Aftersales Training - Product Information.

E92 M3 Complete vehicle.

BMW Service

The information contained in the Product Information and the Workbook form an integral part of the training literature of BMW Aftersales Training.

Refer to the latest relevant BMW Service information for any changes/supplements to the Technical Data.

Information status: 07/2007

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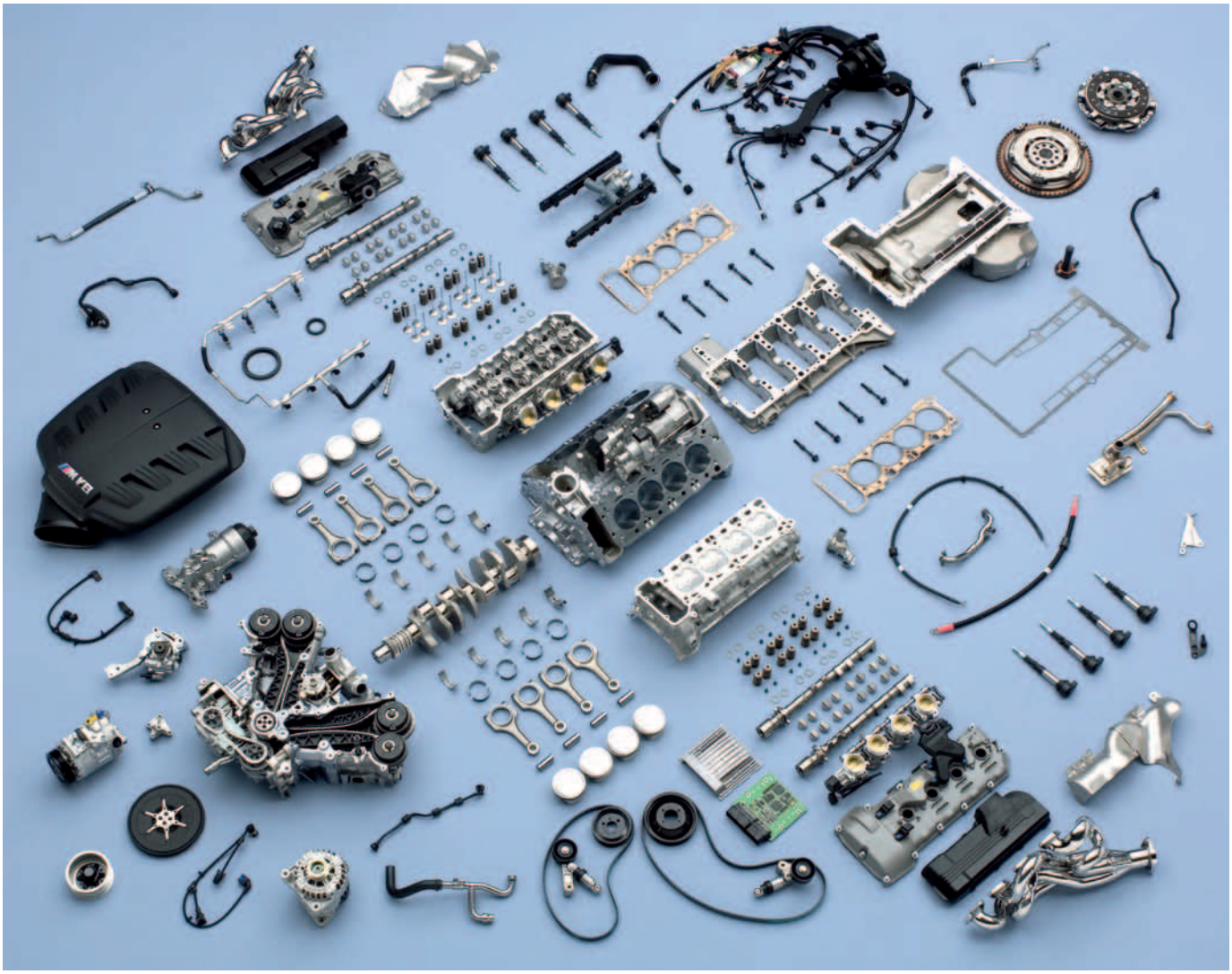
Product Information.
E92 M3 Complete vehicle.

The 4th Generation M3

The integrated overall M concept

The S65B40 engine with 8 cylinders and exceptional high engine-speed concept



Notes on this product information

Symbols used

The following symbols are used in this product information to facilitate better comprehension and to draw attention to important information.

⚠ Contains information to facilitate better understanding of the described systems and their function.

◄ Identifies the end of a note.

Information status and national variants

BMW vehicles conform to the highest safety and quality standards. Changes in terms of environmental protection, customer benefits and design render necessary continuous development of systems and components.Consequently, this may result in deviations between this product information and the vehicles available in the training course.

This document describes only EURO variants of left-hand drive vehicles. Some controls or components may be arranged differently in right-hand drive vehicles from the way shown on the graphics in the product information. Further differences may arise as the result of the equipment variants used in specific markets or countries.

Additional sources of information

Further information on the individual subjects can be found in the following:

- Owner's Handbook
- BMW diagnostic system
- Workshop systems documentation
- SBT BMW Service Technology.

Contents.
E92 M3 Complete vehicle.

Models.
E92 M3 Complete vehicle.

M3 Models

Four Generations of the M3

EU Models	E30		E36			E46		E92
M3	**Coupé 2.3 (Evo. I)**	**Coupé 2.5 Evo. III**	**Coupé 3.0**	**Coupé 3.0 GT**	**Coupé 3.2**	**Coupé 3.2**	**Coupé 3.2 CSL**	**Coupé 4.0**
Year	86-91	1990	92-95	1995	95-00	01-06	2003	07-
Engine model	4 cyl. S14B23	4 cyl. S14B25	6 cyl. S50B30	6 cyl. S50B30	6 cyl. S50B32	6 cyl. S54B32O0	6 cyl. S54B32T0	V8 S65B40O0
Cylinder capacity [cm^3]	2302	2467	2990	2990	3201	3246	3246	3999
Power [hp/kW]	200/147	238/175	286/210	295/217	321/236	343/252	360/265	420/309
At engine speed [rpm]	6750	7000	7000	7000	7400	7900	7900	8300
max.	>7000	> 7000	7280	7280	7600	8000	8000	8400
Power [hp/kW] per litre	87/64	96/70	96/70	99/73	100/74	105/77,3	111/ 82	105/77.3
Torque [Nm]	240	240	320	323	350	365	370	400
At engine speed [rpm]	4750	4750	3600	3900	3250	4900	4900	3900
EU weight* [kg]	1275	1275	1535	1535	1535	1570	1460	1655
DIN power to weight ratio [kg per hp/kW]	6.0/8.2	5.0/6.9	5.1/7.0	4.9/6.7	4.5/6.2	4.4/5.9	3.9/5.2	3.8/5.1
Accel. 0-100 km/h [s]	6.7	6.5	6.0	5.9	5.5	5.2	4.9	4.8
1000 m** [s]	27.2	26.7	25.6	25.5	24.7	24.2	23.5	23.3
V_{max} [km/h]	235	248	250***	250***	250***	250***	250*** (280)	250*** (280)

* unladen weight on-the-road, with 75 kg load, fuel tank 90 % full, no optional equipment

** standing start

*** electronically controlled down/limited (in brackets: increase in option V_{max})

Comparison with E46 M3 and E92 335i

EU Models	E92 M3 Coupé	E46 M3 Coupé	E92 335i Coupé
Year	07-	01-06	07-
Engine model	V8 S65B40O0	6 cyl. S54B32O0	6 cyl. series N54B30U0
Cylinder capacity [cm^3]	3999	3246	2979
Power [hp/kW]	420/309	343/252	306/225
At maximum	8300	7900	5800
speed [rpm]	8400	8000	7000
Power [bhp/kW] per litre	105/77.3	105/77.3	102.7/75.5
Torque [Nm]	400	365	400
At engine speed [rpm]	3900	4900	1300-5000
EU weight*[kg]	1655	1570	1600
DIN power to weight ratio [kg per hp/kW]	3.8/5.1	4.4/5.9	5.0/6.8
Acceleration 0-100 km/h [s]	4.8	5.2	5.5
1000 m**	23.3	24.2	24.5
V_{max} [km/h] ***	250 (280)	250	250

* unladen weight on-the-road, with 75 kg load, fuel tank 90 % full, no optional equipment

** standing start

*** electronically controlled down/limited (in brackets: increase in option V_{max}).

Introduction.
E92 M3 Complete vehicle.

Foreword

A new addition to the 'M' family has just arrived. The new BMW M3.

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 motor sport, winning races across the globe since its beginning back in 1985. Not only has the race version of the M3 gained a successful motor sports heritage, its on road credentials live up to the expectations and demands of today's M3 drivers. The E92 M3 will be launched in the middle of 2007.

This precisely balanced sports car will set new benchmarks in driving dynamics for sport coupes. As with its predecessor the focus has been on optimizing the power to weight ratio whilst 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.

1 - E92 M3 side panel

History

E30 M3
Approx. 18,000 vehicles delivered, Coupé and Convertible. Two engines worldwide.

2 - E30 M3

1986
The E30 M3 celebrates its launch with a 4-cylinder engine (S14B23) and 194/200 hp, with/without catalytic converter.

1987
The M3 dominates touring car racing on the world's race tracks. Roberto Ravaglia brings the World Championship title back to Munich.
The limited edition Evo I with 200 hp (S14B23) arrives.

1988
The sought-after Evo II now features 220 hp (S14B23).
Those who prefer 'open-top' driving can choose the M3 Convertible.

1989
The M3 wins 16 national and European titles, including the European mountain championship for touring cars.
The special edition Cecotto with 215 hp (S14B23) makes its debut.

1990
The M3 is awarded 15 international and national titles.
The limited number of Evo IIIs with catalytic converter and 238 hp (S14B25) are quickly snapped up.

3 - The E30 M3 Cecotto takes part in the German Touring Car Championships.

E36 M3
Over 70,000 vehicles; Coupé, Convertible and Saloons are produced, not including the Z3 M Roadster and Z3 M Coupé. The M3 is available with two different engines and vehicle configurations; one for the EU, and another for US release.

4 - E36 M3

1992
The second M3 generation, the E36 M3 with 6-cylinder engine and 286 hp (S50B30/US S52B30 with 240 hp) causes a stir, the individual version makes its worldwide debut at the Geneva Motor Show. The high-pressure VANOS variable camshaft control (single VANOS) is used for the first time in an M engine.

1993
The E36 M3 is now also available as a Convertible.

1994
Steve Soper, Joachim Winkelhock and Johnny Cecotto win the touring car world championship.
A 4-door saloon model of the E36 M3 is offered for the first time.
The homologation series of the M3 GT (Coupé only) develops 295 hp (S50B30).

1995
The E36 M3 European model is completely upgraded. For example, it now features, a compound brake with brake discs made from compound materials, and high-pressure double VANOS, enabling the engine (S50B32) to reach 321 hp (US release S52B32 still has 240 hp). The model remains available only as a Coupé and a Convertible.

1996
The E36 M3 is made available with sequential M transmission (SMG I).

E46 M3 Over 80,000 vehicles delivered, Coupé and Convertible. One worldwide engine.

5 - E46 M3

2000
The third generation, the E46 M3 has a 6-cylinder engine with a high engine speed concept and 343 hp (S54B32). This first M "high engine speed concept" engine impresses the automotive experts and earns the "Engine of the Year" award. The M3 becomes the first M vehicle to be delivered with fully variable M limited slip differential with up to 100 percent lock effect as a standard feature.

2001
The M3 Convertible combines the fascination of M power with the fun of open-top driving. The 2nd generation sequential M transmission (SMG II) is available.

2002
With the M3 CSL which produces 360 hp (S54B32HP), the BMW M shows how a high-performance vehicle can be optimized still further through the use of lightweight construction materials in an intelligent lightweight design. The M track mode (now known as M dynamic mode), SMG Launch Control (automatic upshift in S mode shortly before maximum speed), and an electronic ATF level are all used for the first time.

6 - E46 M3 CSL

E92 M3 The Coupé era begins. One worldwide engine.

7 - E92 M3

2007
The fourth generation of the M3 arrives featuring the S65B40 high-speed 8-cylinder engine.

M3 concept

8 - E92 M3 (Diagonal view from front)

- **Body**

  In addition to the sporty and dynamic appearance in both the external design and the interior, the main features were weight optimization and a reinforced bodyshell for improved dynamic handling.

  A further outstanding feature of the E92 M3 is also once again the sophisticated aerodynamics typical of the M series.

9 - E92 M3 (Diagonal view from rear)

- **M-specific equipment**

  Exterior:
  Front zone with generous air inlets, "Powerdome" engine hood with air inlet, carbon roof, side gills, outside mirrors, sill, wheel rim design, extended wheel arches, and the boot with spoiler and four exhaust tailpipes all combine to provide the initial impression.

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

- **Engine**

  Under the engine hood, the 8-cylinder power pack is the high-speed S65B40. With individual throttle butterflies, a generous intake air and exhaust manifold, 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.

- **Drive**

  Double-disc clutch, 6-gear manual transmission and the fully variable M limited-slip differential ensure the forward momentum.

- **Chassis and suspension**

  Front and rear axles with new suspension geometry and M-specific suspension settings with 18" tyres.
  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 with compound brake discs, new high-performance brake pads and standard M series ABS/DSC guarantee optimum braking efficiency and active safety.

- **Electrical system**

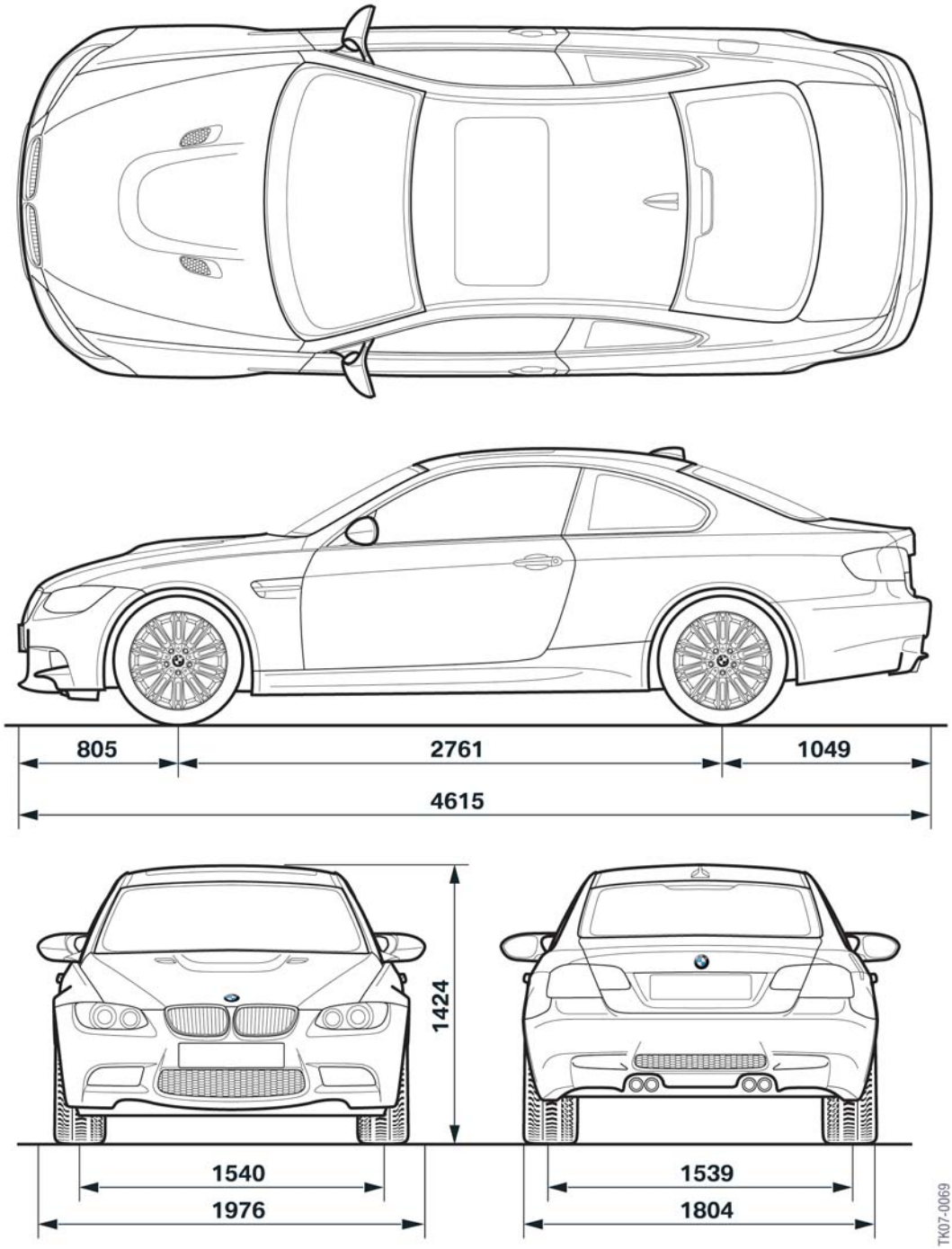
  The electrical equipment and bus structure of the M3 are based on the E92.

  The optional MDrive menu can be used to preset/configure the standard Servotronic and the M engine dynamics control (enhanced with "Sport Plus"), the optional electronic damper control EDC-K (in the E9x series only available in the M3) 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.

