at the rear and 255/40 ZR 19" tires on 8-1/2 inch rims on the front axle also adds to the sporty look.

The rear bumper of the vehicle does not only make the vehicle appear more sporty but includes an air diffuser to better improve the aerodynamics.

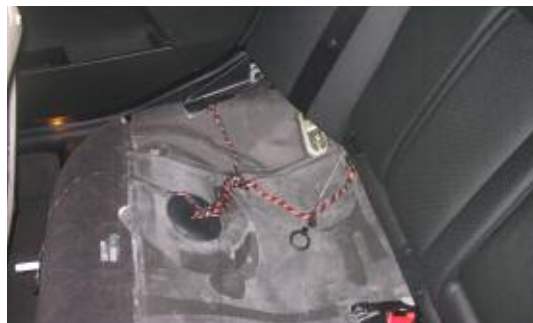


The M5 continues with the signature M dual twin exhaust pipes started with the M Roaster.

When compared with the production 5 Series, the front and rear bumper and side skirt have been changed.

The rear deck lid comes with a spoiler.

The rear deck lid no longer has a cylinder lock for trunk opening with a key. In case of an electrical failure, there is a mechanical release under the rear seat. It is an eyelet/loop with a Bowden cable that connects to the trunk actuator mechanism.



**Mechanical Release for Trunk**

## Interior Design

The cockpit of the new BMW M5 is tailored to the requirements of the M driver, who looks for sports car performance and precision ergonomics. The redesigned instruments in the dashboard combined with the SMG gearshift paddles on the Multi-function steering wheel and the presence of the MDrive button serve to create the unique M ambience.

### Distinctive M Instrument Cluster.

The instrument cluster has been especially designed for the BMW M5. Chrome rings surround the two circular displays for the speedometer and rev counter. The scales are white and permanently illuminated, while the indicator needles glow in traditional M red.



This conveys a unique, almost race-car like ambience. Arranged between the two circular gauges are the displays for SMG mode, current gear and engine oil level.

## Center Console

### ■ Illuminated Selector Lever

The gearshift pattern on the SMG selector lever handle is permanently illuminated, and the current gear is highlighted.

Located next to the selector lever are the buttons for the dynamic system settings: DME, DSC, EDC, and SMG Drivelogic.

### ■ Automatic Air Conditioning

The IHKA system is installed in the M5 as standard equipment.

Same as the production based 5 Series, minor adjustments can be made utilizing the iDrive menu for climate control.

### ■ Central Information Display with Navigation

Navigation is standard equipment on the M5 which includes the Top Hi-Fi (Logic7 ) audio system and the acclaimed iDrive system.



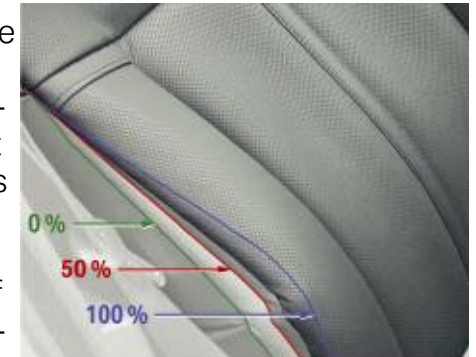
## Front Seats

The standard M Sports seats provide excellent levels of lateral support to the driver and front passenger. This includes individual backrest width adjustment for optimum fit, and adjustable thigh support, seat heating with three settings as well as an adjustable lumbar support. Up to three personal settings can also be stored in Memory and accessed when required.

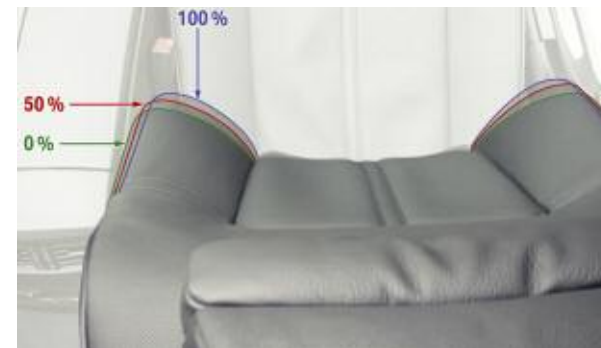
### ■ M Multi-Function Seat (Optional)

Backrest width adjustment system serves the purpose of optimally adapting the side sections of the backrest to the individual upper body of the occupants with the aim of achieving improved support of the upper body when cornering.

BMW M GmbH has developed the active backrest width adjustment in M-vehicles for performance-oriented drivers. The active backrest width adjustment (ALBV) changes the setting of the side sections of the backrest dynamically when cornering. The dynamic setting of the backrest is dependent on various parameters.



Side View of Adjustment Range



Top View of Backrest Adjustment Ranges



Forces acting towards the outer edge of a bend result in centrifugal forces exerted on the upper body of the driver when driving through corners dynamically. The upper body is then displaced towards the outer edge of the bend.

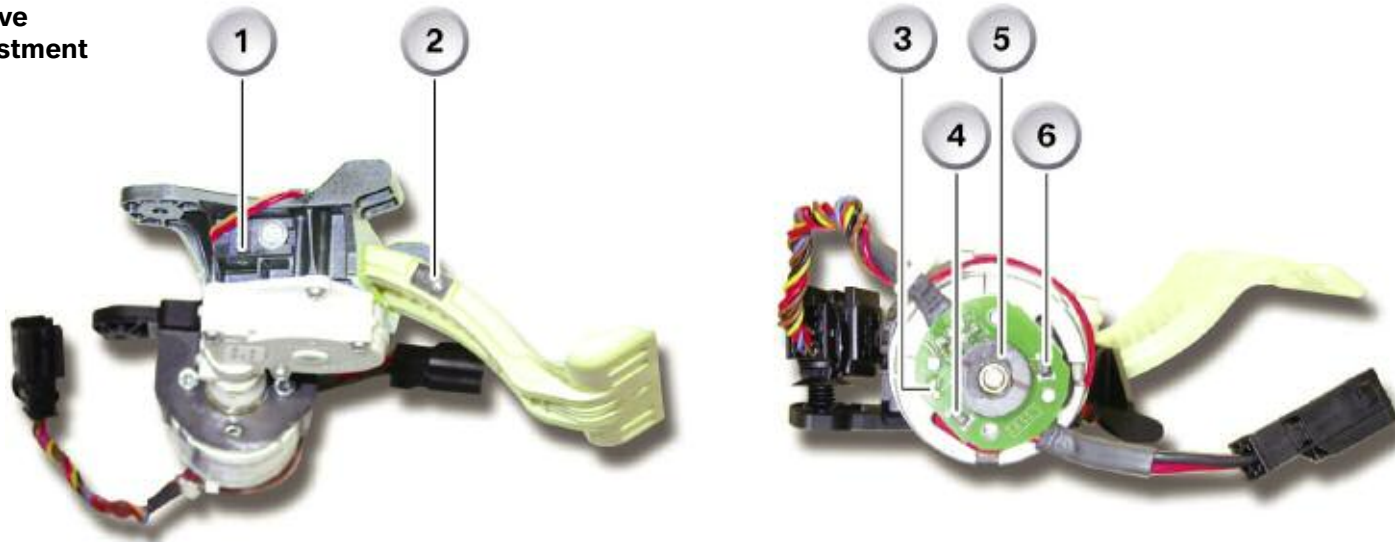
The active backrest width adjustment system activates the respective side section of the backrest to counteract the forces and to keep the upper body stable in the seat. The driver can concentrate fully on steering the vehicle.

### ■ System Components

#### Drive Unit

The drive unit consists of a DC motor with a step-down gear mechanism flanged to it. The gear mechanism engages in the adjustment assembly on which the side sections of the backrest

#### Actuators of the Active Backrest Width Adjustment with Sensors



Index	Explanation	Index	Explanation
1	End Position Sensor	4	Hall Sensor 1
2	Contact for End Position Sensor	5	Magnetic Ring
3	Temperature Sensor Connection	6	Hall Sensor 2

are mounted. The side sections of the backrest are adjusted from maximum open (0%) to maximum closed (100%) by the adjustment assembly.