Dimensions and Vehicle Data

Garage dimensions



10 - Dimensions of the E92 M3

Vehicle data comparison

Designation/Unit of Measurement	E92 M3	E46 M3 Coupé	E92 335i
Seats	4	5	4
Length [mm]	4615	4492	4580
Body width [mm]	1804	1780	1782
Width above mirror [mm]	1976	1924	1985
Height [mm]	1424	1383	1375
EU unladen weight [kg]	1655	1570	1600
Load volume [litres]	430	410	430
C_wxA	0.68	0.66	0.62
Wheelbase [mm]	2761	2731	2760
Track width, front [mm]	1540	1508	1500
Track width, rear [mm]	1539	1525	1507
Steering Average overall ratio	Rack 12.5	Rack 15.4	Rack 16.0
Manual transmission gear ratio Gear 1/2/3/4/5/6/R	GS6-53BZ (M) 4.055/2.396/1.582/1.192/ 1/0.872/3.678	S6S420G 4.227/2.528/1.669/1.226/ 1/0.828/3.746	GS6-53BZ 4.055/2.396/1.582/1.192/ 1/0.872/3.678
Rear-axle final drive gear ratio [:1] fully variable M limited slip differential	 3.85 Yes	 3.62 Yes	 3.08 No
Tyre type/Wheel rim type/ Front rim offset [mm]	245-40 ZR 18/8.5Jx18/ IS29	225-45 ZR 18/8Jx18/ IS47	225-45 WR 17 RSC/8Jx17/ IS34
Tyre type/Wheel rim type/ Rear rim offset [mm]	265-40 ZR 18/9.5Jx18 / IS23	255-40 ZR 18/9Jx18 / IS26	255-40 WR 17 RSC/8.5Jx17/ IS37
Brake disc front/rear Diameter x thickness [mm]	(M Compound) 360x30/350x24	(M Compound) 325x28/328x20	(Compound) 348x30/336x22
Type of fuel [RON]	98 (min. 95)	98 (min. 95)	98 (min. 91)
Tank capacity/Reserve [litres]	63/8	63/8	63/8
EU consumption/distance total [litres/km]	 12.4/510	 11.9/530	 9.5/665
EU-CO_2 emission [g/km]	295	287	228
Permitted emission limits	Europe: EU4/E-OBD-EU4; USA: US-LEV/US-OBD- LEV 2, EVAP-LEV 2; Japan: Japan LEV 200/ Japan OBD (same as E- OBD)	EU3	EU4 (as for E92 M3)

Engine and technical data

V8 with high engine speed concept

11 - S65B40 front view

It will be the first time that a V8 engine has been fitted in a series production M3. The main concept behind this high-revving, high performance engine with a sporty sound is the extremely light, rigid and robust construction which is capable of reaching extreme engine speeds of up to 8,400 rpm. The engine achieves an impressive 420 hp (over 100 hp per litre).

The S65B40 is derived from its big brother, the S85B50. The main changes can be seen in the engine oil system, VANOS valve gear system and air intake system. Special consideration has also been given to engine weight optimization.

The engine with all its assemblies is built in the special engine production area of the Munich BMW plant.

One standard engine is used throughout the world and adapted to suit specific market requirements.

A new dimension to the high engine speed concept

The M engineers consider the high engine speed concept to be the most intelligent strategy of obtaining the maximum thrust from a vehicle.

For example, in a modern formula 1 engine, the crankshaft works at up to 19,000 rpm (resulting in piston speeds of over 25 metres per second).

The actual thrust at the driven wheels is the decisive factor for car acceleration. This thrust is achieved by the engine speed, the torque and the short gear ratio.

12 - Formula 1 example

This concept has been adopted for vehicles in the 'M' range from motor sport. The fully variable M limited-slip differential means that the thrust is optimally distributed to the live axle.

13 - S65B40 View of the intake manifold

Furthermore, the S65B40 also includes the established M-specific features such as double VANOS, individual throttle butterflies and high-performance engine electronics (MSS60 control unit).

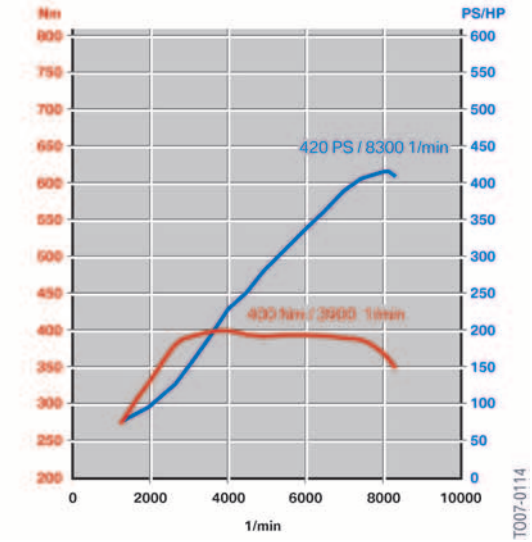
14 - S65B40 Notional view without the intake manifold

Technical workarounds by increasing the cylinder capacity or boosting become superfluous, thus avoiding the increased engine weight and consumption often associated with these methods.

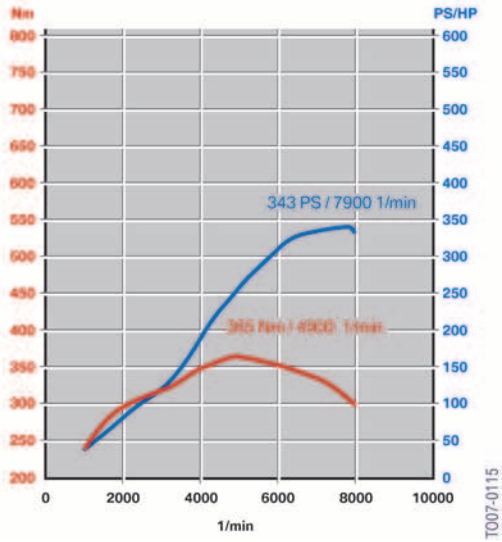
The high engine speed concept helps to achieve dynamically agile handling and the maximum in sports driving performance characteristics.

A maximum torque of 400 Newton meters at 3,900 rpm is reached. Approx. 85 percent (340 Nm) can be utilized beyond the enormous engine speed range of 6,500 rpm. The S65B40 attains 8,400 rpm, and therefore a value that was previously only reserved for racing car engines or exotic custom vehicles.

⚠ For safety reasons, due to the engine dynamics when the vehicle is stationary (i.e. without a road-speed signal), it is already down-controlled at 7,000 rpm to prevent the engine speed from increasing into an impermissible range. ◄



15 - E92 M3: S65B40O0 Power and Torque Curve



16 - E46 M3: S54B32O0 Power and Torque Curve

Technical Data	E92 M3	E46 M3	E6x M5/M6
Engine identifier	S65B40O0	S54B32O0	S85B50O0
Engine type	V8 engine with 90° engine block and 17 mm cylinder bank offset 4 valves per cylinder.	6 in-line engine/ 4 valves per cylinder	V10 engine (design as S65)
firing order	1-5-4-8-7-2-6-3	1-5-3-6-2-4	1-6-5-10-2-7-3-8-4-9
firing interval [° KW]	90	120	90/54
Cylinder capacity [cm^3]	3999	3246	4999
Bore [mm]	92	87	92
Stroke [mm]	75.2	91	75.2
Space between cylinders [mm]	98	91	98
Power [hp/kW] at speed [rpm]	420/309 8300	343/252 7900	507/373 7750
Torque [Nm] at speed [rpm]	400 3900	365 4900	520 6100
Breakaway speed [rpm]	8400	8000	8250
Compression ratio	12:1	11.5:1	12:1
Engine control Combustion monitoring	MSS60 Ion current monitoring	MSS54 Standard misfiring and knock identification	MSS65 Ion current monitoring
Fuel delivery	DME => Electric fuel pump control (Lol-CAN) => three-phase flow pump	DME => DC pump	DME => Electric fuel pump control (PWM) => Double pump system
Fuel delivery pressure [bar]	3-6	5	3-6
Camshaft drive	2x double-roller chain	Double-roller chain	2x single-roller chain
Variable camshaft control (VANOS)	2x double (engine oil pressure) oscillating rotor VANOS	Double high-pressure VANOS	2x double high-pressure VANOS
Adjustment range E/A [°KW]	72-130/81-129	70-130/83-128	79-145/91-128
Kingpin inclination E/A [°KW]	58/48	60/45	66/37
Response time E/A [°KW]	256/256	260/260	268/260
Engine weight [kg]	202	217	240

Overview of Special Features

Body:

- M3 Front and rear apron
- Carbon fibre roof in carbon optic, if no optional sliding/tilt sunroof (body colour)
- Gills in front side panels
- M3 outside mirrors
- Aluminium hood with "Power Dome" and air inlet
- M dome braces, thrust panel and underbody V-brace
- Weight-optimized bumper brackets, front and rear
- Optimized heat isolation package
- Optimized noise isolation package
- Optimized underbody panelling, front and rear.

Interior:

- M3 steering wheel
- M gear lever
- M driver foot supports
- M3 seats
- Lighter floor trim (carpet)
- Lightweight design through-loading in rear

17 - E92 M3 cockpit

Electrics:

- M3 Instrument cluster
- M-specific switches for gear lever in the centre console
- Buttons for the tyre pressure system between centre air conditioning outlets
- Intelligent generator control (IGR)
- AGM battery.

Engine:

- New high-engine-speed concept V8 engine S65B40 with MSS60 engine control system
- M3 Air intake guide
- M Individual throttle butterflies
- M Ion-flow combustion monitoring
- M VANOS
- M3 Exhaust system

Drive:

- Dual-disc clutch used in an M3 for the first time
- M 6-gear manual transmission
- Fully variable M differential with locking action

Chassis:

- M3 Rims, tyres
- M3 Compound brake system
- Adapted front axle carrier, M front axle components
- Servotronic hydraulic steering, M steering-gear ratio
- Adapted rear axle carrier,
  M rear axle components

M-specific options:

- MDrive menu
- EDC-K
- 19" M3 rims, tyres
- Seat back width adjustment (passive)
- Enhanced leather interior
- High speed down-control option 7ME "M Driver's Package" (280 km/h).

Individualization options:

- BMW Individual High End audio system
- Individual highly-polished shadow line
- Individual interior trim
- Individual paint finishes.

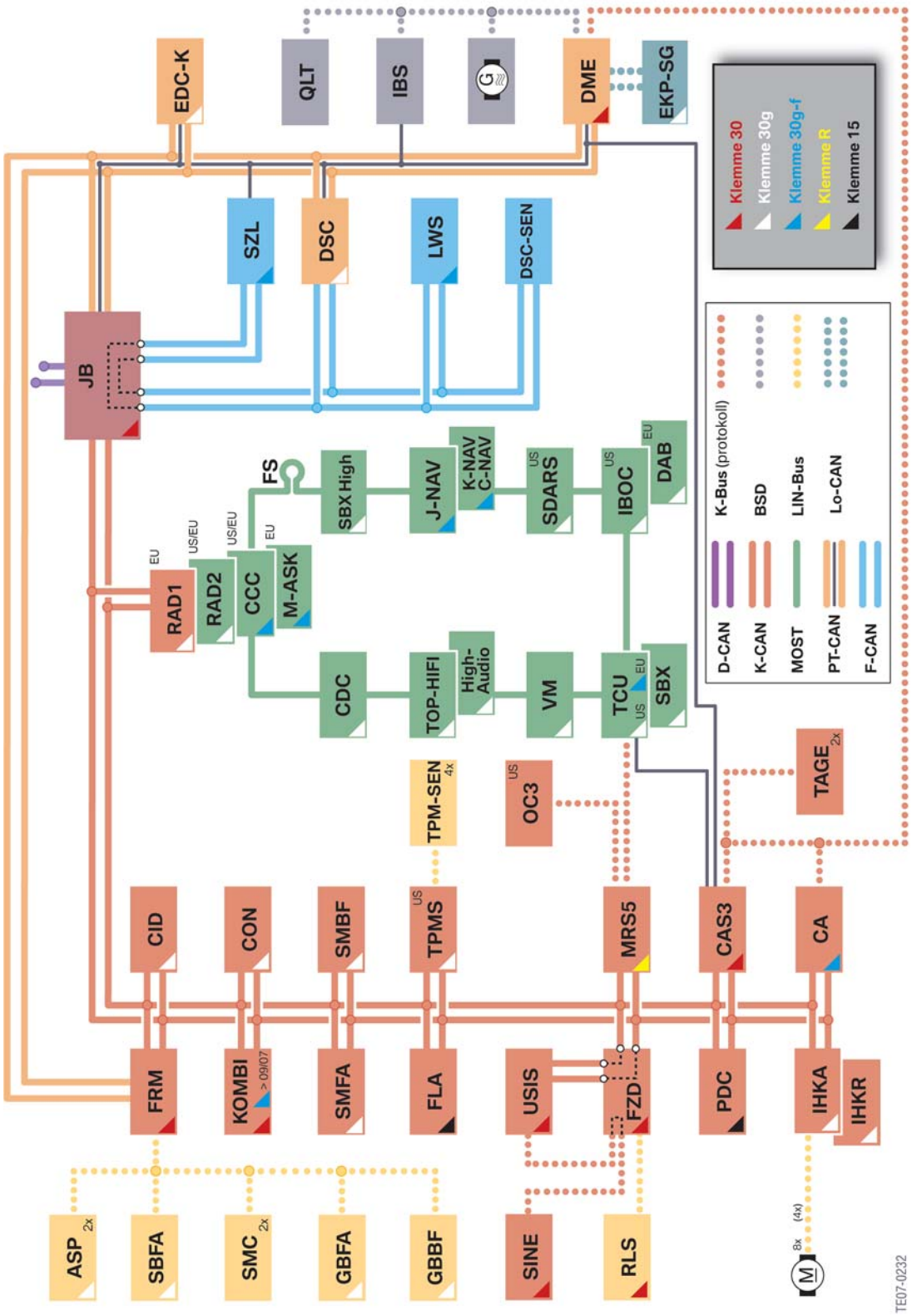
Competitor comparison

Designation/Unit of Measurement	E92 M3	Porsche 911 Carrera	Audi RS4	MB CLK 63 AMG
Engine configuration/no. of cylinders/Valves per cylinder	V8 / 4	Boxter 6/4	V8 / 4	V8 / 4
Cylinder capacity [cm^3]	3999	3596	4163	6208
Bore/Stroke [mm]	92/75.2	96.0/82.8	84.5/92.8	102.2/94.6
Power [hp/kW] at speed [rpm]	420/309 8300	325/239 6800	420/309 7800	481/354 6800
Torque [Nm] at speed [rpm]	400 3900	370 4250	430 5500	630 5000
Compression ratio, Type of fuel [RON]	12.0:1 98	11.3:1 98	12.5:1 98	11.3:1 98
Power [hp] per litre	105.0	90.4	100.9	77.5
EU unladen weight [kg]	1655	1470	1725	1755
EU power to weight ratio [kg per PS]	3.94	4.52	4.11	3.65
Acceleration 0-100 km/h [s]	4.8	5.0	4.8	4.7
V_{max} [km/h] * electronically limited	250* (280)	285	250*	250*
Drive type	Rear axle	Rear axle	All-wheel	Rear axle
Transmission	6-gear	6-gear	6-gear	7-gear automatic
Type of tyres, front/rear	245/265-40 ZR 18	235/265-40 ZR 18	4x255-40 ZR 18	255-40/35 R18
EU consumption, total [litres/km]	12.4	11.0	13.4	14.2
Tank capacity [litres]	63	64	63	62
EU-CO_2 emission [g/km]	295	266	322	338
Permitted emissions limits	EU 4	EU 4	EU 4	EU 4
Length/width/height [mm]	4615/1804/1418	4427/1808/1310	4586/1816/1415	4652/1740/1413
C_wxA	0.68	0.56	0.67	NA
Wheelbase/turning circle [mm/m]	2761/11.7	2350/10.9	2648/11.3	2715/10.76
Track width front/rear [mm]	1540/153	1486/153	1559/156	1493/1474
EU payload [kg]	500	340	482	420
Load volume [litres]	430	135	460	435

System overview.
E92 M3 Complete vehicle.

Vehicle electrical system/terminal status

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

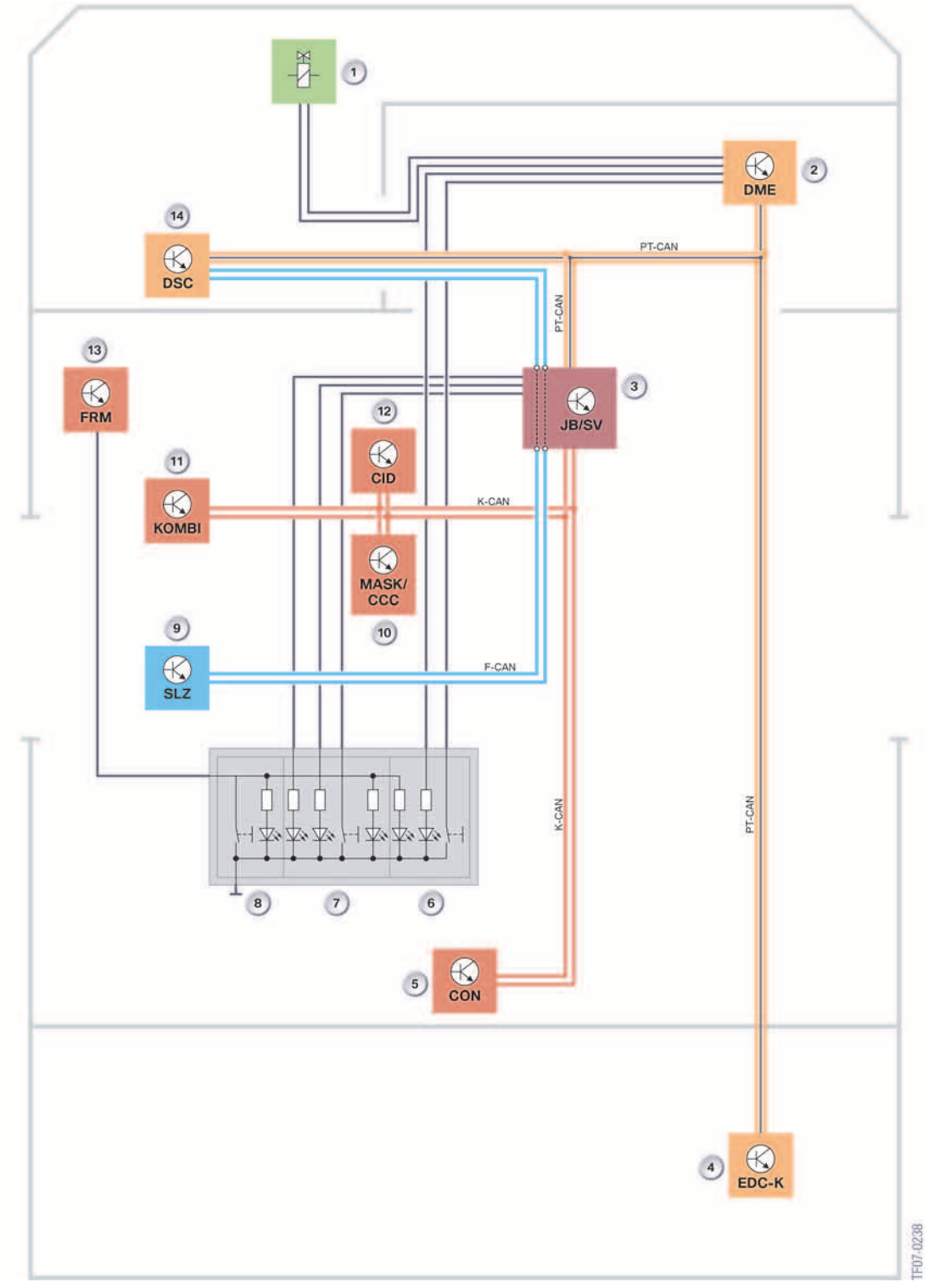


1 - E92 M3 vehicle electrical system overview and terminal status

Index	Explanation	Index	Explanation
ASP	Outside mirrors	IHKR	Integrated heating/air conditioning system
CA	Comfort Access	JB	Junction box
CAS	Car Access System	KOMBI	Instrument cluster
CCC	Car Communication Computer	LWS	Steering angle sensor
CDC	(Compact) CD changer	M-ASK	Multi-audio system controller
CID	Central information display	MRS5	Multiple restraint system, 5th generation
CON	Controller	OC3	Seat occupancy detector mat (US)
DAB	Digital Audio Broadcast	PDC	Park distance control
DME	Digital motor electronics	QLT	Quality, level, temperature oil sensor
DSC	Dynamic Stability Control	RAD	Radio1 or Radio2
DSC-SEN	DSC sensor	RLS	Rain light sensor
SINE	Emergency current siren/tilt	SBFA	Switch block, driver's door
EDC-K	Continuous Electronic Damping Control	SBX	Interface box (ULF functionality)
EKP	Electric fuel pump control unit	SBX High	Interface box High (Bluetooth telephony, voice input and USB/audio interface)
FLA	High beam assistant	SDARS	Satellite tuner (US only)
FRM	Footwell module	SMBF	Passenger's seat module
FS	MOST direct access	SMC	Stepper motor controller
FZD	Roof function centre	SMFA	Driver's seat module
GBBF	Seat belt extender controller, front passenger	SZL	Steering column switch cluster
GBFA	Seat belt extender controller, driver	TAGE	Outside door handle electronics
High-Audio	BMW Individual High End Audiosystem	TCU	Telematics Control Unit
IBOC	In Band On Channel (Digital Radio)	TOP-HiFi	Top-HiFi amplifier
IBS	Intelligent battery sensor	USIS	Ultrasonic passenger-compartment sensor
IHKA	Integrated automatic heating/air conditioning system	VM	Videomodule (only for US)

MDrive

MDrive system circuit diagram



2 - E92 M3 MDrive system circuit diagram

Index	Explanation	Index	
1	Servotronic valve	8	DSC button
2	DME MSS60	9	Steering column switch cluster
3	Junction box distribution box	10	Multi audio system controller/Car Communication Computer
4	Electronic Damping Control controller	11	Central information display
5	iDrive controller	12	Instrument cluster
6	POWER button	13	Footwell module
7	EDC button	14	Dynamic Stability Control

The MDrive option

The MDrive menu known from the M5/M6 is now also available as an option (SA 2MD) in the M3.

Starting from the iDrive main menu, the MDrive menu can be called up by pressing on the iDrive controller and selecting M settings.

The iDrive controller can be used to configure the different MDrive settings ready to be called up.

The overall setting is called up/activated by pressing on the M button on the steering wheel. Pressing the M button again or restarting the vehicle deactivates the settings. The settings can, of course, be retrieved again using the M button.

The following is a list of menu items with selection options that are currently available in the MDrive menu:

- M Engine Dynamics Control (Power)
  - "Unchanged"
  - "Normal"
  - "Sport"
  - "Sport Plus"
- DSC
  - "Unchanged"
  - "OFF"
  - "ON"
  - "M Dynamic mode"
- Servotronic
  - "Normal"
  - "Sport"
- EDC-K (only if fitted)
  - "Unchanged"
  - "Comfort"
  - "Normal"
  - "Sport".

By selecting "Unchanged", when the M button is pressed (i.e. the settings in the MDrive menu are called up), the current settings of this system are retained.

Example:
The driver has deactivated the Dynamic Stability Control function using the DSC button.

MDrive setting: M Engine dynamics control "Sport Plus"; DSC "Unchanged"; Servotronic "Sport".

The driver presses the M button on the steering wheel to call up the M settings.

Only the "Sport Plus" and Servotronic "Sport" settings for M engine dynamics control are activated.
DSC remains deactivated.

Information on the menu items

M Engine Dynamics Control (Power)

Apart from "Unchanged", three engine control programs are available;
"Normal", "Sport" and "Sport Plus".

The options determine how spontaneously the engine responds to actuation of the accelerator pedal.
The maximum engine power is not changed.

Using the power button in the centre console, the driver can only choose between "Normal" and "Sport".

"Sport Plus" is only available in the MDrive menu.

3 - E92 M3 centre console with iDrive controller

DSC

Apart from the "Unchanged" setting, in the DSC submenu, the options "OFF" "ON" and "M Dynamic mode" can be selected.

If "M Dynamic Mode" is selected, the Dynamic Stability Control (DSC) permits higher slip values at the wheels.
The system does not activate the stabilizing function until very close to the handling limit range, when it influences engine output and/or actively engages the brakes.

In "OFF" mode, an experienced sports car driver can also completely deactivate the DCS function.

Using the DSC button in the centre console, the driver can switch between "OFF" and "ON" or if "M Dynamic Mode" is active, between "M Dynamic Mode" and "OFF".

"M Dynamic Mode" is only available in the MDrive menu.

EDC-K

If option 223 continuous Electronic Damper Control is fitted together with MDrive, in addition to "Unchanged", three EDC programs can be selected in the MDrive menu: "Comfort", "Normal" and "Sport".

The driver can use the EDC button in the centre console to switch sequentially between the three programs.

Servotronic

The settings that can be selected for the Servotronic steering function are "Normal" and "Sport". Depending on the selection, the appropriate characteristic curve for power-assisted steering is active.

This selection option is only available in the MDrive menu. Without MDrive, the customer has no option, and a fixed programmed speed-dependent characteristic curve is used.

"Key-dependent settings" menu

Under "M settings", the "Key-dependent settings" menu is also available as well as the MDrive menu.
This allows key-specific settings for certain MDrive menu items.

M engine dynamics control and EDC settings are currently possible, which are assigned to the specific key used during the configuration (configuration => ZV closing action => memorizing).

Under the M engine dynamics control menu item, "Normal" or "Sport" can be selected.

In the EDC menu item, the options "Comfort", "Normal" or "Sport" can be selected.

System components.
E92 M3 Complete vehicle.

Body/Interior trim and equipment:

Bodyshell

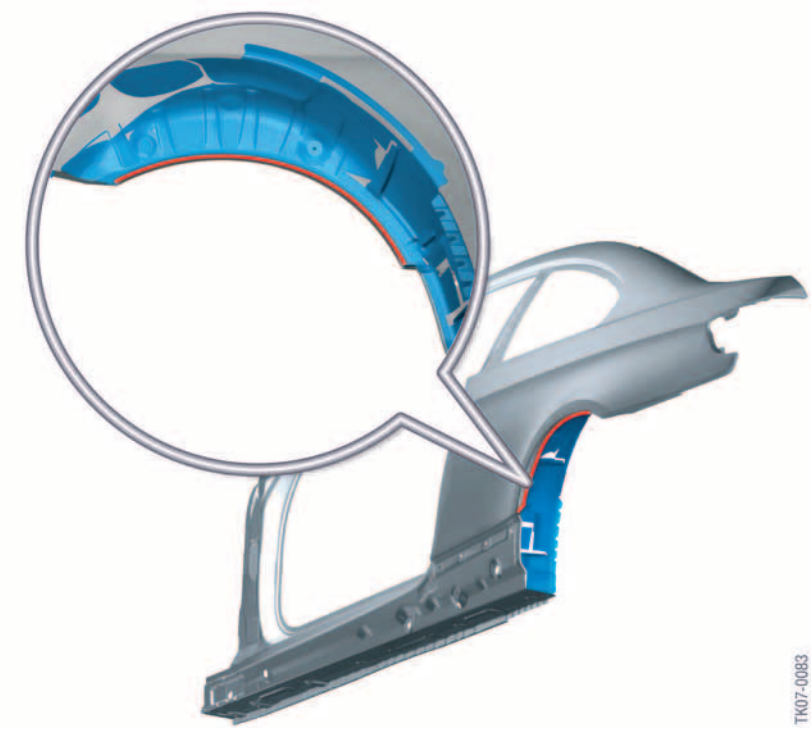
Due to changes to the wheel arch and the carbon roof, the bodyshell components shown in blue have a different part number to the series-model E92.

1 - E92 M3 bodyshell components, view from above

2 - E92 M3 bodyshell components, view from below

New body side panels which are 20 mm wider each side over the flared rear wheel arches are typical of the 'M' design.

To ensure the necessary M3 wheel clearance at the rear wheel arch, the side frame wheel arch has been extended by approximately 20 mm, and the 180° joining lip edge inside the wheel arch has been rolled upwards to further increase the wheel clearance in the wheel housing.

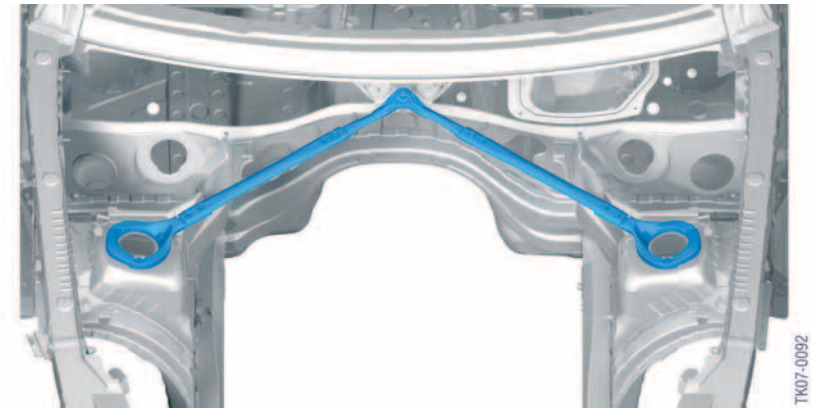


3 - E92 M3 Rear weel arc

Additional reinforcements

4 - E92 M3 Overview of additional bolted-on reinforcements

The E92 M3 is equipped with a v-shaped reinforcement brace in the engine compartment, known as the dome strut, which consists of five separate components. It is secured to the suspension strut dome and screwed centrally to the middle of the bulkhead.



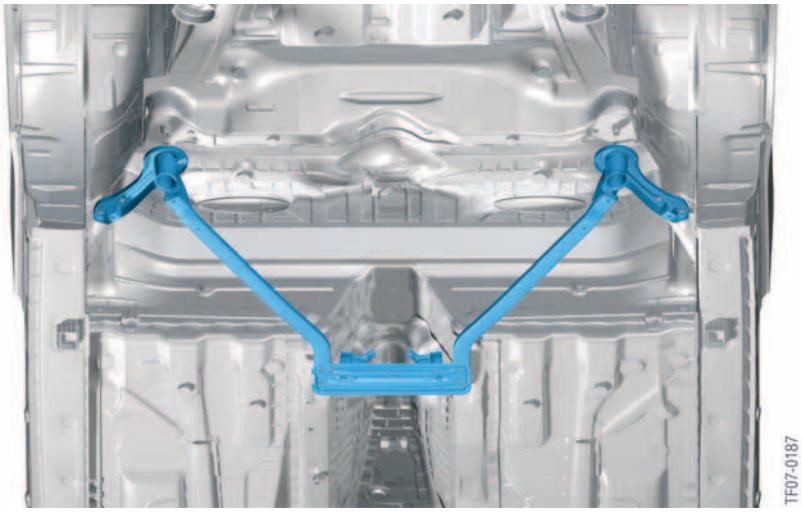
5 - E92 M3 Dome strut

The E92 M3, just like the E46 M3, is equipped with a reinforcement plate, known as the thrust panel, made from aluminium alloy.

The thrust panel primarily increases the torsional strength while also acting as a lower motor cover and oil pan protection. The thrust panel is fitted to the axle carrier with six bolts from below, and has two openings for changing the oil.

6 - E92 M3 thrust panel

The V-shaped braces used in the rear underbody area of the series production E92 have been strengthened and adapted, and in the M3 are permanently welded to the tension strut and screwed to the body with the transmission tunnel bridge (in the series E92 they are screwed to the tension strut and welded to the bridge).
The bridge has been strengthened and adapted. In the M3, it is also used to mount the exhaust line.



7 - E92 M3 Rear axle braces and transmission tunnel bridge

Exterior Body

8 - E92 M3 View of M3-specific external body components

9 - E92 M3 View of M3-specific external body components

The doors and the tailgate are taken from the series-model E92. All other external body components are new.

- New "Powerdome" aluminium hood lid with air apertures. The aperture on the left when viewed in the direction of travel is used for incoming engine air, and the right-hand aperture offers optical symmetry.

10 - E92 M3 Power Dome aluminium hood lid

- The roof on the E92 M3 is manufactured from carbon fibre. This has reduced the overall vehicle mass on the upper level of the car by approximately 5 kg, therefore considerably lowering the centre of gravity. Unlike the E46 M3 CSL, a roof rack system can be assembled on the E92 M3 with carbon fibre roof. The carbon fibre roof of the E92 M3 has specific inserts for roof luggage rack brackets.

  The repair procedures and options are similar to or the same as the M6 (see the service literature for more information).

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

11 - E92 M3 Carbon roof

- An advanced plastic material is used for the front side panels, which are wider than those used on the series E92. The side panels include the model-specific "M side gills" with integrated side indicators and M3 emblem.
- The side sills are more highly accentuated, in accordance with the M design criteria.

12 - E92 M3 Front side panel

13 - E92 M3 Side sill trim

- 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.

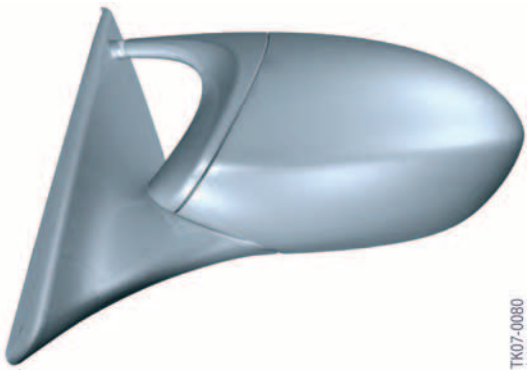
The functions of the outside mirrors are the same as the series production E92. Driver and passenger mirrors are electrically heated and adjusted.

14 - E92 M3 Outside mirrors on the vehicle

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

Outside mirrors with memory and folding functions and/or automatic anti-glare control are optionally available.

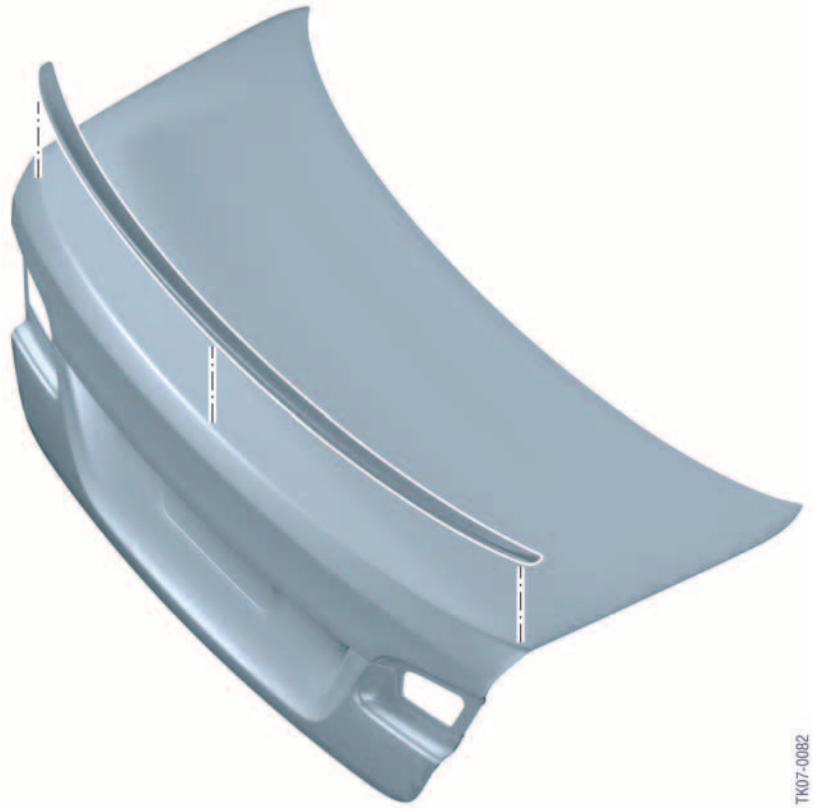
15 - E92 M3 Outside mirror (view from the mirror side)



16 - E92 M3 Outside mirror (view from the trim side)

- The tailgate is taken from the series production E92. The rear spoiler (Gurney) is attached as a standard feature on the E92 M3. It can optionally be removed.

With the option 7ME "M Driver's Package" (high speed limiting), the spoiler is permanently fixed.



17 - E92 M3 Tailgate and spoiler (Gurney)

The new M3 is fitted with larger wheel housing covers that accommodate the larger wheels and flared wheel arches. The front wheel housing cover has been adapted specifically to meet the M3 requirements.