An electric motor is driven by a PWM signal (pulse-width modulation) for this purpose. The adjustment speed can be influenced corresponding to the pulse width. At maximum closing speed, the side section of the backrest is adjusted from completely open (0%) to completely closed (100%) within approx. 1 second.

The drive units are controlled with following pulse width corresponding to the characteristic curve.

The drive unit uses various sensors to operate. The end position sensor (a two-wire Hall sensor) recognizes the fully opened backrest width (0%).

Two Hall sensors (offset by 120 degrees) are additionally installed for determining the direction of rotation and position. The signals of the Hall sensors are counted up or down, enabling the ALBV control unit to determine the direction of rotation and position. The Hall sensors are monitored by the ALBV control unit and sampled every 200 ms.

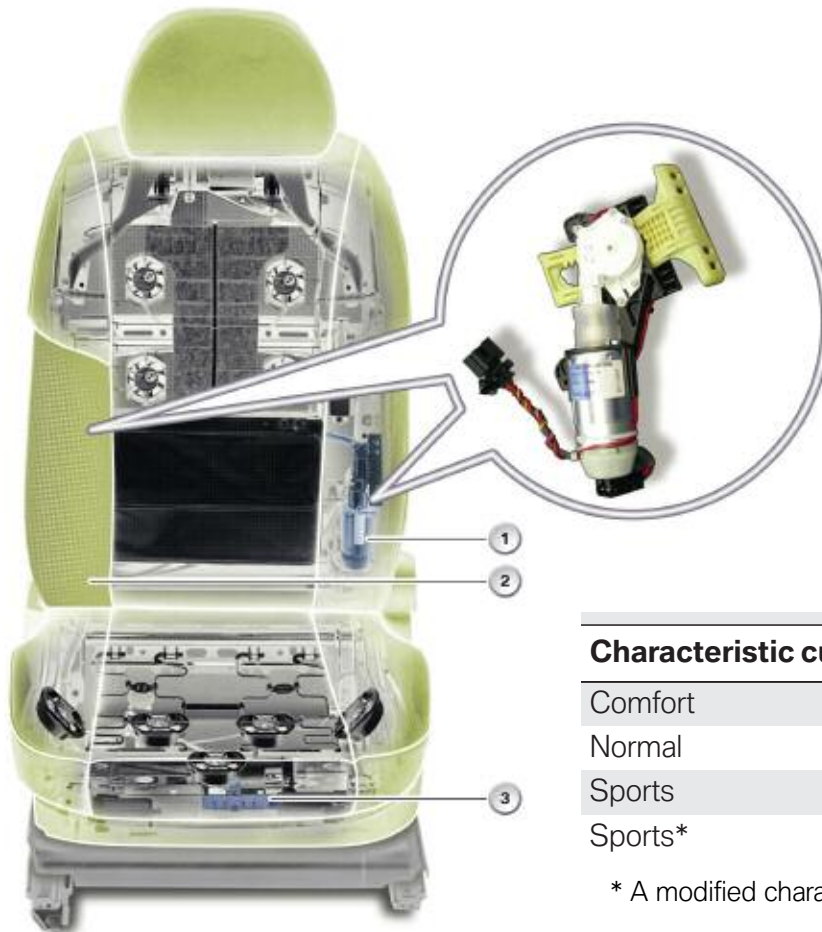
A temperature sensor is installed in the drive unit. At excessively high temperatures, the drive unit is no longer activated until the temperature has dropped below a permissible value.

The active backrest width adjustment system consists of the following control units:

- Active backrest width adjustment, driver (ALBV FA)
- Active backrest width adjustment, front passenger (ALBV BF)

Both control units are located in the respective driver's or front passenger's seat. The control units feature a PT-CAN bus link. This connection to the PT-CAN is necessary in view of the high number of parameters relating to the vehicle dynamics from the DSC and DME control unit and the short response time of the system.

### Comfort Seat with Active Backrest

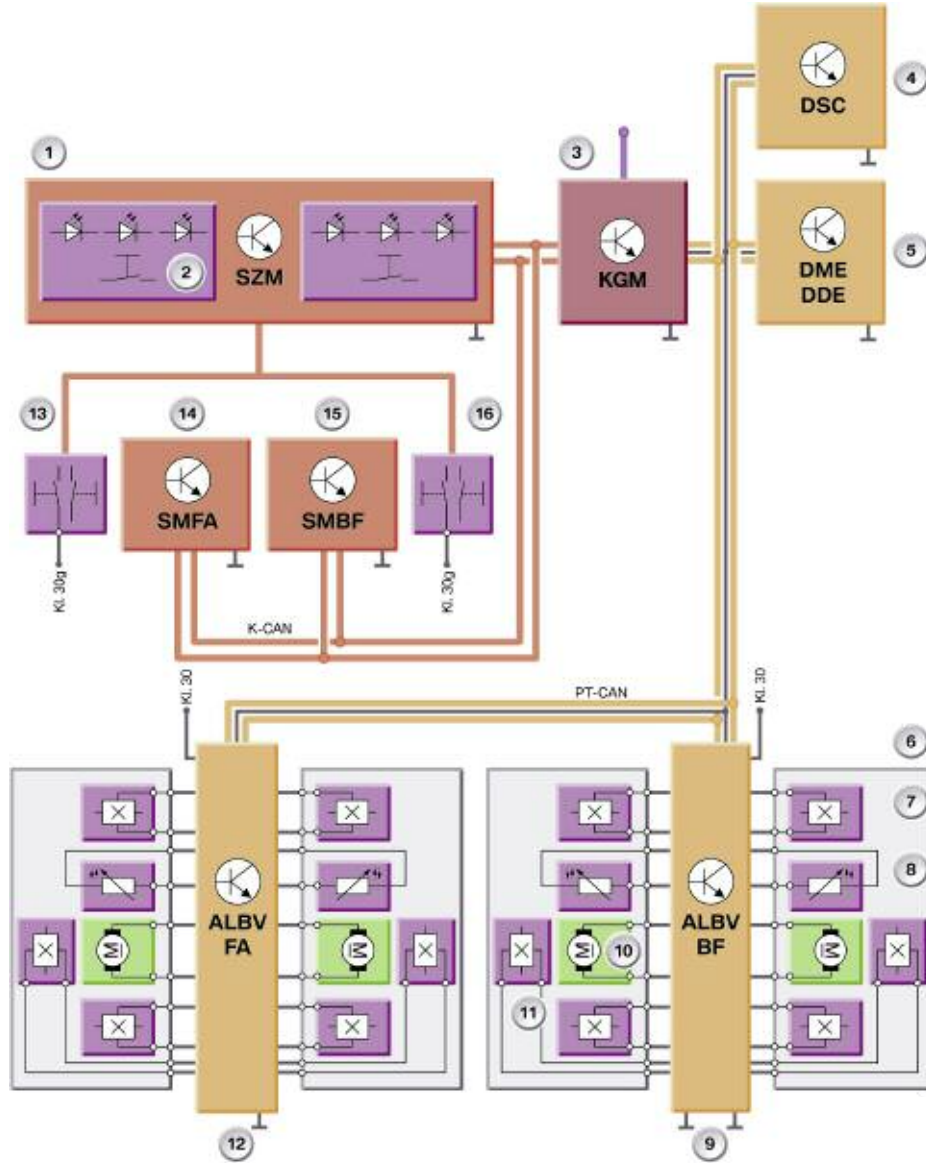


Index	Explanation
1	Both Drive Unit
2	Adjustable Backrest Section
3	ALBV Control Unit

Characteristic curve	Adjustment range in %	Pulse width modulation in %
Comfort	50 -100	50
Normal	0 - 100	65
Sports	0 - 100	80
Sports*	0 - 100	85

\* A modified characteristic curve for PWM control is used in the sports setting on M GmbH vehicles.