Front wheel housing cover

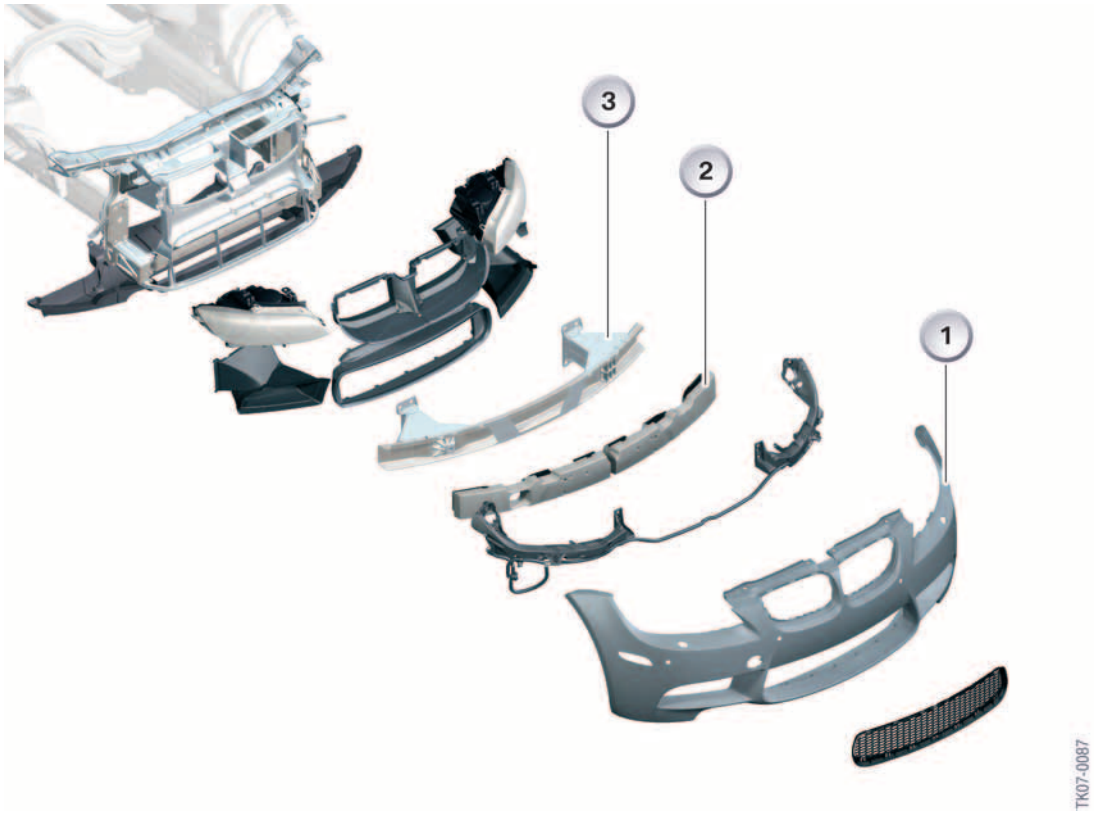
18 - E92 M3 Front wheel housing cover

Rear wheel housing cover

19 - E92 M3 Rear wheel housing cover

Front End Module

The front end module has a new single piece M-specific thermoplastic bumper trim and is fitted to a reinforced lightweight plastic bracket.



20 - E92 M3 Front end module

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

21 - E92 M3 Bumper brackets

22 - E92 M3 Front bumper trim

The bumper trim is colour coded to the car. The front M3 bumper has apertures for the kidney grill, engine air inlet, PDC ultrasonic sensors (optional), the headlight-cleaning system and the mounting for the towing eye. Front bi-xenon headlamp units are identical to the series E92. The M3 front bumper overhang is longer than that of the series E92.

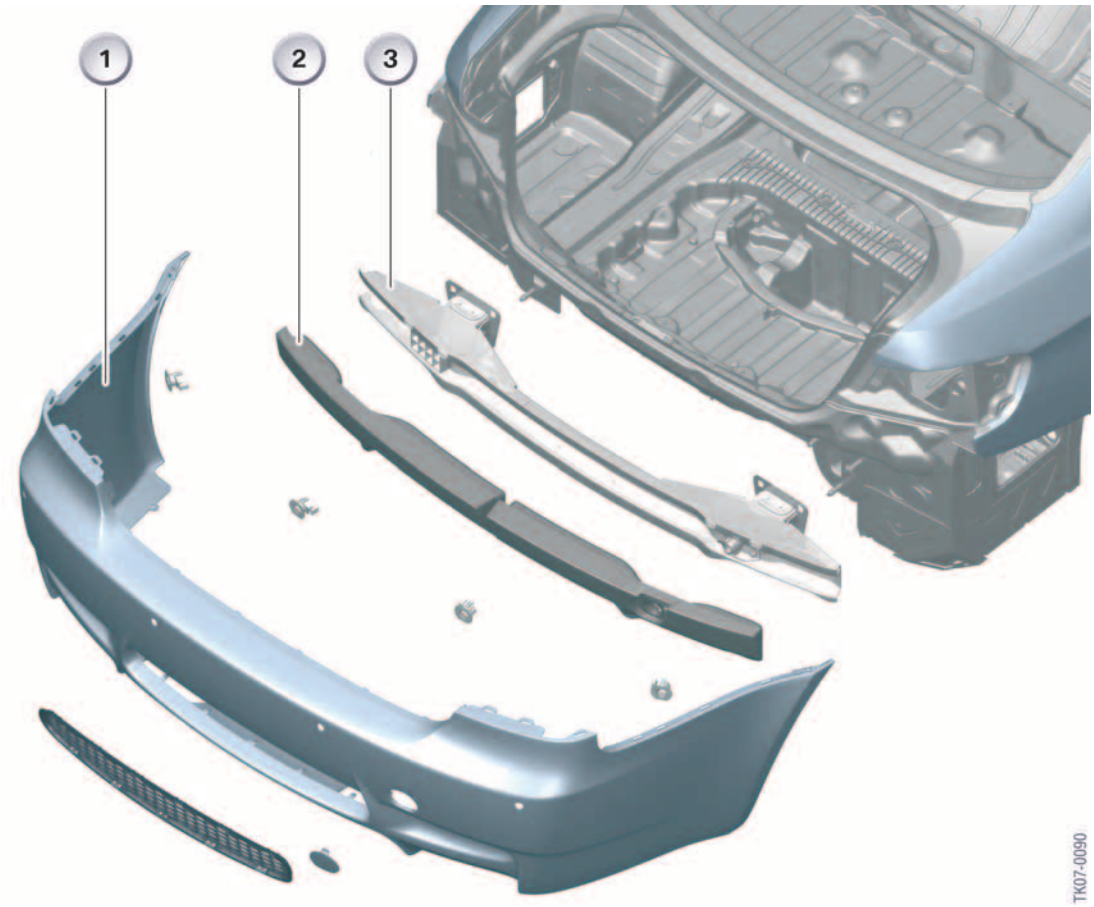
Headlight cleaning system (SWR)

23 - E92 M3 Headlight cleaning system

The container for the M3 headlight cleaning system is new. The design has been changed from the series E92 in order to provide the necessary space for installing the M3 side gills with integrated indicators in the M style. The filler neck and the line for the headlight cleaning system are new, together with the fixed washer nozzles on the bumper trim.

The wiring harness section for the headlight cleaning system has been adapted accordingly.

Rear End Module

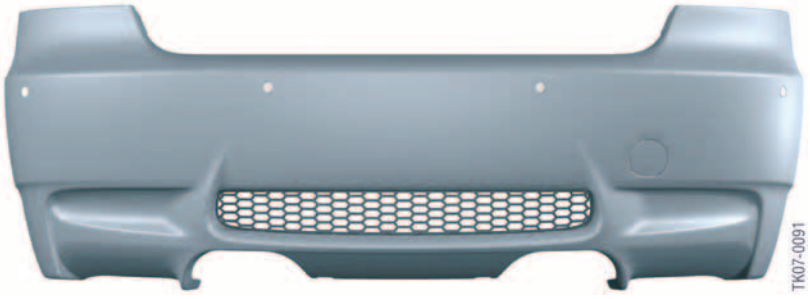


24 - E92 M3 Rear end module

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

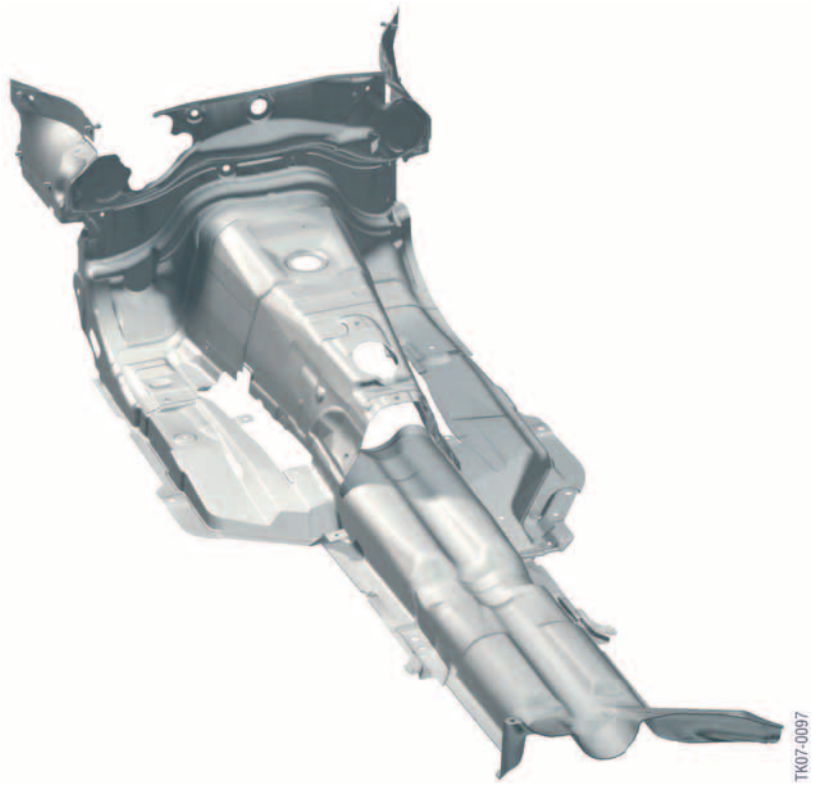
The rear end module also features a new, single-piece bumper trim in the M style made from a special thermoplast material. The bracket is also made from reinforced lightweight plastic.

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



25 - E92 M3 Rear bumper trim

Sound insulating mat and thermal insulation



26 - E92 M3 Sound insulating mat and thermal insulation

New sound insulation and thermal insulation covers have been installed.

The sound-insulating mats are attached in the vehicle interior to the bulkhead and transmission tunnel, and the thermal insulation is mounted in the underbody area of the exhaust system and the engine.

Other underbody panelling

27 - E92 M3 Underbody panelling

The underbody panels have been optimized to ensure the best possible vehicle aerodynamics and the maximum possible cooling capacity for the driveline components.

Interior Body

28 - E92 M3 Implementation of the M Mobility System

The M3 floor insert in the luggage compartment has been modified to accommodate the M Mobility System.

29 - E92 M3 Seat structure

Index	Explanation	Index	Explanation
1	Seat upholstery	3	Seat width adjustment
2	Backrest		

Two M3 seat versions are available: The 'Speed' version is a cloth/leather combination that is included in the standard equipment, and the 'Novillo' is a full leather seat option. The "Novillo" type is also available in an extended version. In the extended version, the bottom of the dashboard and the side walls of the centre console are also covered with leather in a matching colour.

The versions also differ in their covers and stitching.
The frame and the foam structure are identical.

The front head restraints feature the M logo, as in the E6x M5.

In order to provide an enhanced sporting character and more hold, the seat cushions and backrests in European vehicles have been further developed. In US vehicles, only the front seat backrests have been revised. The seat upholstery installed in US vehicles is the same as that used on the E92 series-model sport seat.

The optional backrest width adjustment is a further development of the series E93 sport seat and is available as an option together with a lumbar support. In the M3, this is manually operated (passively).
The rear backrest cover is always black.

The 'Speed' seat is currently only available in a combination of black leather and anthracite fabric covering.

The leather 'Novillo' is currently available in the following finishes:

- Black leather
- Palladium silver leather
- Fox red leather
- Bamboo beige leather

30 - E92 M3 "Novillo" seat in palladium silver

New door trim/side trim panels are used.

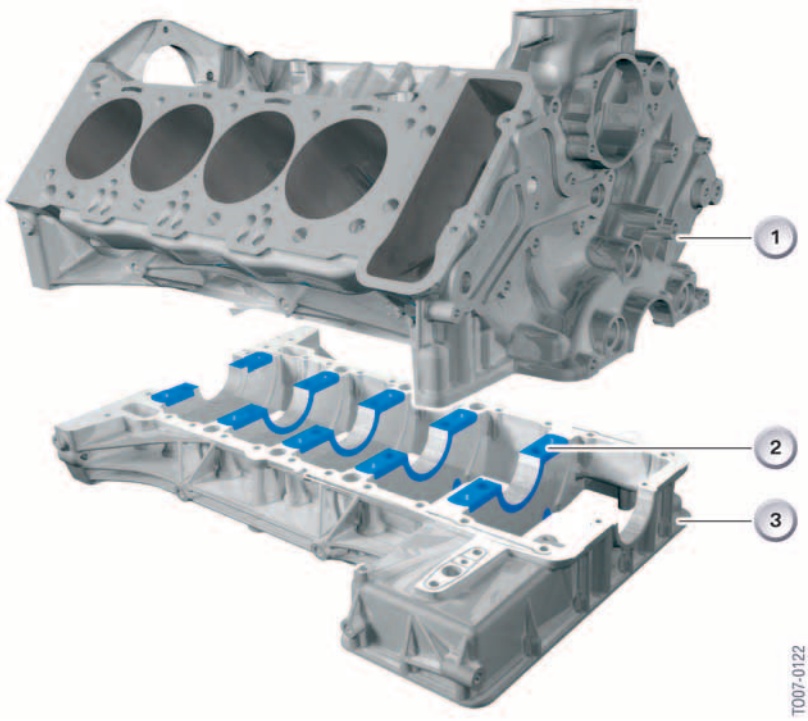
The frame with rear seat bench with through-loading capability has enabled further weight savings in the E92 M3 (similar to the E46 M3 CSL). This is achieved through the use of lighter materials, which are processed using a special method for seat construction in a sandwich design (1).

31 - E92 M3 Sectional view of the frame of a rear seat back (1)

32 - E92 M3 Rear seat bench

S65B40O0 Engine

Engine block with bedplate construction



33 - S65B40 Engine block with bedplate construction

Index	Explanation	Index	Explanation
1	Engine block (upper section)	3	Bedplate construction (lower section)
2	Grey cast iron inlays		

The construction and materials are identical to the S85; the upper low-pressure die-cast crankcase is made from an aluminium-silicon alloy.

The cylinder bores are formed using exposed hard silicon crystals, rendering the use of cylinder liners redundant.

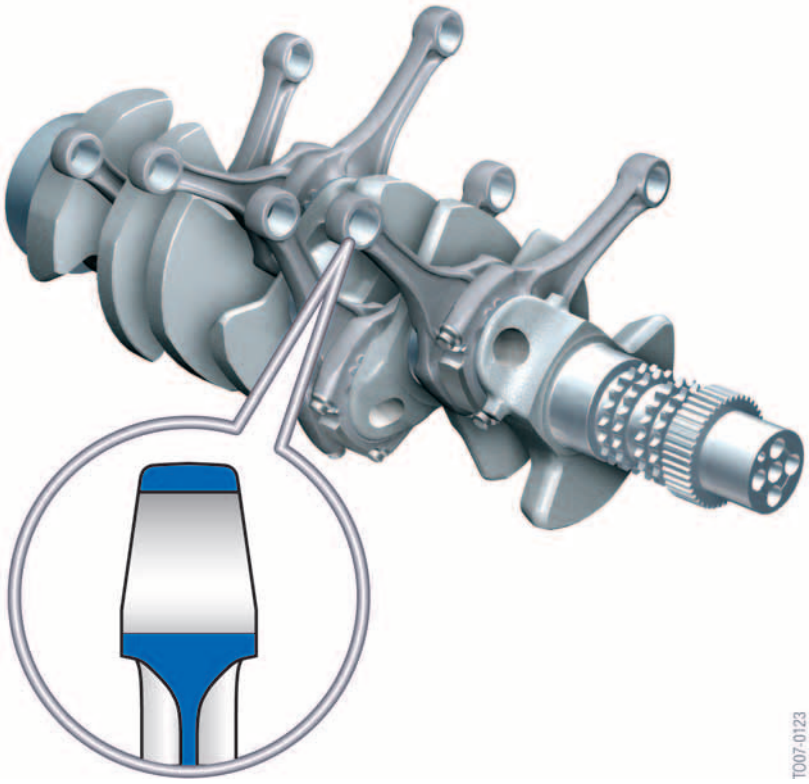
The lower crankcase (bedplate) is also constructed using die-cast aluminium. Due to the extreme forces, grey cast iron inlays are used to reinforce the bedplate construction. These also limit crankshaft bearing clearances over a greater temperature range and thus have a positive effect on the oil flow rate.

Crankshaft

The five-bearing crankshaft is forged from a single piece, including the two double-chain wheels for driving the valve gear. The gear wheel for the oil pump drive is flange-mounted. The cylinder spacing is 98 mm. The crankshaft possesses a high level of bend resistance and high torsional strength at a relatively low weight. The crank pin offset is 90°. The diameter of the main bearing journal is 60 mm. The crankshaft end float is controlled by a thrust bearing located at the fifth main bearing.

For design reasons, the firing order 1-5-4-8-7-2-6-3 was chosen for the S65, instead of the firing order 1-5-4-8-6-3-7-2 more commonly employed in BMW V8 engines.

⚠ The identification marking of the bearing shells is engraved on the crankcase and on the first crank web. ◄



T007-0123

34 - S65B40 crankshaft with magnification of the upper section of the connecting rod

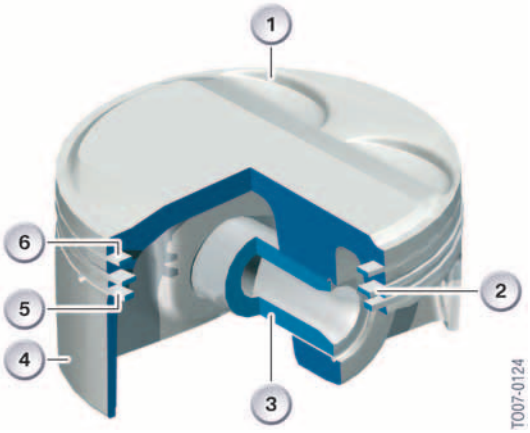
Connecting rods

The weight-optimized, high tensile steel connecting rods split by fracture separation and the pistons are the same as those used in the S85 engine. For weight reduction, the upper section of the connecting rod has a trapezium-shaped cross-section.

⚠ The large connecting rod eye is asymmetrically ground to reduce the length of the engine. This means that the installation is direction-specific.

For the workshop, bearing shells are available in a repair stage (for more information, see the service documentation). ◄

Pistons

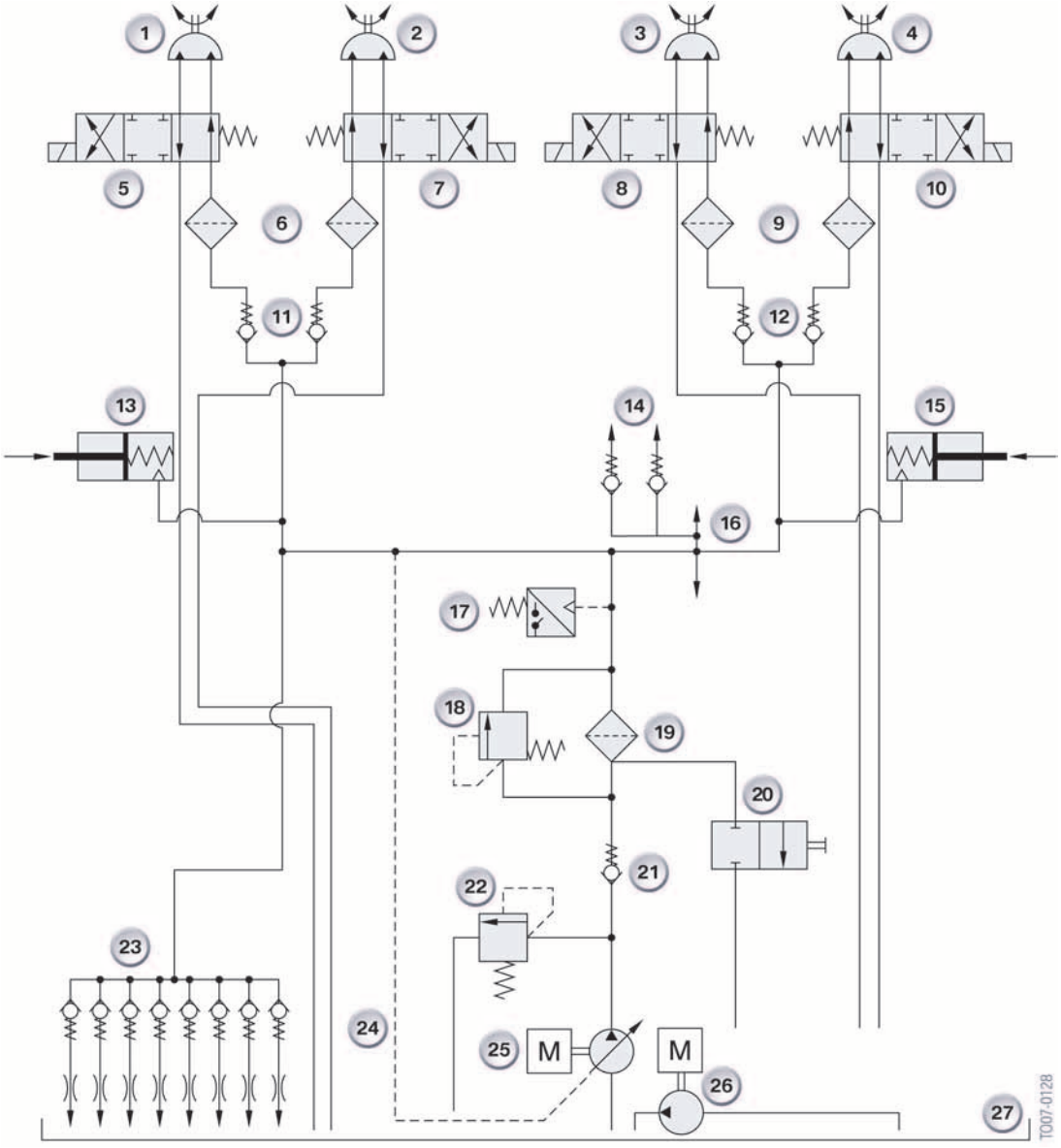


35 - S65B40 Pistons

Index	Explanation
1	Pistons
2	Taper-faced ring
3	Gudgeon pin
4	Piston skirt
5	Oil scraper ring (VF system)
6	Compression ring (plain compression ring with spherical contact face)

A piston is manufactured from a cast aluminium alloy and weighs approximately 480 grams including gudgeon pin and piston rings. The piston design is the same as the S85 piston (piston shaft with galvanized iron coating [Ferrostan] and a running-in layer containing tin. The installation position is direction-specific.

Oil Supply

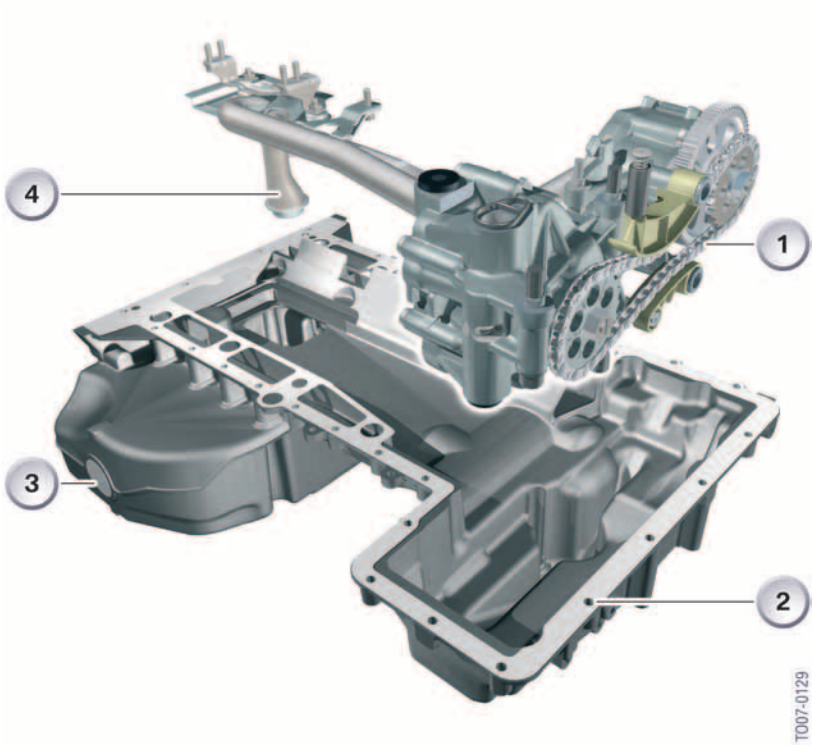


36 - S65B40 Hydraulic schematic of oil supply

Index	Explanation	Index	Explanation
1	Cylinder bank 1 VANOS exhaust hydraulic motor	15	Cylinder bank 2 chain tensioner
2	Cylinder bank 1 VANOS inlet hydraulic motor	16	Main oil channel (lubrication points engine block and cylinder head)
3	Cylinder bank 2 VANOS inlet hydraulic motor	17	Oil pressure switch
4	Cylinder bank 2 VANOS exhaust hydraulic motor	18	Oil filter bypass valve
5	Cylinder bank 1 VANOS exhaust multiway adjustment valve	19	Oil filter
6	Cylinder bank 1 VANOS sieve filter (max. 300 µm) before multiway adjustment valve	20	Oil filter outlet aperture
7	Cylinder bank 1 VANOS inlet multiway adjustment valve	21	Non-return valve
8	Cylinder bank 2 VANOS inlet multiway adjustment valve	22	Pressure limiting valve
9	Cylinder bank 2 VANOS sieve filter (max. 300 µm) before multiway adjustment valve	23	Piston cooling nozzles
10	Cylinder bank 2 VANOS exhaust multiway adjustment valve	24	Oil pressure regulation line
11	Cylinder bank 1 VANOS non-return valve	25	Volume flow-controlled hinged valve main oil pump
12	Cylinder bank 2 VANOS non-return valve	26	Oil return pump
13	Cylinder bank 1 chain tensioner	27	Sump
14	Cylinder bank 1 and 2 non-return valve from chain lubrication		

Two oil pumps are installed in the S65 engine; the oil return pump, which is driven via a gearwheel by a crankshaft, and the volume flow-controlled main oil pump, driven via chain drive by the oil return pump.

In the S85, the VANOS high pressure pump is installed instead of the S65 oil return pump, and the S85 oil return pump is contained in a housing together with the main oil pump (tandem pump).



37 - S65B40 Oil pumps

Index	Explanation	Index	Explanation
1	Oil intake area of the oil return pump	3	Main oil pan
2	Front, smaller section of the oil pan	4	Oil intake area of the main oil pump

Since there is no space to install a tandem pump in the S65, the oil return pump has been moved from the main oil pump housing and installed instead of the VANOS high-pressure pump. This allows the pump drive principle (crankshaft => gearwheel => pump => chain => pump) to be maintained. As in the S85, the volume flow-controlled main oil pump is a hinged-valve oil pump with a feed capacity adjusted to suit the VANOS low-pressure system.

The duocentric design of the oil return pump ensures that oil is always available at the inlet pipe of the main oil pump in the rear area of the oil pan,
i.e. even when braking sharply from high speeds.

The electrical oil return pumps installed in the S85 for scavenging the cylinder heads are no longer required, which results in a further weight saving.
This is made possible by the lower number of cylinders, modification of the oil return routes, and the large capacity of the oil pan.

The oil pan has a capacity of 8.3 litres (S85 9.3 litres).

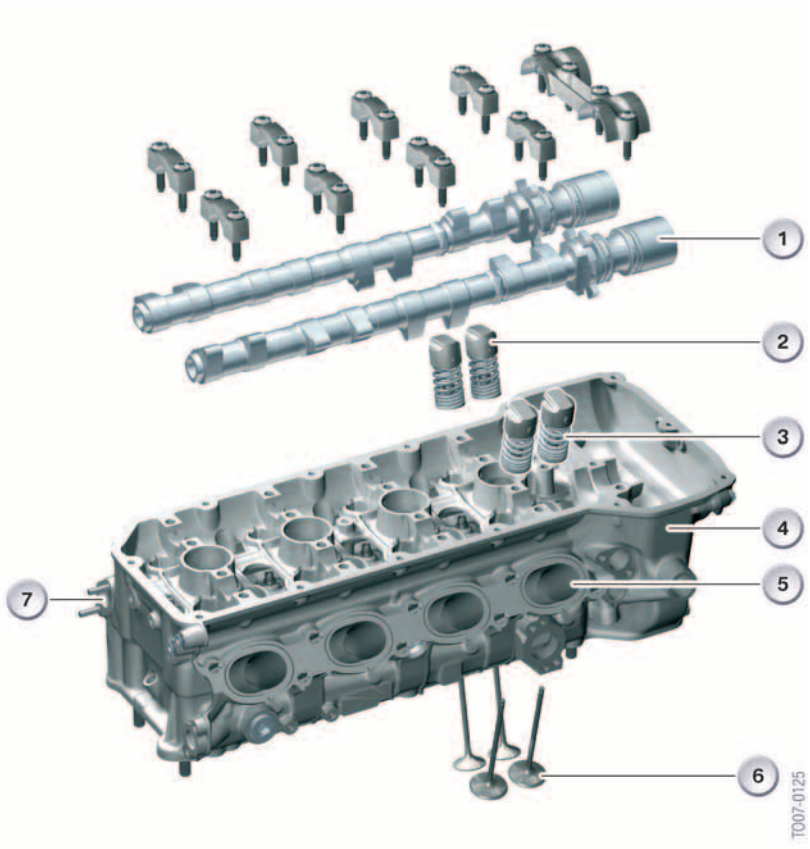
The oil supply is also guaranteed at extreme longitudinal and lateral accelerations of up to 1.4 times the normal gravitational acceleration.

The oil filter housing is installed on the engine.

Cylinder Head

The cylinder head is constructed from a single piece of aluminium alloy.
To reduce the number of sealing faces, the secondary air channel has been integrated back into the cylinder head.
The design of the cylinder head is based on the S85. Changes have been made in the front engine compartment to the VANOS and the timing chain.
The inlet and exhaust tracts have been further airflow-optimized. The integrated idle air channel has been discontinued and replaced by an idle air bar for each cylinder bank.

As in the S85, the camshafts are manufactured as a hollow-cast, one-piece construction with integrated sensor gears. The weight-optimized valves with a 5 mm shaft diameter and the spherical bucket tappets with hydraulic valve clearance adjustment are also used.



38 - S65B40 Cylinder head

Index	Explanation	Index	Explanation
1	Camshaft	5	Intake passage
2	Bucket tappet with hydraulic valve clearance adjustment	6	Valve
3	Beehive-shaped valve springs	7	Connection flange of the integrated secondary air channel
4	Cylinder head		

39 - E92 M3 Bucket tappet

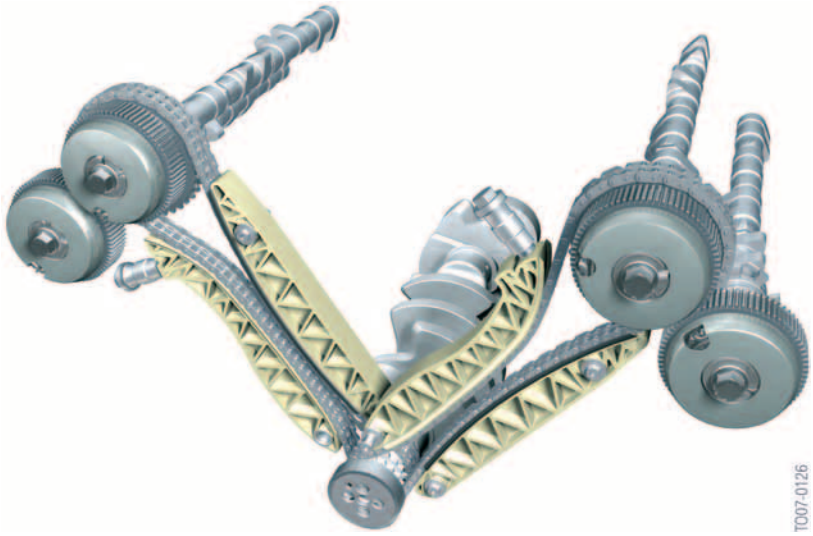
Index	Explanation
1	Spherical contact surface
2	Box tappet
3	Guide lug

These bucket tappets with a cylindrical camshaft contact surface and rotational lock allow a high level of convexity. This results in effective valve lift characteristics with the smallest possible tappet diameter and hence tappet mass (ideal for high engine speeds).

Technical Data	E92 M3	E46 M3	E6x M5/M6
Engine identifier	S65B40	S54B32	S85B50
Valve operation	Bucket tappet	Drag arm	Bucket tappet
Valve head ∅ E/A [mm] Valve shaft ∅ [mm] Valve lift [mm] autom. compensation for play	35/30.5 5 11.35 Yes	35/30.5 6 12 No	35/30.5 5 11.7 E; 11.5 A Yes

Camshaft drive

As in the S85, the inlet camshafts are driven by chain drive and the exhaust camshafts are driven by a gearwheel drive. This means that the inlet and exhaust camshafts always have an opposite direction of rotation. In contrast to the S85, which works with two single-roller chains between the crankshaft and the inlet crankshafts, in the S65, two double-roller chains are installed. This is because of the higher chain drive load in the V8 S65.



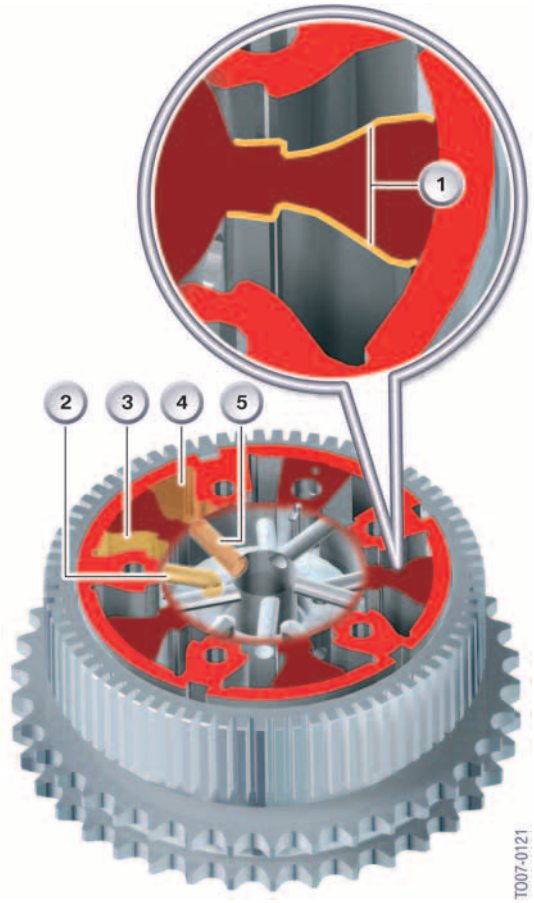
40 - S65B40 Drive valve control

Technical Data	E92 M3	E46 M3	E6x M5/M6
Engine identifier	S65B40	S54B32	S85B50
Camshaft drive	2x double-roller chain	Double-roller chain	2x single-roller chain

The VANOS adjustment units are an integral component of the valve control and are mounted on the relevant camshaft by a central bolt.

⚠ The central bolts of the inlet and exhaust side have a CCW thread, please refer to the repair instructions. ◄

VANOS



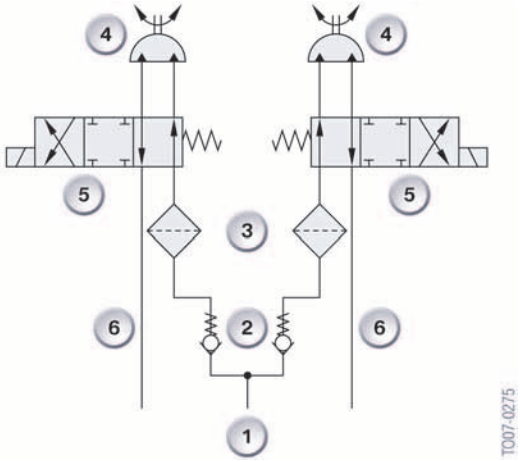
41 - S65B40 VANOS hydraulic motor

Index	Explanation
1	Optimized hydraulic rotor pressure surfaces
2	Optimized inlet channel oil chamber 1
3	Oil chamber 1
4	Oil chamber 2
5	Optimized inlet channel oil chamber 2

The compact double VANOS system fitted to the S65 engine operates at normal oil pressure, unlike the S85 engine (which uses high oil pressure). The low-pressure system means that the high-pressure pump and additional pressure lines and reservoir are unnecessary. This results in a space saving as well as a weight reduction of approx. 8.4 kg.

This has been made possible by the considerably stronger switching moments at the camshaft compared to the 10-cylinder and 6-cylinder engine, particularly in the lower engine speed range. The low-pressure system uses these switching moments to adjust the overall gear ratio.

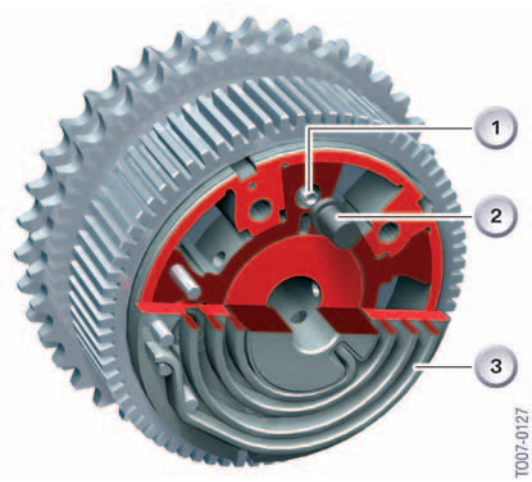
The oil is directed to the sealed oil chambers (3 and 4) of the VANOS adjustment unit. When the chambers are pressurized with oil pressure, one chamber allows the camshaft to advance whilst the other chamber allows the camshaft to retard.