■ System Circuit Diagram ALBV



Index	Explanation
1	Center console switch cluster SZM
2	Button for active backrest width adjustment
3	Body Gateway Module KGM
4	Dynamic stability control DSC
5	Digital diesel electronics/digital motor electronics DME/DDE
6	Drive units for active backrest width adjustment (2 per seat)
7	End position sensor
8	Temperature sensor
9	Control unit for active backrest adjustment, front passenger ALBV BF
10	Servomotor
11	2 Hall sensors for direction of rotation and position recognition
12	Control unit for active backrest adjustment, driver ALBV FA
13	Backrest width adjustment switch, driver
14	Driver's seat module
15	Passenger's seat module
16	Backrest width adjustment switch, front passenger

## ■ Principles of Operation

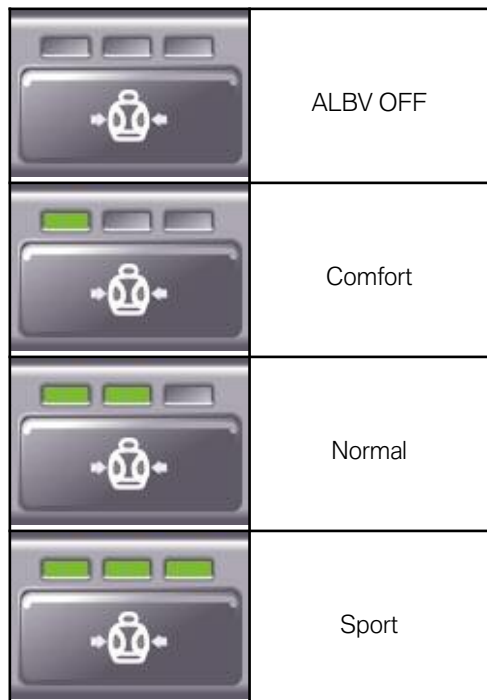
### System Activation

The active backrest width adjustment system cannot be activated before the engine is running. There are buttons for the driver's and front passenger's side located in the center console switch cluster (SZM) to switch on the system.

A green LED lights when the button is pressed with the engine running. The indicator switches to two LEDs or three LEDs when the button is pressed again.

The active backrest width adjustment system is switched off immediately if the button is pressed for longer than 1.2 seconds and all LEDs go out.

Each of these LEDs represents a specific characteristic map that is stored in the ALBV FA / ALBV BF.



The actuators for setting the side sections of the backrest are actuated corresponding to the selected characteristic map. The actuators are controlled by means of a PWM signal (pulse-width modulation).

The ALBV system features the following functions:

- Basic Function
  - Active backrest width adjustment
- Additional Functions
  - Easy-entry for driver's and front passenger's side
  - Backrest width adjustment
  - Readjustment of the backrest width
  - Soft start/stop of the drive unit for backrest width adjustment
  - Backrest width memory function
  - Special features in M-Drive mode

### Basic Function

After activation of a corresponding characteristic curve (comfort, normal, sports) the outer (closest to the curve) side section of the backrest is controlled during vehicle operation depending on various parameters.

The side sections of the backrest are adjusted to such an extent as to take up the transverse forces and to keep the position of the upper body stable in the seat.

Various control units make available information on the PT-CAN to the ALBV control units for the purpose of controlling the respective side sections. The DSC control unit provides the most important information.

The following information is made available:

- Road Speed – The mean value of the signals of all four wheel speed sensors is determined and sent as the road speed signal on the PT-CAN.
- Longitudinal and transverse acceleration – The longitudinal and transverse acceleration is calculated in the DSC control unit from the signals of the Y sensor 2.
- Yaw Rate – The yaw rate, i.e. the rotation about the vertical axis, is also calculated in the DSC control unit from the signals of the Y sensor 2.
- Steering Angle – The steering angle is determined by the steering angle sensor in the steering column switch cluster SZL. The SZL sends a data telegram via the F-CAN to the DSC control unit.
- Steering Angle Speed – The steering angle speed is also determined by the steering angle sensor and sent via the SZL to the DSC control unit.

Further information from the DME (ECM) and driver's/front passenger's seat modules:

- Engine speed information – The DME sends an engine speed signal so that the ALBV control unit recognizes that the engine is running and the system can be activated.
- Memory information – The backrest width memory is integrated in the seat memory located in the respective driver's/front passenger's seat module. The seat module initiates the backrest width memory by means of a K-CAN telegram.

### Convenience Entry/Exit Aid

To make it easier for the driver and passenger to get in and out of the vehicle the side sections of the backrest are completely opened (0%) and held in this position.

The side sections of the driver's seat backrest are opened under the following conditions:

- Terminal R OFF
- Terminal R ON and driver's door opened
- Driver's door open and terminal 15 OFF

The side sections of the front passenger's seat backrest are opened under the following conditions:

- The front passenger's door is opened and the seat belt not buckled.

**Note: The easy-entry facility is deactivated when the active backrest width adjustment is enabled, i.e. the engine is running and the side sections of the backrest are in the position last stored.**



## Backrest Width Adjustment

The backrest width can be preset manually by means of a seat adjustment switch on the control panel.

The customer has the option of setting the backrest width to his/her individual requirements. Adjustment is possible as from terminal 30.

The switches for backrest width adjustment are connected via the K-bus to the center console switch cluster (SZM). The SZM is connected via the K-CAN to the KGM and the PT-CAN.

After selecting a characteristic curve for the active backrest width adjustment, only the presetting between completely open (0%) and half closed (50%) is possible otherwise subsequent adjustment would no longer be possible if the side sections of the backrest were completely closed (100%).

Only the open backrest side section can be adjusted during control of the active backrest width.

### Control for Seat Adjustment



Index	Explanation
1	Backrest Width Open
2	Backrest Width Close
3	Memory Button

## Readjustment of the Backrest Width

Readjustment is intended to balance out the asymmetry in the side sections of the backrest after manual adjustment of the backrest width or after assuming a memory position.

Readjustment takes place when the electronic circuitry in the ALBV control unit recognizes a difference of >5 Hall pulses between the left and right actuator motors.

Readjustment takes place 1 second after the end of the backrest width adjustment procedure. If the adjustment was not successful, the procedure is repeated after 2 seconds.

No readjustment takes place while the active backrest width adjustment is in operation.

## Soft Start/Stop of Drive Unit

A special control facility is responsible for starting and stopping the electric motor. The controlled start function minimizes starting current peaks and avoids mechanical noise during the adjustment procedure. The controlled soft stop function prevents overrunning of the drive unit.

## Backrest Width Memory

The backrest width memory is located in the respective driver's and passenger's seat module. With the aid of the memory buttons in the seat control panel, two positions can be stored for each personalized key in the backrest width adjustment memory.

The setting of the driver's seat last selected is additionally stored in the current key under following conditions:

- 10 seconds after manual backrest width adjustment
- When retrieving a memory position
- When switching terminals from 15 to R M-Drive

## ■ Service Information

### Initialization of the Drive Units

An initialization procedure must be performed to ensure smooth operation after replacing a control unit or a drive unit.

As part of this initialization procedure, the zero position of the drive units is defined by the signal from the end position sensors. For this purpose, the drives are moved to the fully opened position and the switch pressed and held for at least 15 seconds.

Initialization can be performed with the aid of the BMW diagnosis system (Service functions => Body => Active backrest width adjustment).

### Rear Seats

The rear seat have been modified slightly in order to improve seat positioning during hard cornering maneuvers.

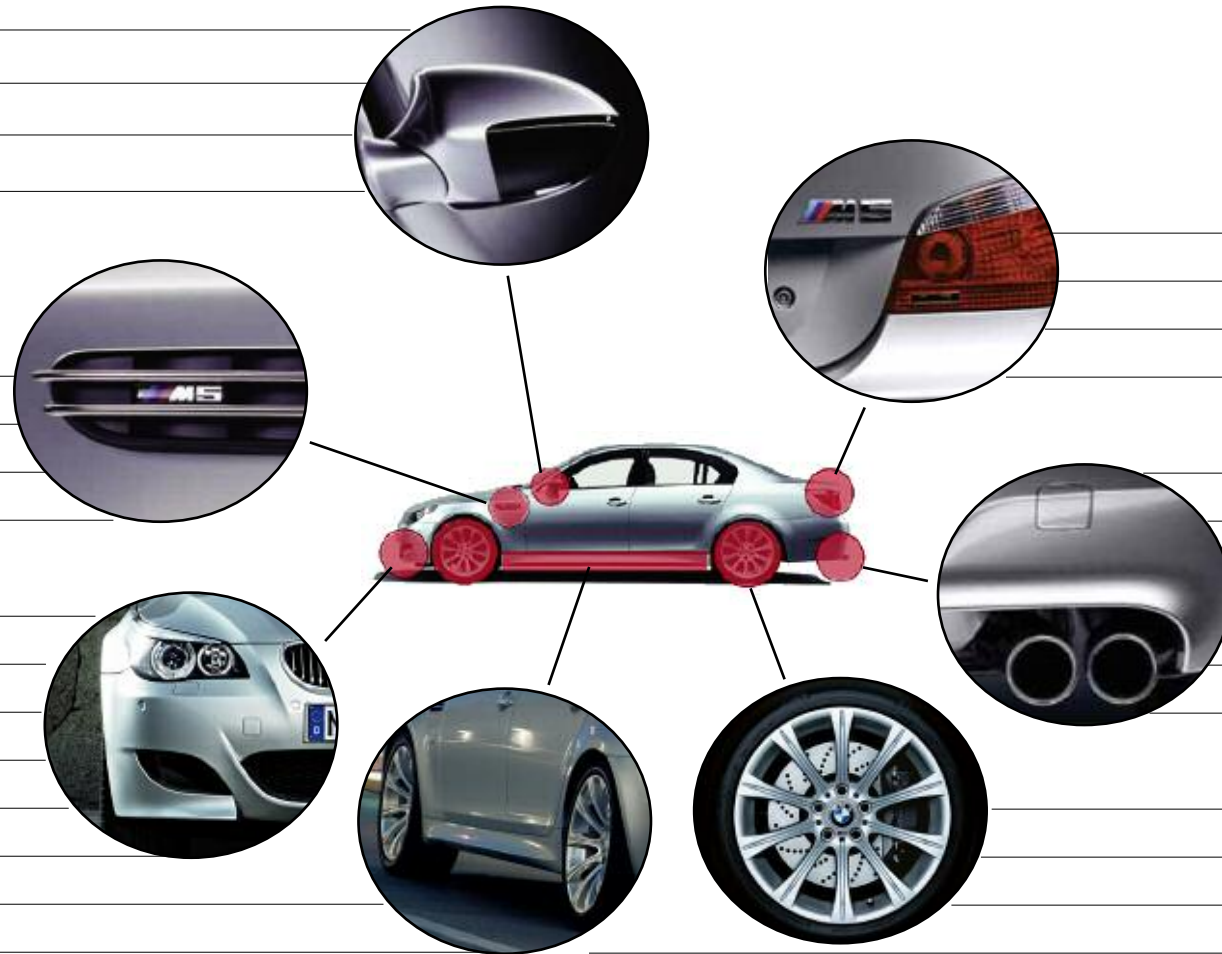
The M5 still boasts having split 60/40 rear seat backs for extra storage capability and an armrest with built in cup holders.



**Rear Seat Arrangement**

## Workshop Exercise - Walk Around

Using the instructor designated E60 M5 vehicle, note the most prominent features that make the E60 M5 stand out when compared to the 5 Series sedan.





## Workshop Exercise - Walk Around

Using the instructor designated E60 M5 vehicle, place vehicle on the lift and remove the belly pans to gain access to transmission, steering and exhaust components.

What is important to note regarding the M5 exhaust temperature sensors?

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Why can't the E60 M5 be ordered with fog lamps?

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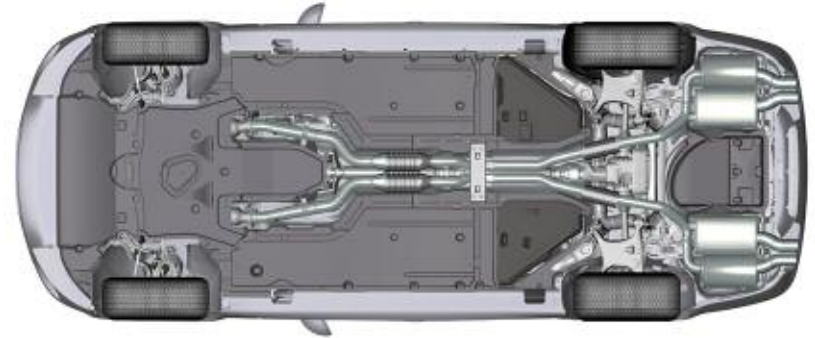
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Which of the systems listed below are **NOT** available in the E60 M5?

Select all that apply.

- AFS
- ACC
- Night Vision
- All of the above



What is important to note regarding the under car components of the E60 M5?

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What is important to note regarding the rear section of the E60 M5?



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## E63/E64 M6

With the M6, BMW M GmbH presents the sports-oriented 6 Series luxury coupe and Convertible. These vehicles share many features with the E60 M5 especially the powertrain.

As on the E60 M5 the 5.0 liter, 10 cylinder S85 engine is installed. With an output of 500 hp and 383 lb-ft of torque the engine is capable of revving beyond 8000 rpm.

But power is not everything. What is more significant are the acceleration characteristics and the vehicle dynamics, which in turn depend, on the one hand, on the vehicle weight and, on the other hand, on the actual thrust at the drive wheels that is derived from the engine torque and the overall transmission ratio.

The 7-speed SMG is the ideal gearbox for optimally transferring the power from the V10 engine via the drivetrain to the rear wheels. Together with the excellent, uncompromising chassis with its sports oriented tuning, this power plant launches the BMW M6 into the ranks of a super sports car.

Yet, in contrast to its normally two-seater competitors, the M6 offers the space and comfort of a typical 2+2 configuration, as well as the interior trim and equipment of a typical luxury class BMW.





## Technical Data

### Engine-specific data

Engine designation	S85B50
Engine type	V10, 90°
Displacement	5 L / 4,999 cm
Bore	3.62 in / 92 mm
Stroke	2.96 in / 75.2mm
Output	500hp at 7,750 rpm
Torque	383 lb-ft / 520Nm at 6,100 rpm
Engine speed (max)	8,250 rpm
Compression ratio	12:1
Valves per cylinder	4

### Vehicle-specific data

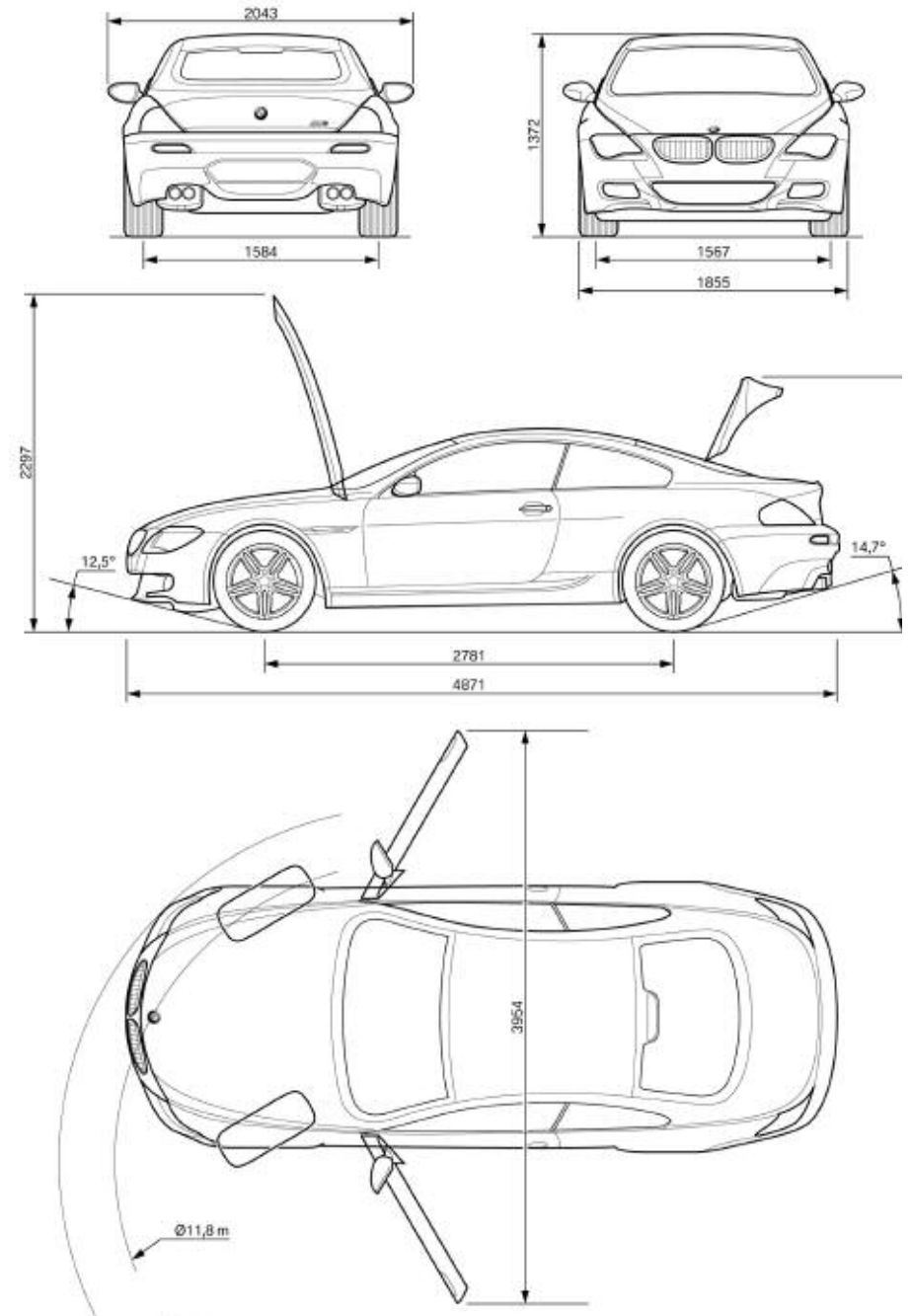
Acceleration (0-60 m/h)	4.5s
Top speed	155 m/h
Unladen weight	3909 lbs
Transverse acceleratio	1.4g
Power to weight ratio	3.5kg/bhp
Drag coefficient	0.32 Cd
Vehicle weight	1710kg
Wheelbase	278 cm
Toe, front/rear	1567/1584mm
Turning circle	12.5 m
Luggage compartment	450 litre
Length	482 cm
Width	185.5 cm
Height	137.5 cm