42 - S65B40 VANOS Hydraulic schematic of a cylinder bank

Index	Explanation
1	Oil supply from the main oil gallery
2	Non-return valves
3	Sieve filter upstream from control valves
4	Hydraulic motor at the inlet and exhaust camshaft
5	Multiway adjustment valves inlet and exhaust side
6	Oil return flange to the oil sump

The VANOS oil pressure is supplied by the engine's main oil pump. The VANOS oil flow is controlled by one multiway valve for each camshaft. These VANOS multiway valves are controlled by the MSS60 and are directly installed in the cylinder head.



43 - S65B40 VANOS hydraulic motor

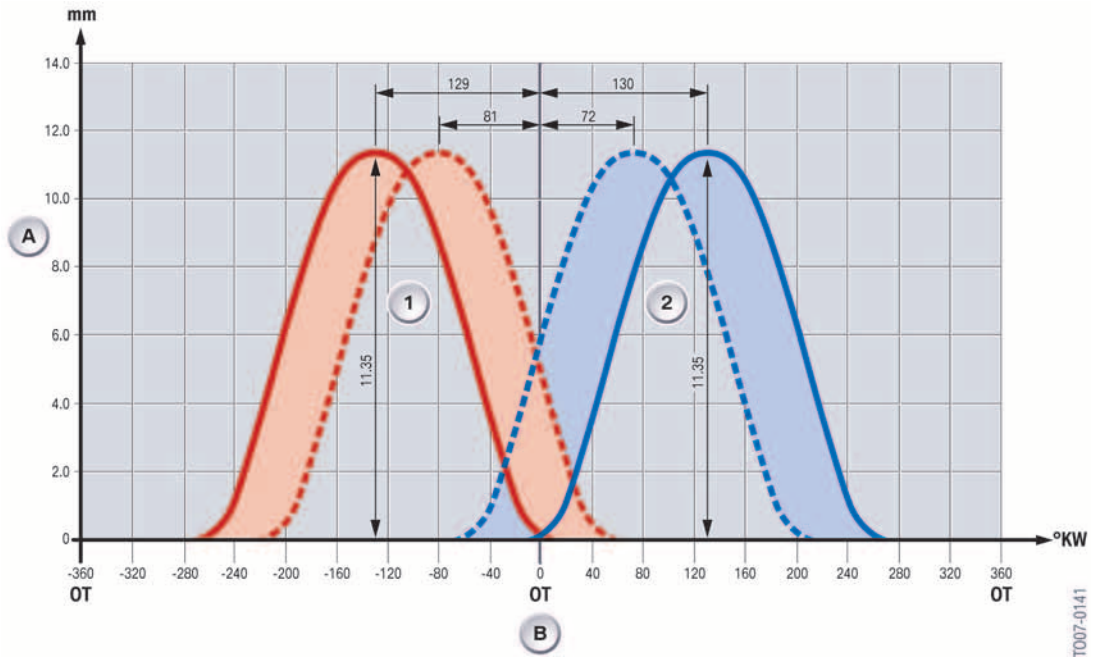
Index	Explanation
1	Locking pin spring
2	Locking pin
3	Spiral-wound spring

As with the S85, the VANOS adjustment unit of the inlet camshaft drives the VANOS adjustment unit of the exhaust camshaft by means of a constantly meshed gear.

At zero pressure, a locking pin (2) also holds the VANOS unit in the normal position or engine start position.

The spiral-wound spring (3) is also used for coordinating the adjustment time between the advance and retard adjustment.
In contrast to AG petrol engines, the spiral-wound spring for the inlet and exhaust sides is mounted in the opposite working direction, since the camshafts in the S65 rotate in the opposite direction.

The principle of action of the hydraulic motor in this M VANOS is based on the VANOS in current BMW petrol engines and is optimized for the S65 in terms of oil supply and drainage diameters, and in the rotor surface area.



44 - S65B40 Control diagram

Index	Explanation
A [mm]	Valve lift
B [°]	Crankshaft angle
1	Exhaust camshaft
2	Inlet camshaft

The setting angle of the inlet camshaft is 58° in relation to the crankshaft. The exhaust camshaft has a setting angle of 48°. As in the S85 engine, this VANOS also reaches an adjustment rate of 360° camshaft per second.

⚠ The service instructions should be followed exactly. TheVANOS adjustment unit must not be disassembled. ◄

Technical Data	E92 M3	E46 M3	E6x M5/M6
Engine identifier	S65B40	S54B32	S85B50
Variable camshaft control (VANOS)	2x double (engine oil pressure) oscillating rotor VANOS	Double high-pressure VANOS	2x double high-pressure VANOS
Adjustment range E/A [°KW]	72-130/81-129	70-130/83-128	79-145/91-128
Kingpin inclination E/A [°KW]	58/48	60/45	66/37
Response time E/A [°KW]	256/256	260/260	268/260

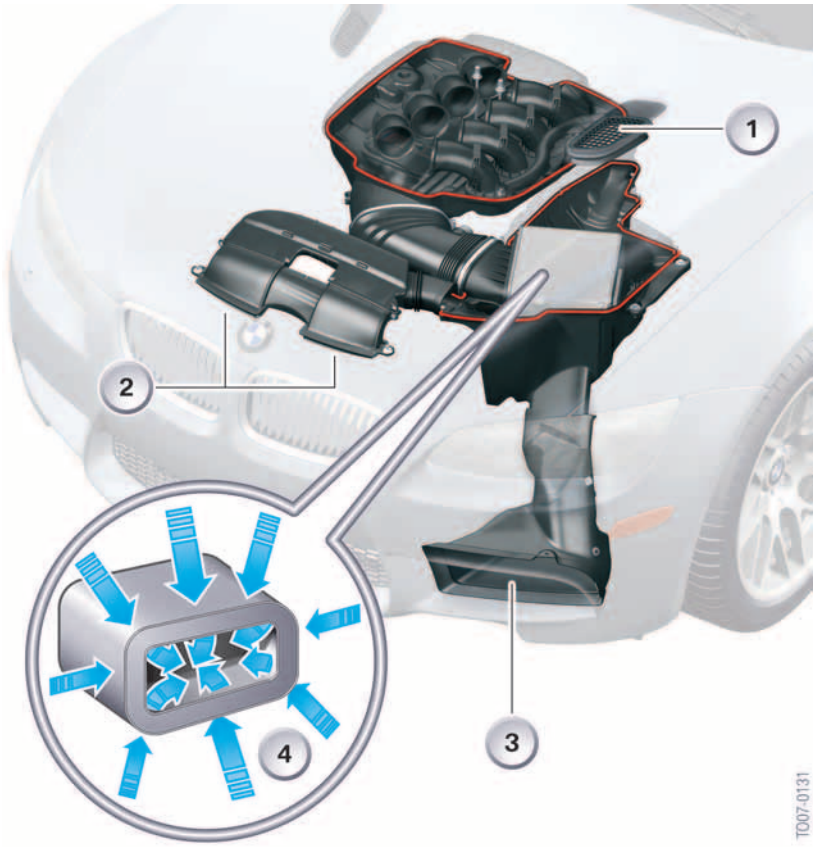
Ancillary belt drive

The main belt drive drives the coolant pump and the generator, while the auxiliary belt drive drives the air conditioning compressor and the power-assisted steering pump.

The generator and the coolant pump are in the same position as in the S85. The coolant pump is identical to the S85, but has a larger belt pulley.

45 - S65B40 Belt drive

Air intake guide/Oil separator/Secondary air system



46 - S65B40 Air intake guide

Index	Explanation	Index	Explanation
1	Engine hood air inlet	3	Air inlet in the bumper
2	Air inlet behind the ornamental grilles of the BMW kidney	4	Air filter element

The combustion air enters the engine via three flow-optimized air guides. An air inlet is located on the left side of the engine hood when viewed in the direction of travel. To maintain an optical balance in the appearance of the engine hood, another intake grill is located on the right-hand side, but this is blinded and does not perform any function.

The second air inlet guide is located behind the kidney grilles of the BMW kidney.

The third air inlet guide is on the left below the front bumper.

The S65 has a large, single-piece air collector for the intake air to both cylinder banks.

A cylindrical air filter element (4) with an enlarged surface area is used.

The filtered air flows into the intake manifold, from where it flows through eight integrated individual inlet pipes and into the individual throttle valve assemblies.

To optimize air resistance, no air-mass sensor is installed in the intake area.
The air flow is determined using a model-based calculation from the aperture of the throttle valve assemblies and the idle speed actuator, the VANOS adjustment position, the engine speed, the air temperature and the atmospheric pressure.
For safety reasons, an additional pressure sensor is mounted in the idle speed system (see idle speed control).

Oil separators

47 - S65B40 Oil separator connection point to the intake manifold

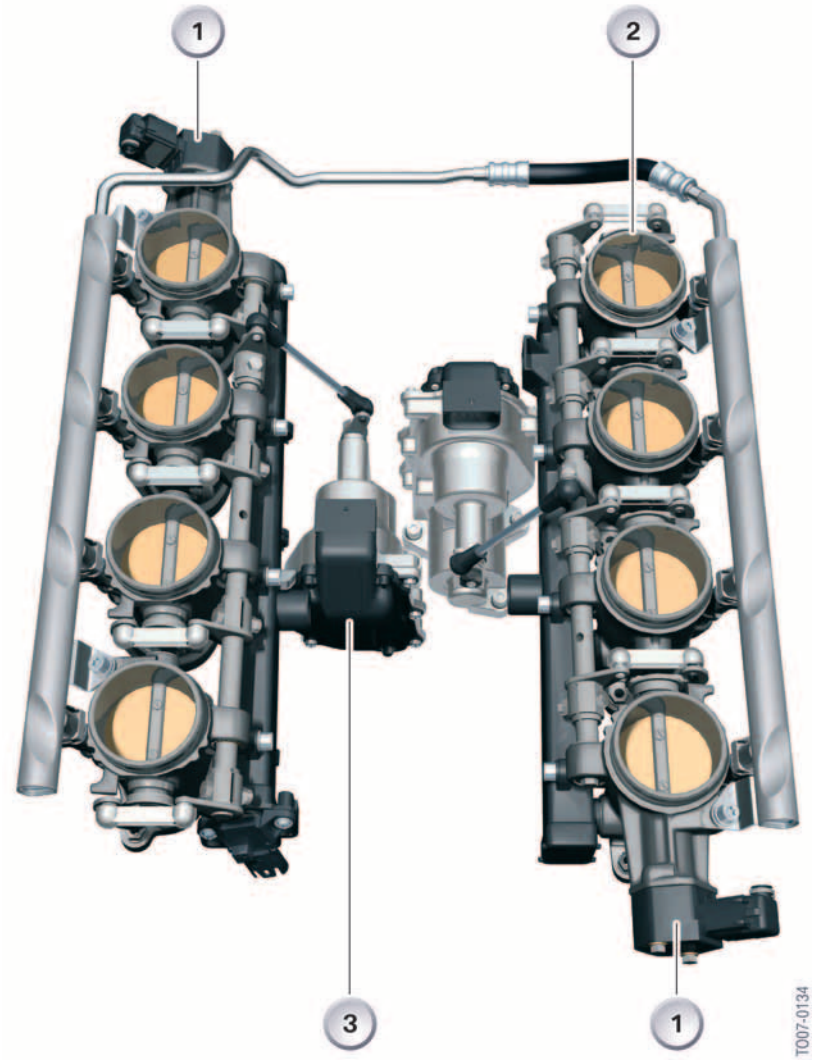
The oil separators are bolted onto the cylinder head covers. The connection between the oil separator and the intake manifold is not screwed but plugged. This reduces the risk of incorrect assembly.

As is typical for the M series, no crankcase pressure control is mounted/integrated.

Secondary air system

The secondary air pump is mounted on the rear side of the engine in the "V" of the cylinder banks. The secondary air is guided into the relevant exhaust channel via a check valve and an air channel integrated in the cylinder head. An upstream secondary air pump hot-film air-mass sensor measures the secondary air flow. The structure and function are the same as the system in the E60 M5 and are described in the PI E60 M5.

Individual throttle butterfly system



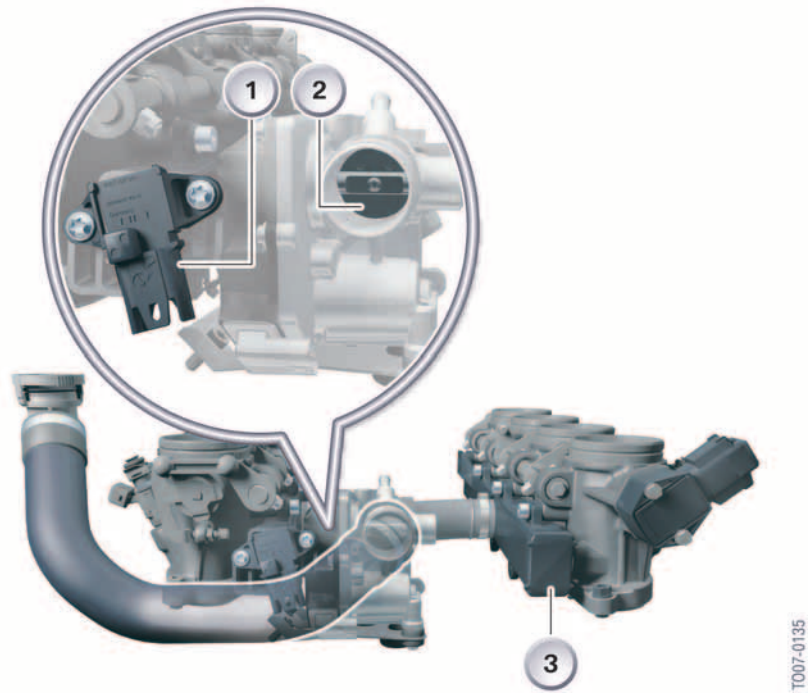
48 - S65B40 Single throttle valve system

Index	Explanation	Index	Explanation
1	Double throttle valve sensor cylinder bank 1 and 2	3	Electrical throttle-valve actuator
2	Individual throttle valve assemblies		

The design principle of the S65 individual throttle valve air intake system is the same as the S85 and consists of eight individual throttle valve assemblies and two electrical throttle valve actuators. One electric throttle valve positioner activates four individual throttle butterflies of one cylinder bank, which are mechanically coupled. The throttle valve position for each cylinder bank is recorded using a double throttle valve sensor on the shared throttle body shaft. A signal is sent directly to the throttle valve actuator responsible for this cylinder bank. The throttle valve actuator can therefore independently adjust the throttle valve position specified by the MSS60.
The second signal is sent to the MSS60 for checking purposes.

For communication with the MSS60, the two electrical throttle valve actuators use a shared DK-CAN bus (DK-CAN).

Idle control system



49 - S65B40 Idle speed air system

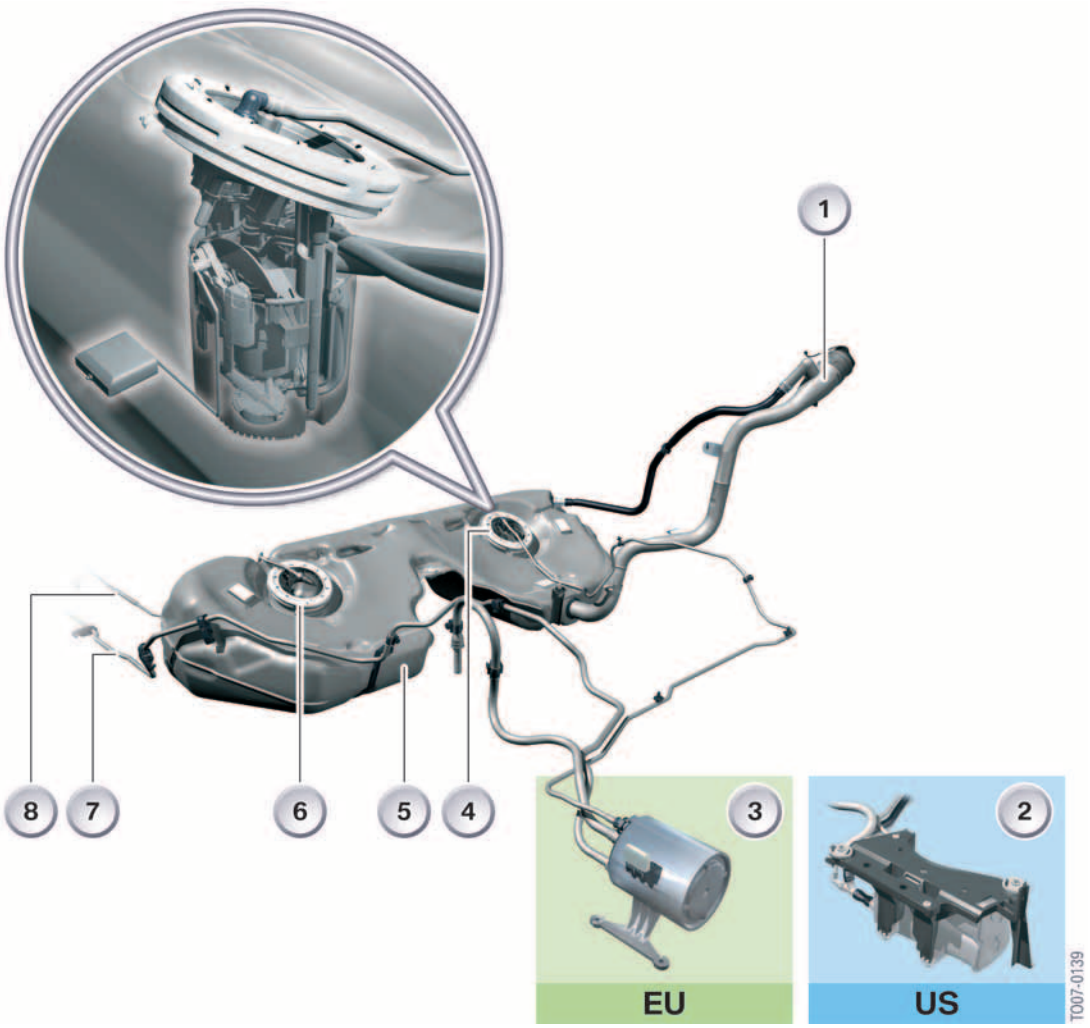
Index	Explanation	Index	Explanation
1	Pressure sensor on idle air bar, cylinders 5-8	2	Throttle valve
3	Idle air bar, cylinders 1-4		

One common idle speed actuator for both cylinder banks controls the air supply at idle speed and at low engine loads. The idle speed actuator is located in the V formed by the two cylinder banks, and controls the idle air supply using a throttle valve. The air enters the shared bar for each cylinder bank via the relevant air ducts, and from there is guided into each throttle body below the throttle valve.