### Tires and Wheels

Tires front	255/40ZR-19
Tires rear	285/35ZR-19
Wheels front	19 x 8.5
Wheels rear	19 x 9.5

### Transmission

SMG Gear	Ratios
First / Reverse	3.99:1
Second	2.65 : 1
Third	1.81 : 1
Fourth	1.39 : 1
Fifth	1.16 : 1
Sixth	1.00 : 1
Seventh	0.83 : 1
Final Drive Ratio	3.62 : 1



## Modifications and New Features

The following system components have been adopted from the E60 M5:

- S85B50 engine including engine management
- Fuel supply system
- 7-speed SMG with Drivelogic function
- Steering with 2 Servotronic characteristic maps
- Final drive unit/rear axle carrier
- Instrument cluster
- General vehicle electrical system

## S85B50 Engine

The engine add-on parts have been adapted to the E63/E64 engine compartment.

**Note: For more information regarding the S85 refer to the M Engines section of this training material.**

### Unfiltered Air Snorkel, Intake Silencer

The primary intake is a common part of an E63 with the N62 (cyl. 6-10) engine. The primary intake of cylinders 1-5 is inversely symmetrical, while taking into account the arrangement of the secondary air pump.

The secondary air duct is the same as on the E60 M5 but adapted to the shape of the front apron on the E63/E64 M6.



## Fuel Supply System

The fuel lines have been adapted to the S85B50 engine.

The fuel tank is the same as on the E63 645i but the components built into the fuel tank, including the delivery unit, are from the E60 M5.

The carbon canister (AKF) is the same as on the E63. The line connection has been adapted to the larger carbon canister LEV2.

## Exhaust System

The exhaust system is new.

Only the intermediate silencer and the diameter of the tail pipes at the rear silencers have been adopted from the E60 M5.

The acoustic characteristics has been tuned to a more 'sports-oriented sound'.



## Driveshaft

The two-piece steel drive shaft is the same as installed on the E60 M5. The length has been adapted accordingly.

## SMG/Gearshift

The selector lever has been adopted from the E46 M3 with its length correspondingly adapted. The selector lever knob is the same as on the E60 M5.

The Power, EDC and DSC buttons have been integrated in the selector lever cover.



Index	Explanation
1	Selector lever with function lights
2	Power
3	DSC
4	EDC
5	Drivelogic



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## Chassis and Suspension

The chassis of the M6 differs from that of the M5 by a shorter wheelbase and an even lower center of gravity thus increasing agility.

### Electronic Damper Control (EDC)

The electronic damper control system has been adopted from the E60 M5 and the software adapted to the E63/E64 M6.

### Traction Control System

The DSC Mk60E5 system from the E60 M5 with the software configuration (adapted to the E63/E64 M6) is used.

### Front Axle Suspension

The stabilizer bar on the front axle is designed as a tubular stabilizer bar and has been adapted to match the chassis tuning. The link, rubber mount and bracket have been adopted from the E60 M5. Due to the design of the front axle, there are sections with different outside and inside diameters.

The spring strut corresponds to that of the E60 M5 but the spring plates have been adapted to the E63/E64 M6 in terms of the kinematic requirements as well as spring tuning and length.

The geometry of the cylindrical coil spring is the same as on the E39 M5. The spring plate and top spring mount are identical to those on the E46 M3.

### ■ Front Axle Mounting

The thrust panel on the front axle is a common part with the E60 M5 and is made from aluminum.

The material thickness is 2.5 mm on the E63 645i and 3.5 mm on the E63/E64 M6.

The control arms are the same as installed on the E63 645i but fitted with rubber mounts from the E61.

The heat shield panels on the left and right of the front axle carrier have been adapted to the S85B50 engine.

### ■ Wheel Bearings

Apart from the camber modification, the swivel bearing is a common part with the E63 645i.

Negative camber E63 645i: 12 min

Negative camber E63 M6: 60 min (1°).

### Rear Axle Suspension

The spring strut and the shock absorbers correspond to those on the E60 M5, however, they have been adapted in terms of tuning and length.

The springs together with the mounting assembly and stabilizer bar are the same as on the E60 M5 but adapted to the specific requirements of the E63 M6.

### ■ Final Drive

The final drive unit is the same as the M-limited slip differential of the E60 M5.

Gear ratio E63 M6: I = 1:3.62 = 47:13 teeth

Basic model E63 645i: I = 1:3.46.

## Wheels/Tires



### ■ Front

Weight-optimized light-alloy wheel, forged and polished 8.5x19 ET 12 mm.

Hole pitch circle diameter: 120 mm

Center diameter (hub): 72.5 mm

Summer tires: 255/40R19 Styling No. 167M.

### ■ Rear

Weight-optimized light-alloy wheel, forged and polished 9.5x19 ET 17 mm for summer tires 285/35R19 Styling No. 167M.

Winter wheel same as on E60 M5 (front and rear) 8x18 rim offset (ET14 mm new).

Tires: 245/45 R18, Conti Winter Contact TS 810S, Michelin Pilot Alpine 2

Snow chains can be mounted on winter wheels only.

## Electrical System

### Wiring Harness

The main wiring harness is new. It is designed as a one-piece, modular structure specific to the equipment configuration.

The MOST system is integral. The wiring to the hood lock is new - necessary with SMG.

## Brakes

### Brake Operation (hydraulic system)

The brake system is the same as on the E60 M5 but specifically adapted to the E63 M6.

### Electric Vacuum Pump

The assistance of an external vacuum pump is required under various operating conditions (e.g. race track mode, driving off with the engine cold or rolling at terminal 15 with the engine not turned on) to ensure sufficient vacuum in the brake booster at all times.

An electric vacuum pump has been installed with the introduction of the E63E64 M6. It is installed on the left in the engine compartment under the left microfilter for the heating/air conditioning system. This vacuum pump is also installed with the series launch of the E60 M5.



Index	Explanation
1	Pressure Regulator
2	Vacuum Pump

The electric vacuum pump is actuated by the DME (digital motor electronics) MS\_S65. For more information refer to the M engine Management System section of this training material.

## Body

Apart from the carbon roof, front and rear bumpers as well as the left and right side sill panels, the body corresponds to that of the basic E63 645i.

The outside mirrors are the same as on the E60 M5.

Changes to the body:

- Roof
- Front bumper
- Rear bumper
- Left/right sill panel

## Roof

As already used on the E46 M3 CSL in other markets of the world, the E63 M6 (Coupe) features a visible carbon fiber reinforced plastic (CFK) outer roof skin panel.



The carbon fiber-reinforced plastic roof is 7 kg lighter than the standard steel roof therefore lowers the vehicle's center of gravity. This has a particularly positive effect on the vehicle dynamics.

Minor scratches can be painted. The roof must be replaced in the event of more extensive damage (e.g. a hole). The carbon fiber-reinforced plastic roof is bonded to the body (see Repair Instructions No. 41 31 000).

**Note: The panoramic roof option SA is not available.**

## Front Bumper

The front bumper is designed as a lightweight bumper.

It has its own distinctive appearance and is aerodynamically optimized. The design specifically takes into account the brake cooling function and the air intake for the V10 engine.

It consists of:

- Advanced composite plastic carrier with deformation element (a glass fiber reinforced plastic (GFK) braiding as replacement for the standard, heavier aluminum section)
- Shock absorber (foam material)
- Plastic paneling (material same as on the E63 basic vehicle)
- No body molding

**Note: The fog light and ACC (active cruise control) options are not available.**



### Front Bumper

Index	Explanation
1	Cooling air duct on left and right for wheel arch, brakes, secondary unfiltered air duct for intake silencer.
2	Center cooling air duct
3	Primary air duct for intake silencer

### Rear Bumper

The rear bumper is designed as a lightweight bumper.

It has its own distinctive appearance and is aerodynamically optimized (see illustration).

It consists of:

- Advanced composite plastic carrier with deformation element (a glass fiber reinforced plastic (GFK) braiding as replacement for the standard, heavier aluminum section)
- Shock absorber (foam material)
- Plastic paneling (material same as on the E63 basic vehicle)
- No body molding



### Rear Bumper

Index	Explanation
1	80 mm Diameter Exhaust Tail Pipes
2	Integrated Diffuser

### Left/Right Sill Panel

The left and right sill panels are new parts with a distinctive appearance and developed in accordance with aerodynamics aspects.

The ram air lips (see magnified view in illustration below) in front of the rear wheel are made from stone chip-resistant material.

The sill panels are an integral part of the aerodynamic design package of the M6 coupe.



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## E9X M3

M3 is a simple letter and number combination which has become synonymous with an extremely powerful and dynamic performance car.

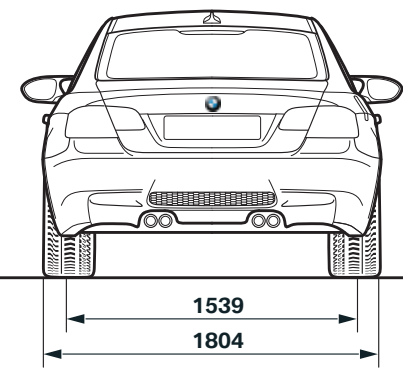
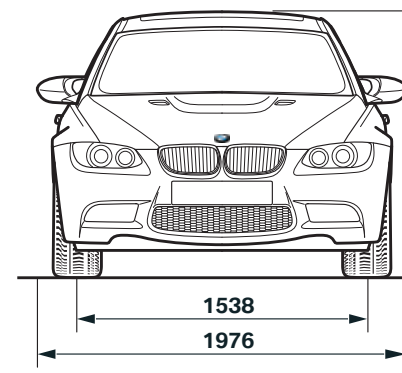
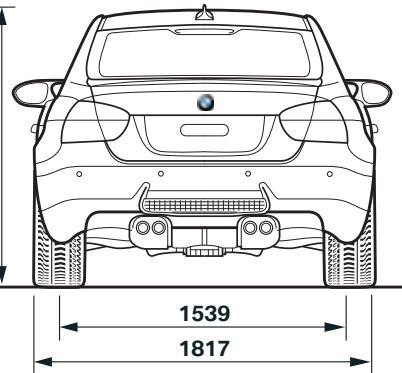
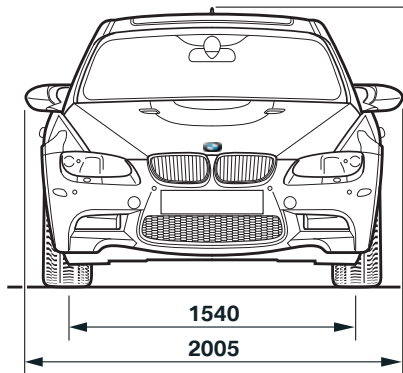
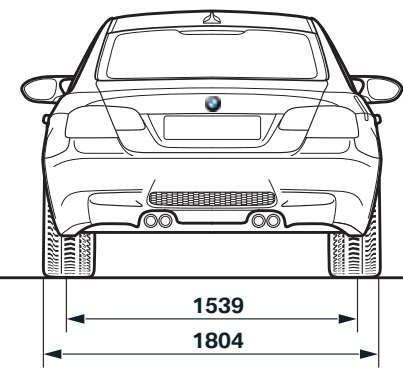
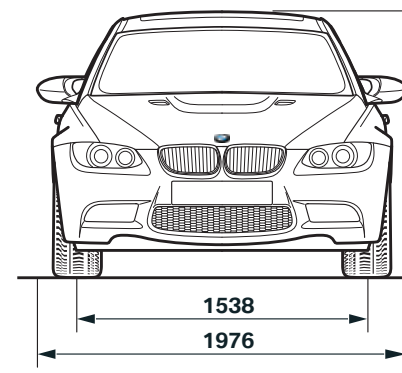
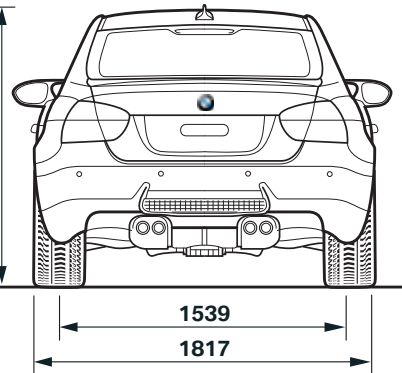
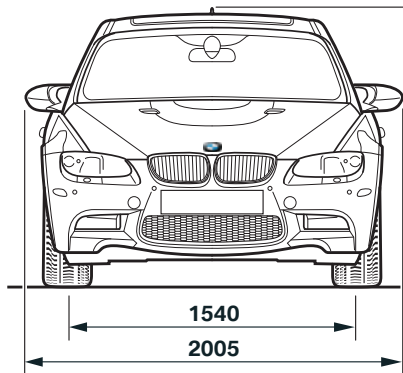
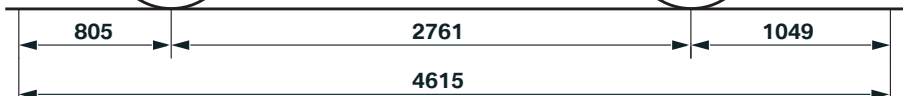
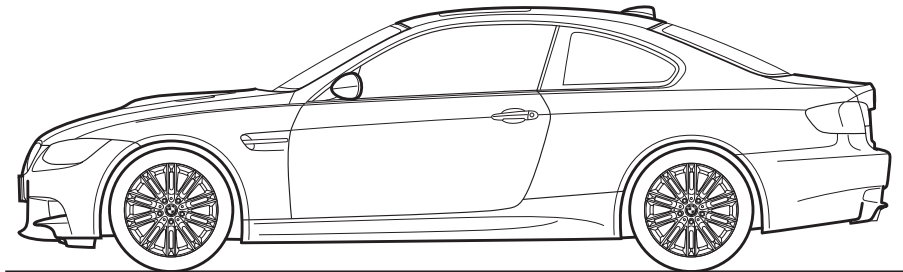
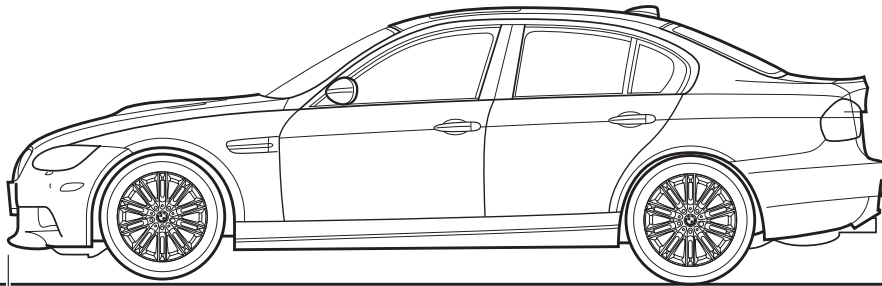
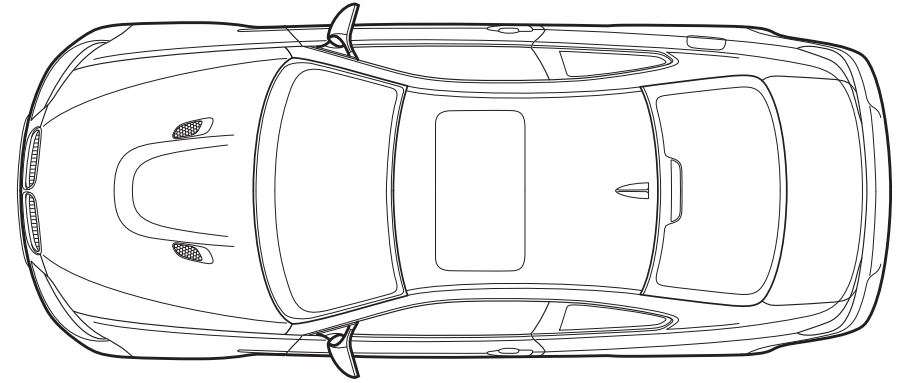
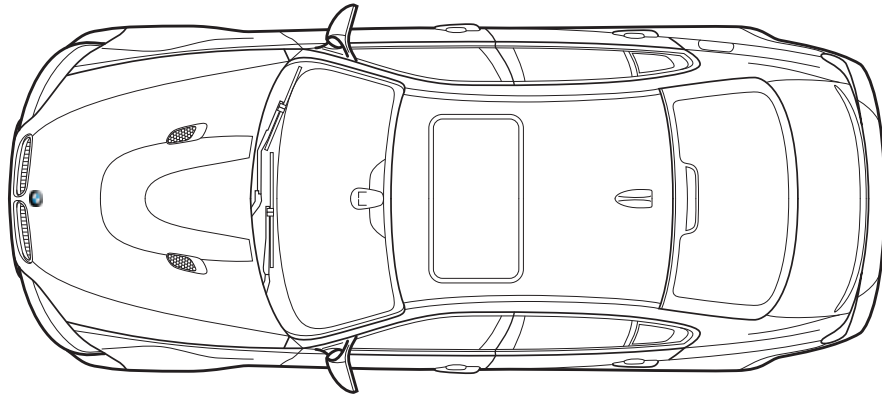
The M3 is now in its fourth generation with a history of success in the world of motorsport, winning races across the globe since its beginning back in 1985. Not only has the race version of the M3 gained a successful motorsports heritage, its own road credentials live up to the expectations and demands of today's M3 drivers. The E92 M3 was launched in the spring of 2008. (The E90 sedan and E93 Convertible followed soon after).