The idle speed actuator receives control instructions from the MSS60 via its own local CAN bus (LoCAN).

To ensure emergency operation in the event of the failure of one or both throttle valve sensors (even without the hot film air-mass sensor), an additional pressure sensor is integrated on the idle air bar (as in the S54B32HP (M3 CSL)). This allows evaluation of the pressure conditions behind the throttle valves. This pressure is also used for the plausibility check of filling and load in normal operation.

Fuel supply system



50 - E92 M3 Fuel supply system

Index	Explanation	Index	Explanation
1	Tank filling supports	5	Fuel tank
2	Tank leakage diagnosis unit	6	Left fuel supply unit
3	Activated carbon filter	7	Tank vent line
4	Right fuel supply unit	8	Engine fuel supply line

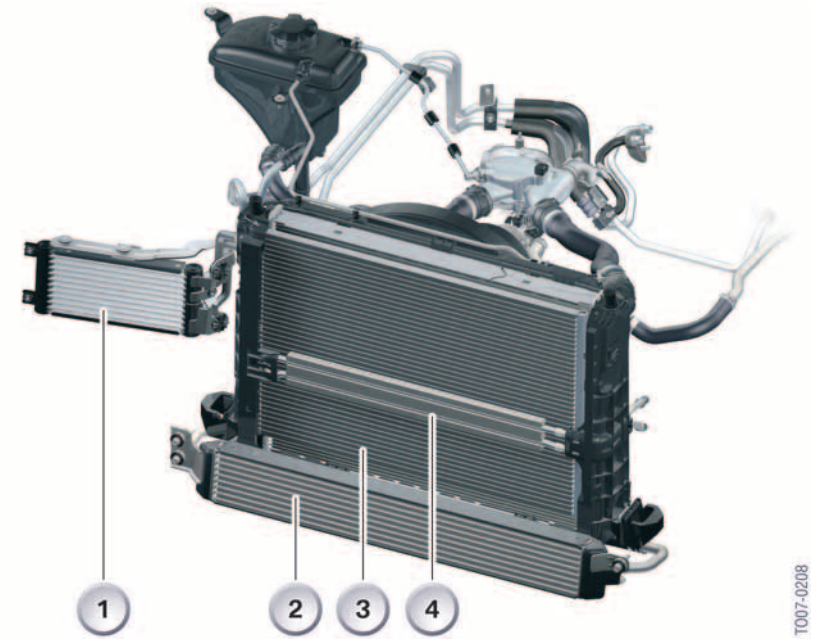
The fuel tank is based on the series E92 tank, although the shape has been changed to accommodate the exhaust system. Both in-tank units are new. The fuel pump is installed in the right-hand unit, and the pressure regulator is installed in the left-hand unit in front of the fuel filter.
The ventilation lines have been adapted, while all other lines have been taken from the E92 335i. The US release is fitted with a tank leakage diagnosis unit.

The electrical controls are described in the MSS60 engine control system.

Cooling System

51 - E92 M3 Oil cooler

Index	Explanation	Index	Explanation
1	Gearbox oil cooler	2	Engine oil cooler



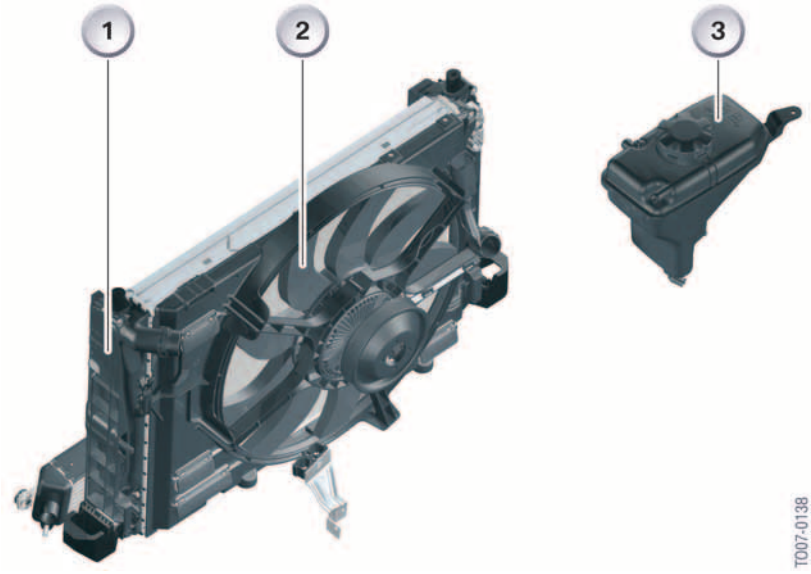
52 - E92 M3 complete cooler package

Index	Explanation	Index	Explanation
1	Gearbox oil cooler	3	Engine coolant cooler
2	Engine oil cooler	4	Steering oil cooler

The mechanical coolant pump was taken from the S85.
The water pump belt pulley has been adapted due to the reduced water flow rate in the S65 compared with the S85 and has a larger diameter, which has allowed a reduction in pump speed.

A one-piece crossflow radiator is used to cool both banks, unlike the S85 engine which has a two-piece radiator, one part for each bank.

The following components have been adjusted for the M3: The expansion tank for the coolant, the crossflow radiator, the radiator hoses, the thermostat and the electric fan. The gear oil and steering oil coolers are also installed in the series-model E92.



53 - E92 M3 Engine radiator

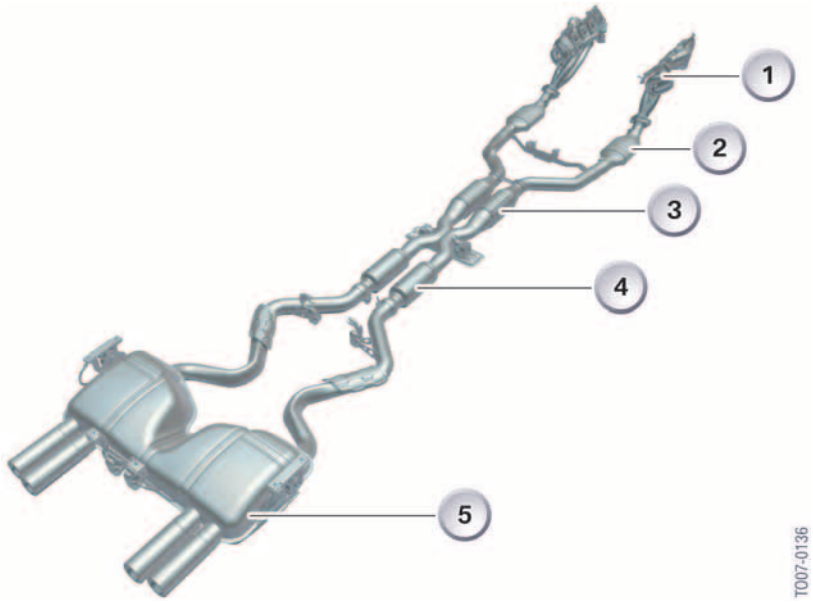
Index	Explanation	Index	Explanation
1	Engine cooler package	3	Expansion tank
2	Cooler fan		

The control of the electric fan is described in the MSS60 engine control system.

Exhaust system

The exhaust pipes of the M vehicles are manufactured using the innovative internal high pressure forming technology (IHU). The "IHU" technology was used for the first time in the world in 1992 in the BMW M3, since when it has undergone continual refinement. Nowadays, it is also used in AG vehicles. Using the IHU technology, the seamless stainless steel exhaust pipes are formed under a pressure of up to 800 bar. This results in extremely thin wall thicknesses of between 0.65 and 1.0 millimetres, which means both the weight of the exhaust system and the response characteristics of the catalytic converters can be optimized. At the same time, the IHU technology enables unprecedented styling and even more efficient geometric tolerances. The largest possible pipe cross-sections are used, thus minimizing flow resistance. The complete exhaust system is manufactured in stainless steel and has a dual flow.

The 4-in-1 exhaust manifold in each cylinder bank, as used in motor sport, has a length and cross-section designed to enable optimal use of dynamics in the exhaust flow and to avoid unnecessary exhaust backpressure.



54 - E92 M3 Exhaust system

Index	Explanation	Index	Explanation
1	Manifold	4	Front exhaust silencer
2	Catalytic converter close to the engine	5	Final muffler
3	Main catalytic converter		

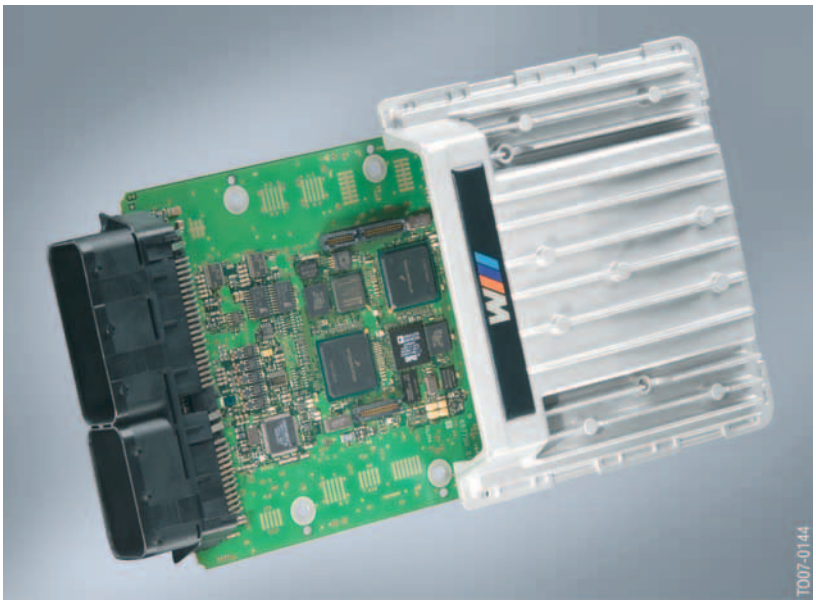
The exhaust system has one quick-responding metal catalytic converter close to the engine per exhaust line, (approx. 20 cm behind the exhaust manifold), followed by the metal main catalytic converter. The front silencer and the final muffler shared by both exhaust lines with a volume of 35 litres are constructed in an absorption design.

The lambda oxygen sensors are located before and after both engine-side catalytic converters. The exhaust temperature sensor installed in previous M models is no longer required and is replaced by an internal calculation model in the control device.

The S65 fulfils the requirements of the European EU4 standard and the American LEV 2 classification.

⚠ At maximum operating temperatures, the entire exhaust system can expand in length by 35 mm. ◄

MSS60 Engine Control System



55 - E92 M3 Engine control system MSS60

The S65 features a revised engine control system, the MSS60, which is based on the MSS65 in the S85 engine.

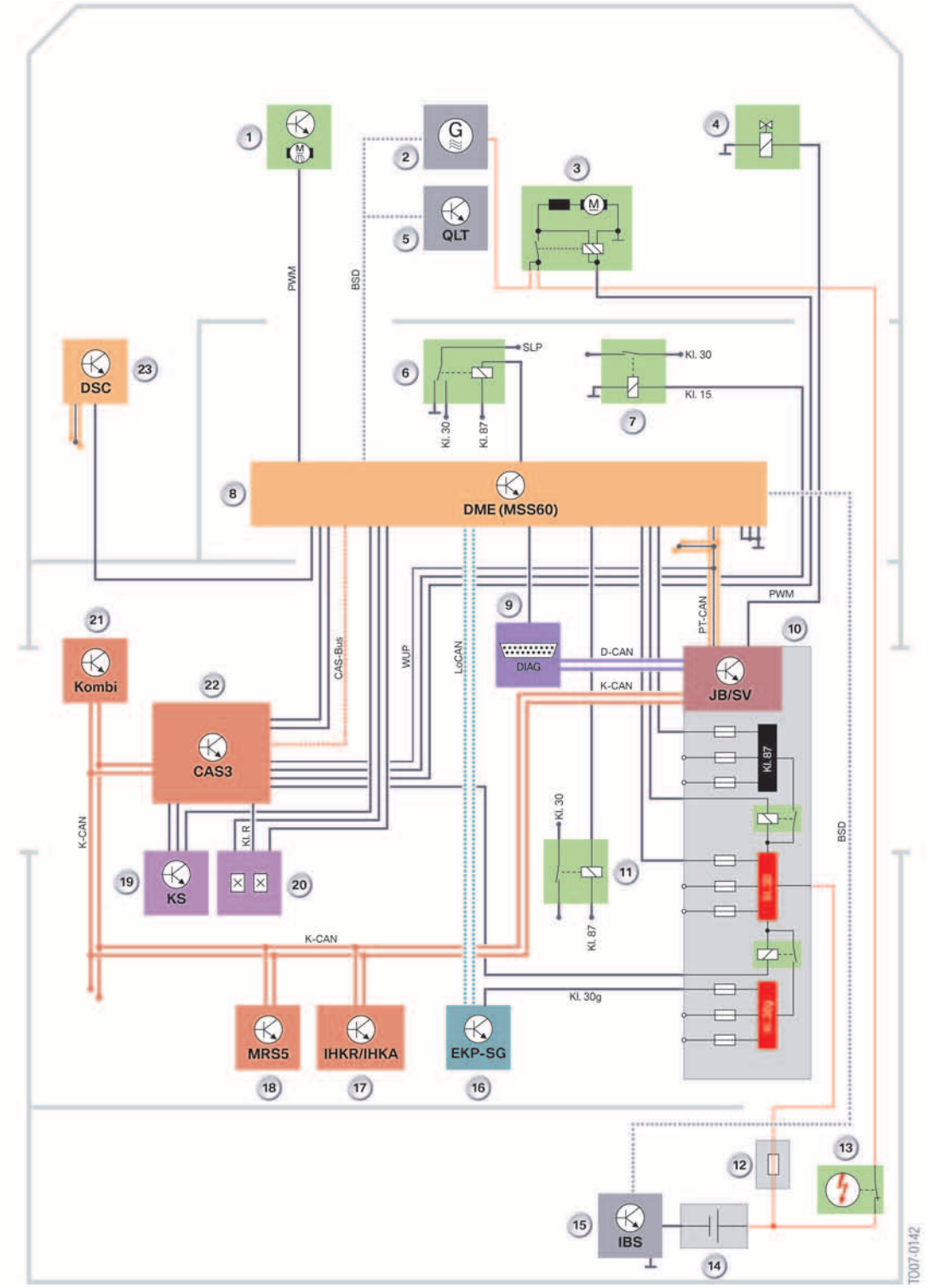
This engine control system is designed for engine speeds of up to 9,000 rpm.

These engine control units belong to the latest generation and are characterized by an extremely high data processing capability, processing millions of calculations per second.

The main functions are described in the product information for the E60 M5.

The following is a description of the areas of the system that differ from the MSS65.

On-board network connection



56 - MSS60 On-board network connection

Index	Explanation	Index	Explanation
1	Electrical cooling fan	13	Safety battery terminal (SBK)
2	Alternator	14	AGM battery.
3	Starter	15	Intelligent battery sensor (IBS)
4	Control valve in the air conditioning compressor	16	Electric fuel pump control unit
5	Oil condition sensor	17	IHKR/IHKA control unit
6	Secondary air pump relay	18	Multiple restraint system (MRS5)
7	Injection nozzle supply relay	19	Clutch module (KS)
8	Engine control unit MSS60	20	Brake light switching module
9	OBD2 diagnosis connector (TD output from MSS60 and D-CAN to JB)	21	Instrument cluster
10	Junction box (JB) and distribution box (SV)	22	Car Access System (CAS3)
11	Evacuating pump relay for brake servo action	23	Dynamic stability control (DSC)
12	High-current circuit breaker (250 A)		

Ion current combustion monitoring

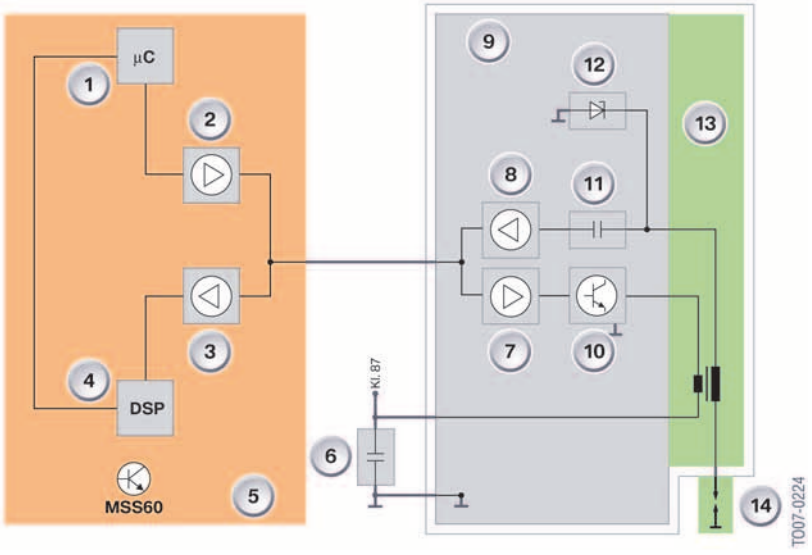
The ion current combustion monitoring is also used in the MSS60 for knock identification and misfiring identification. In principle, the method of action is identical to the S85 and its MSS65.

The S85 has two ion current monitoring devices, each of which covers a whole cylinder bank. In the S65, the electronic ion current system is integrated into each ignition coil and the ion current monitoring devices are not required.

During ignition, the measurement current is stored in a capacitor integrated in the ignition coil, and after ignition, is available at the spark plug electrode. In the S65, the ion current measurement and evaluation is also performed exclusively by the MSS60.

The functional range of the ion current electronics has been further refined. There is no longer a need for two measurement control lines, and the ignition current and the ion current measurement signal have been combined into a single transmission route (separate in the S85). For the purposes of smoothing the voltage and electromagnetic compatibility, an "ignition suppression capacitor" is installed in the wiring harness of each cylinder bank (in the S85 this is in the ion current control device). This is electrically connected using terminal 87 and the vehicle earth.