This precisely balanced sports car set new benchmarks in driving dynamics for sport coupes. As with its predecessor the focus has been on optimizing the power to weight ratio while maintaining the high engine speed concept. This combination ensures that both power and driving agility are exceptional, placing the M3 in an even higher level of sport car competition.



## E90 M3 Dimensions

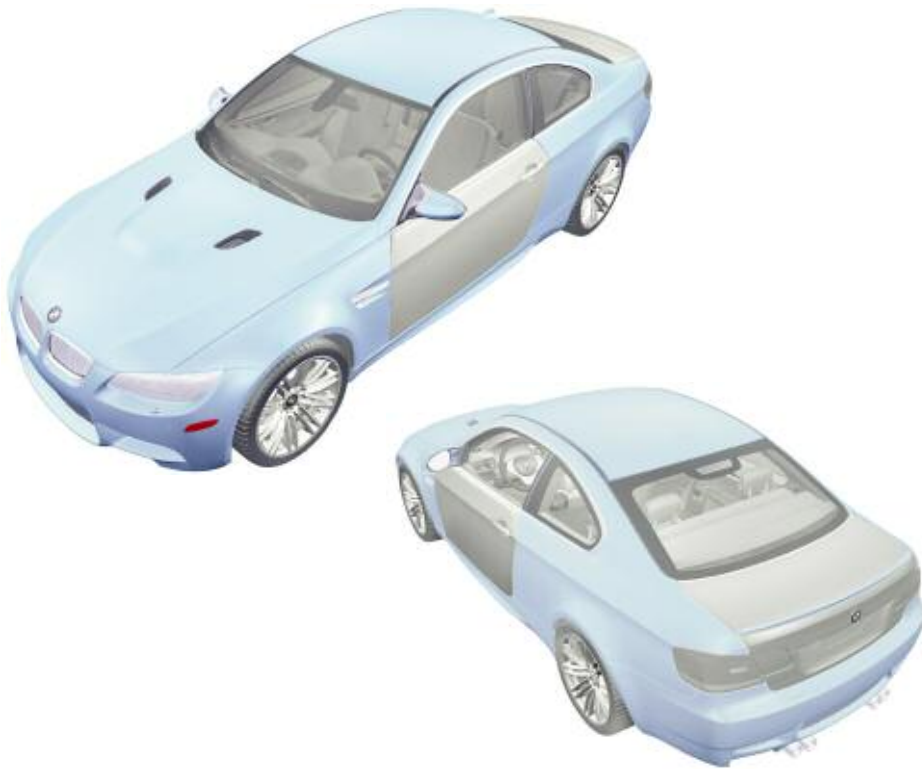
## E92 M3 Dimensions



## Body

In addition to the sporty and dynamic appearance of the external design, the main features are weight optimization and a reinforced bodyshell for improved dynamic handling. A further outstanding feature of the E92 M3 is the sophisticated aerodynamics typical of the M series.

The doors and the trunk lid are taken from the series-model E92. All other external body components of the Coupe are new (shown here in blue).



**View of M3-specific external body components**

## Hood

A New "Powerdome" aluminum hood with air opening is introduced. The air intake on the left (when viewed in the direction of travel) is a fresh air intake for the engine. The right-side aperture is closed and is only for optical symmetry.

### Power dome aluminum hood



## Fenders

An advanced plastic material is used for the front fenders, which are wider than those used on the series E92. The fenders incorporate the (functional) model-specific "M side gills" with integrated side indicators and M3 emblem.

### Front fender with functional side gill vent





## Roof

The roof on the E92 M3 is manufactured from carbon fiber. This has reduced the overall vehicle mass on the upper level of the car by approximately 5 kg, therefore considerably lowering the center of gravity.

A roof rack system can be assembled on the E92 M3 with carbon fiber roof. The roof has specific inserts for roof luggage rack brackets.

The repair procedures and options are similar to or the same as the M6.



If the sunroof option is selected, a steel roof similar to the series model E92 is fitted.

## Side Sills

The side sills are more highly accentuated, in accordance with the M design criteria.



## Exterior Rear View Mirrors

The 'M' designed exterior door mirrors have an optimized air flow design. The mirror surface area is larger to comply with future legislation. The mirror base mounting has been adapted to suit the new mirror unit.

The functions of the outside mirrors are the same as the series production E92. Driver and passenger mirrors are electrically heated and adjusted.

The cover cap of the exterior mirror housing is painted in the body color.

## Trunk Lid

The trunk lid is taken from the series production E92. The rear spoiler is attached as a standard feature on the E92 M3.



## Front Bumper

The front section module has a single piece M-specific thermoplastic bumper trim and is fitted to a reinforced lightweight plastic bracket. The bumper trim is color coded to the car.

The front M3 bumper has openings for the kidney grill, engine air inlet, PDC ultrasonic sensors (optional), the headlight-cleaning system and the mounting for the towing eye (hook).

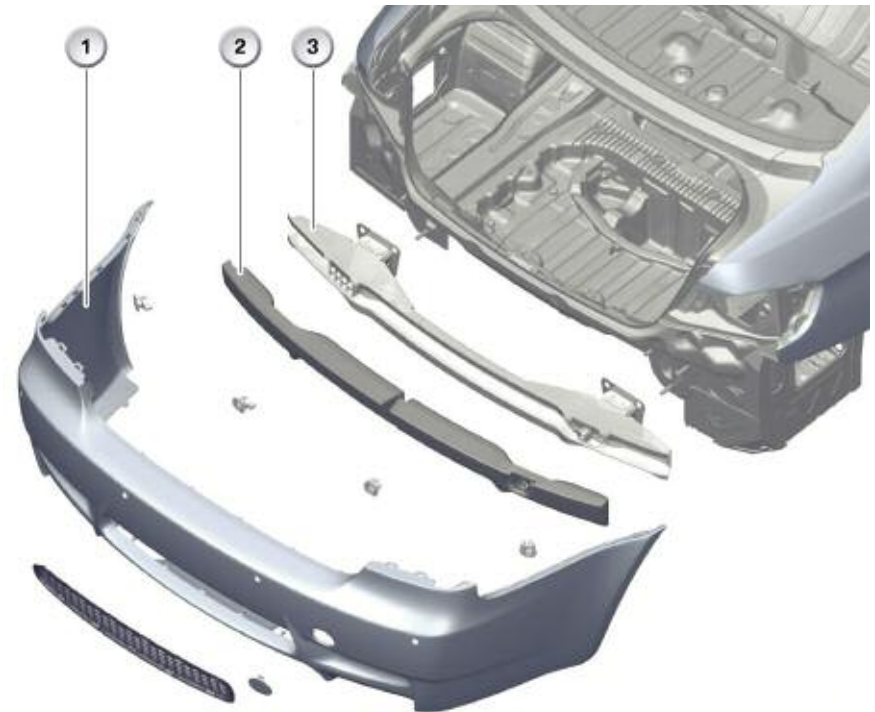


Front bi-xenon headlamp units are identical to the series E92. The M3 front bumper overhang is longer than that of the series E92.

## Rear Bumper

The rear section module also features an M style single-piece bumper trim made from thermoplastic material. The bracket is also made from reinforced lightweight plastic.

The module has openings for the bumper grid, PDC ultrasonic sensors (optional) and the mounting for the towing hook.



Index	Explanation
1	Bumper trim
2	Shock absorber foam
3	Bumper bracket

## M- Specific Equipment

**Exterior:** Front apron with generous air inlets, "Powerdome" engine hood with air inlet, carbon fiber roof, functional side gills, outside mirrors, sporty rocker covers, extended wheel arches, new wheel rim design, rear spoiler and four exhaust tailpipes all combine to provide the initial impression that this is an M vehicle.

**Interior:** Sill trim strips, seats, steering wheel, instrument cluster, switches in the center console and the gear lever design all increase the anticipation.

## S65B40 Engine

For the first time in a production M3 a V8-power plant used. The Formula 1 inspired S65B40 is designed for high-speed operation and extreme reliability.

With eight individual throttle plates, generous intake air and exhaust manifolds, and many more refined M-specific features such as the MSS60 engine control, the S65B40 is once again an outstanding highlight of the M Series.

**Note: For further information on the S65B40 engine refer to the M Engines section of this training material.**





## Drivetrain

The vehicle is available with the double-disc clutch and 6-gear manual transmission or with the M-DCT Double-Clutch Transmission coupled to the fully variable M limited-slip differential (See Drivetrain section of this training material for further information).

## Chassis and Suspension

Front and rear axles with enhanced suspension geometry and M-specific suspension settings with 18" tires.

Specific objectives of the development were weight optimization, and in particular, control of the longitudinal and lateral acceleration/power that is generated when enjoying the pleasure of driving the M3.

The M3 brake system has compound brake rotors with high-performance brake pads and standard M series ABS/DSC to guarantee optimum braking efficiency and active safety.



**M-DCT Dual Clutch Transmission**

## Electrical System

The electrical equipment and bus structure of the M3 are based on the E92 series vehicle.

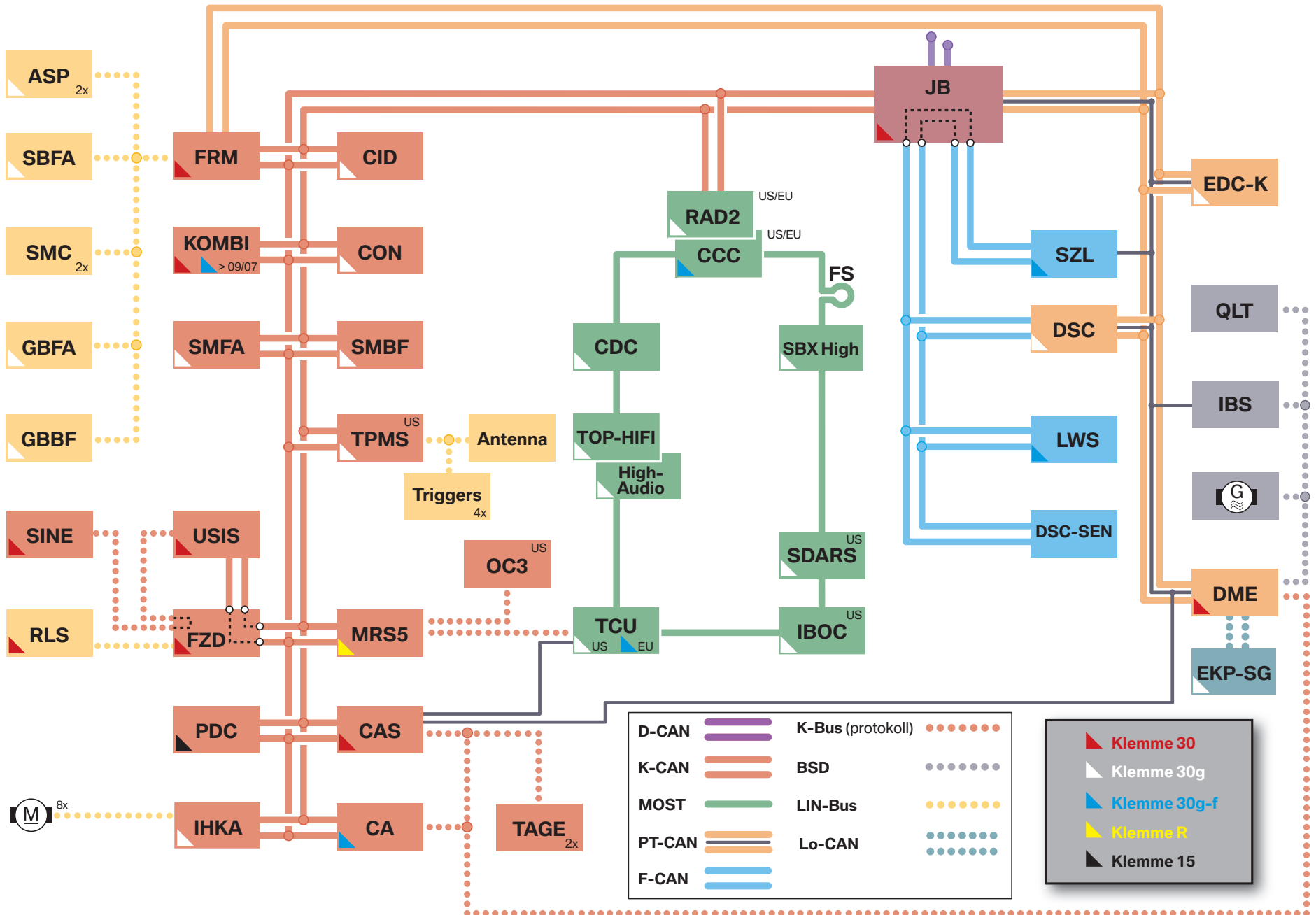
The optional MDrive menu can be used to preset and configure the standard Servotronic and the M engine dynamics control (enhanced with "Sport Plus"), the optional electronic damper control EDC-K and the DSC M dynamic mode.

In the E9x Series, the BMW Individual High End audio system is offered for the first time in the M3.

**Note: The vehicle electrical system is based on the E92 series production vehicle system and has been adapted for the M3.**



# Vehicle Electrical System and Terminal Status Overview



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