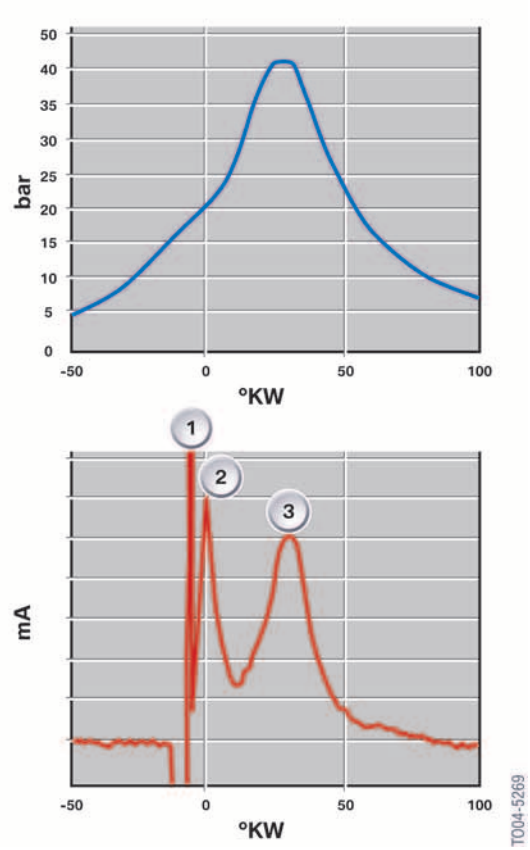
⚠ If the ignition suppression capacitor is defective, this can lead to faults in the communications and/or audio electronics when the engine is running. ◄



57 - MSS60 Simplified basic layout of ion current monitoring

Index	Explanation	Index	Explanation
1	Microcontroller ignition	8	Output amplifier of the ion current measurement signal
2	Output amplifier of the ignition signal	9	Ignition coil with integrated ion current electronics
3	Ion current input amplifier	10	Ignition output stage
4	Digital signal processor for ion current measurement signal	11	Capacitor for storing measured flow
5	MSS60 Engine control system	12	Zener diode for limiting the measured voltage
6	Ignition suppression capacitor (one per cylinder bank for 4 cylinders)	13	Primary and secondary coil
7	Input amplifier for ignition signal	14	Spark plugs

The following diagrams show the ion current curve (bottom) in relation to the development of combustion pressure (top). This curve is used for the evaluation of combustion quality and the identification of misfiring.

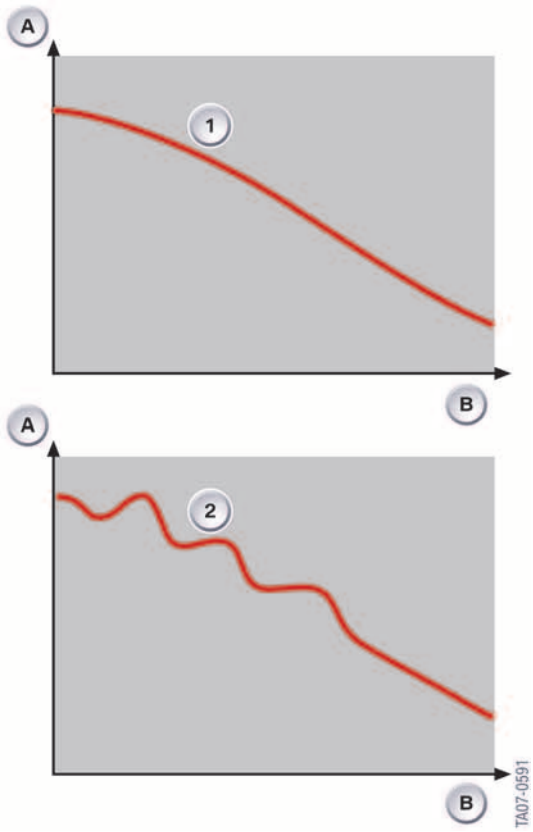


58 - Combustion curve (top) and ionic current (bottom)

Index	Explanation
1	Ionic current maximum by induction of ignition coil
2	Ionic current maximum due to ignition (flame front directly in area of spark plugs)
3	The ionic current progression is a function of the pressure curve

Depending on the engine load, the level of the ionic current generated at the spark plug lies in the range 50-500 µA and is only measured by the electronic system in the mA range.

Combustion knock is identified in the ionic current measurement signal in the form of oscillations within a defined measuring window. The measuring window is after position 3 of the previous diagram.



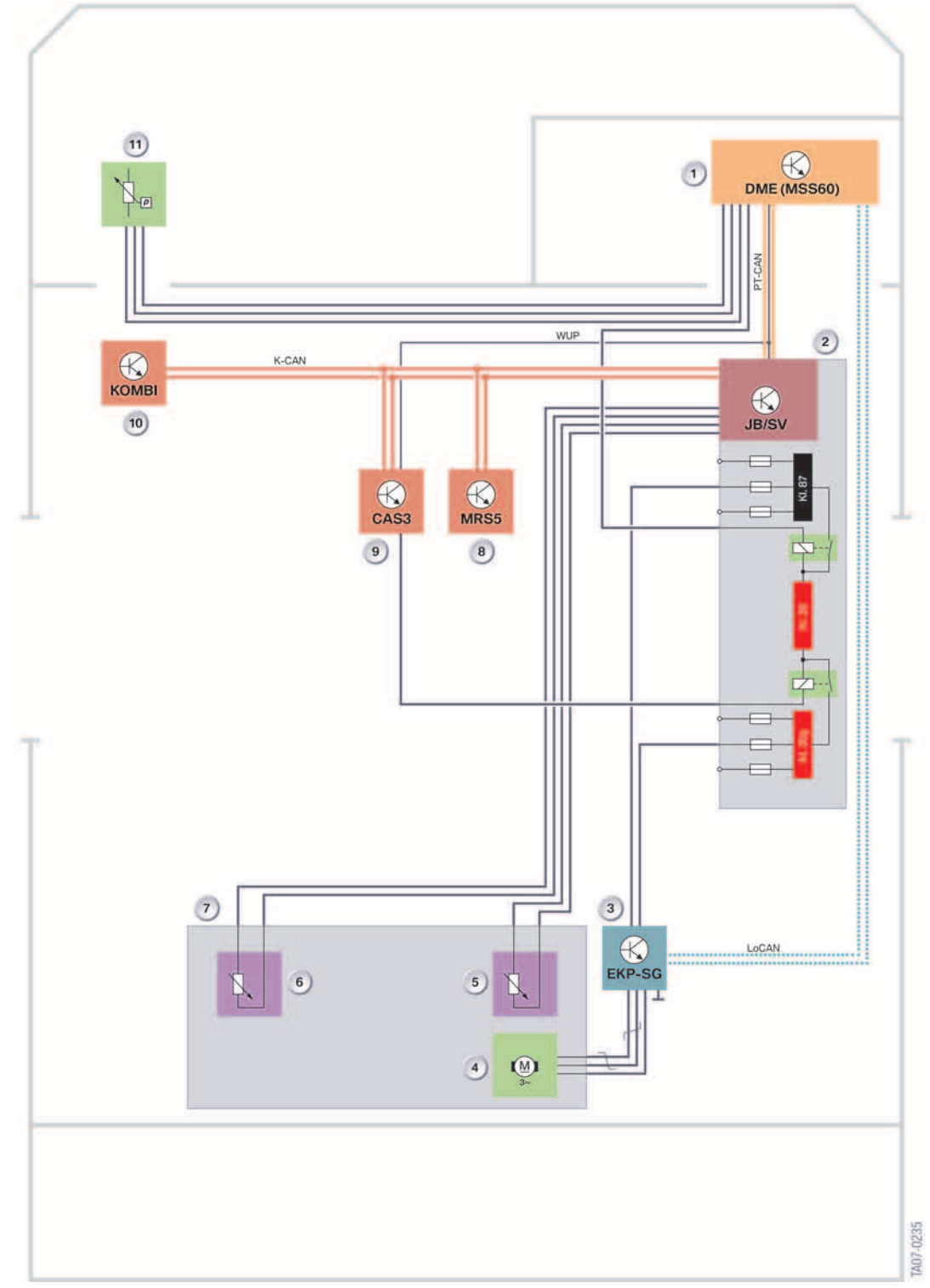
59 - MSS60 Representation of normal combustion and combustion knock

Index	Explanation
A	Ionic current (mA)
B	Section of measuring window
1	Normal combustion (no knocking)
2	Combustion knock

The same spark plugs are used as in the S85 (basic value approx. 60,000 km).

⚠ For design reasons, the firing order 1-5-4-8-7-2-6-3 is used in the S65, instead of the firing order 1-5-4-8-6-3-7-2 more commonly employed in BMW V8 engines until now. ◄

Fuel supply system



60 - MSS60 Fuel supply system circuit diagram

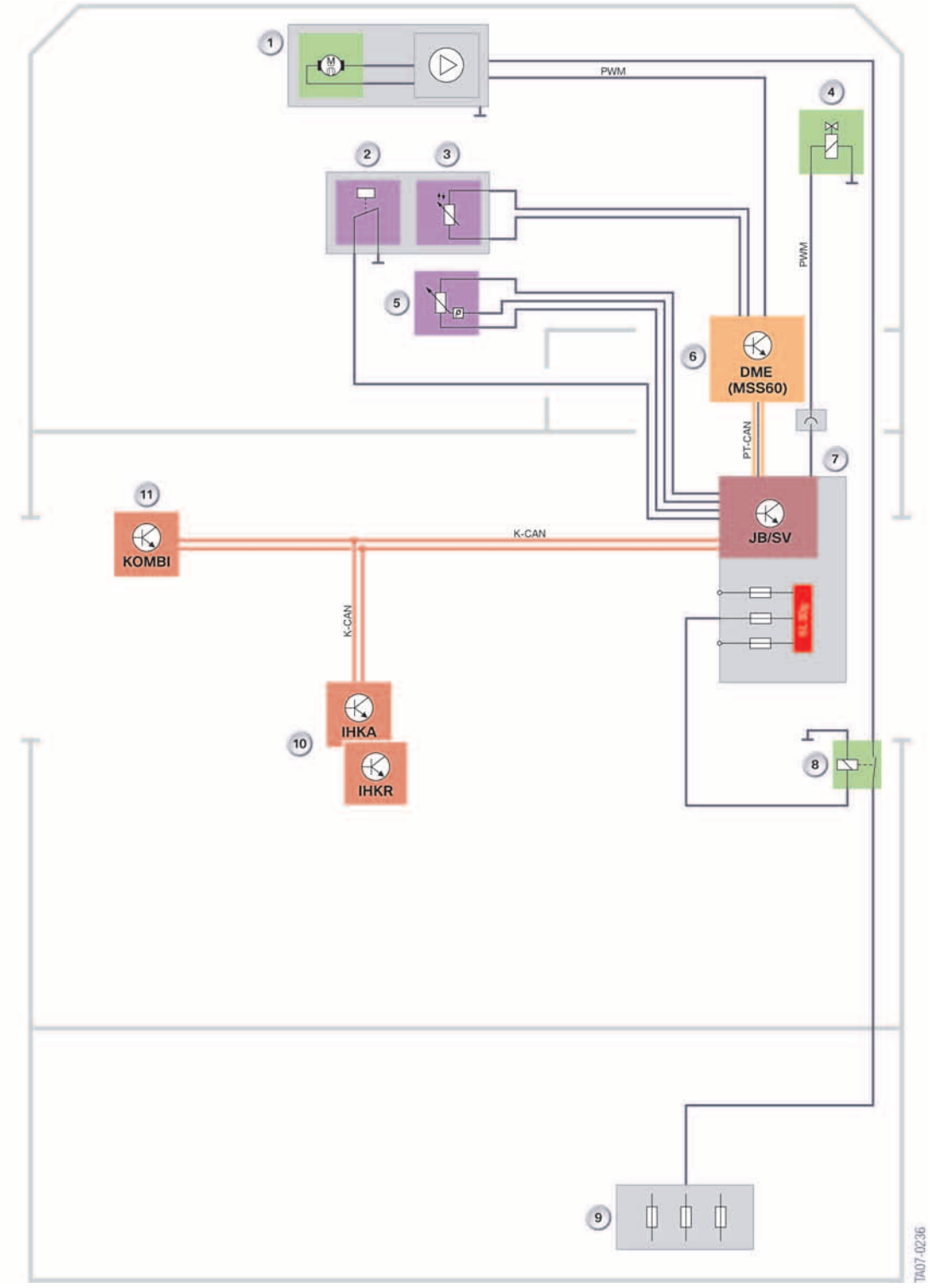
Index	Explanation	Index	
1	Engine control unit MSS60	7	Fuel tank
2	Junction box	8	Multiple restraint system 5th generation (MRS5)
3	Electric fuel pump control unit	9	Car Access System 3rd generation (CAS3)
4	Fuel pump with three-phase motor	10	Instrument cluster
5	Tank fill level sensor, right	11	Fuel pressure sensor
6	Tank fill level sensor, left		

A separate control unit is used for the electric fuel pump (EKP-SG). The EKP control signals from the MSS60 are produced via a dedicated CAN bus (LoCAN) (M5: PWM signal). The EKP control unit is made ready for operation by the MSS60 via the input terminal 87. The load current is controlled via a relay at the terminal 30g by CAS3.
In the event of a crash that reaches the relevant threshold value, the MRS5 requests an interrupt to the fuel supply via the K-CAN connection to CAS3.

There is now only one fuel pump (the M5 has two). This has a three-phase motor, which ensures sufficient torque across the whole pump speed range. The pump speed is used to provide the required fuel pressure of 3-6 bar, depending on the engine operating state. A fuel pressure sensor sends its signal to the MSS60.
If the pressure sensor fails or there is a fault in the CAN bus and in the engine emergency program, the fuel pump is operated at full speed. In this process, the pressure is limited to 6 bar by the mechanical pressure sensor.

The signals from both tank fill level sensors are sent to the junction box and are forwarded to the instrument cluster via the K-CAN, where they are evaluated and displayed.

Cooling System



61 - MSS60 Cooling system circuit diagram

Index	Explanation	Index	
1	Electric fan (850 W)	7	Junction box
2	Coolant level switch	8	Electric fan relay
3	Coolant temperature sensor	9	High-current circuit breakers
4	Control valve in the air conditioning compressor	10	Integrated automatic heating/air conditioning system control (IHKA/ IHKR)
5	Coolant pressure sensor	11	Instrument cluster
6	MSS60 Engine control system		

Cooling system function overview

In the E92 M3, an electric fan is installed (as in the E70), which initially reaches a maximum output of 850 Watts. The fan is activated by the MSS60 via a pulsewidth-modulated signal (PWM signal) with a frequency of 100-300 Hz for fan operation, wake-up function, and interface diagnosis function.
A frequency of 10 Hz is used for overrun requests.
The signal voltage is approximately the same as the on-board supply voltage. The following cycle ratio specifications (in %) refer to the "low" proportion of the signal period.

The cooling fan power supply is produced using a 100 A high-current circuit breaker in the luggage compartment distributor and a high-voltage relay near the front passenger footwell. The relay is control by terminal 30g (CAS).

The performance of the cooling fan depends on the coolant temperature, the IHKA/IKHR request, the intake air temperature, the calculated exhaust gas temperature downstream from the catalytic converter, and the request by the generator (overheating protection).

The control valve in the air conditioning compressor and the coolant pressure sensor are electrically connected to the junction box (JB). The IHKA/IHKR can use the K-CAN connection to evaluate the pressure and send the appropriate control requests for the control valve in the air conditioning compressor to the JB. A resulting load torque for the torque correction and an electric fan speed request are also sent to the MSS60 via the K-CAN.
The junction box only activates the control valve in the air conditioning compressor following release by the MSS60. The MSS60 adapts the idle speed control accordingly and activates the electric fan.

The switching state of the coolant level switch is also transmitted to the junction box and evaluated by the instrument cluster via the K-CAN connection. If there is insufficient coolant, a corresponding warning is sent to the driver.

Function/control of the electric fan

Fan operation

The adjusted fan speed increases in a linear fashion as the cycle ratio increases. The rated speed (n_{Nom}) in the M3 is the same as the maximum number of revolutions (2,400 rpm).

The engine speed of the M3 is controlled in a linear relationship with the cycle ratio (10-91 %), starting with 800 rpm ($^1/_3$ of n_{Nom}) up to 2,400 rpm.

⚠ In the E6x M5/M6 (600 W fan), an additional unregulated increase in engine speed to at least 2,700 rpm (n_{max}) is produced, from a 92 % to 95 % cycle ratio. ◄

"Wake-up" function

If they are in sleep mode, the fan electronics can be "woken" by a PWM signal (100-300 Hz) with a cycle ratio of 5-9 %. In the E92 M3, in normal operation, the waking is triggered by activation of the terminal 30g with "Ignition ON".

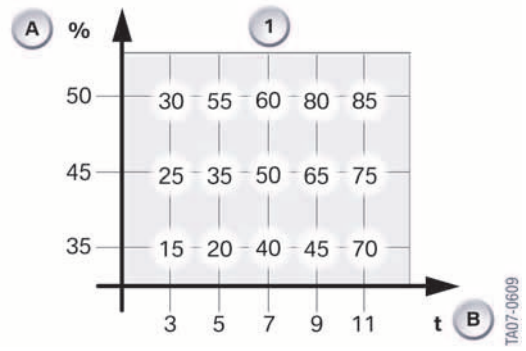
Interface diagnosis function

An interface diagnosis is triggered by the MSS60 and used to check the interface. The MSS60 sends a PWM signal (100-300 Hz) for approx. 1 second with a cycle ratio of 96-99 %. If the interface is intact, the fan electronics for confirming the PWM signal cable are set to "low" for 2.5-3 seconds (M5 fan 1-1.5 s).

Overrun request

If an overrun of the fan is required after "Ignition OFF", approx. 7 seconds after "Ignition off", the MSS60 emits a PWM signal with a frequency of 10 Hz for at least 3 seconds. At the issued cycle ratio, the electrical fan system detects at which speed and for what duration the overrun should occur.
The cycle ratio is between 15 and 85 % in 5 % increments.
It contains the information displayed in the following graphic:

- Engine speeds of 35, 45 or 50 % of the rated speed.
- Run-on time of 3-11 minutes in increments of 2 minutes.



62 - MSS60 Display of the overrun control of the cooling fans

Index	Explanation
A	Percentage of rated speed
B	Overrun in minutes
1	Cycle ratio in percent

Fan self-diagnosis and fault signal

The electronic fan system performs an internal diagnosis procedure. If a fault is detected, fan operation is continued as far as possible, if necessary at reduced power.

The following faults lead to a diagnosis message:

- Engine is blocked
- A fault has occurred in the electronic fan system, which means that fan operation is permanently restricted or impossible.

In response to the fault message, the electronic fan system changes the PWM signal to "low" for at least 5, to a maximum of 7 seconds.

⚠ A fault message is issued with a delay of approx. one minute, since the electronic fan system first executes a triple internal test cycle. ◄

Drive train

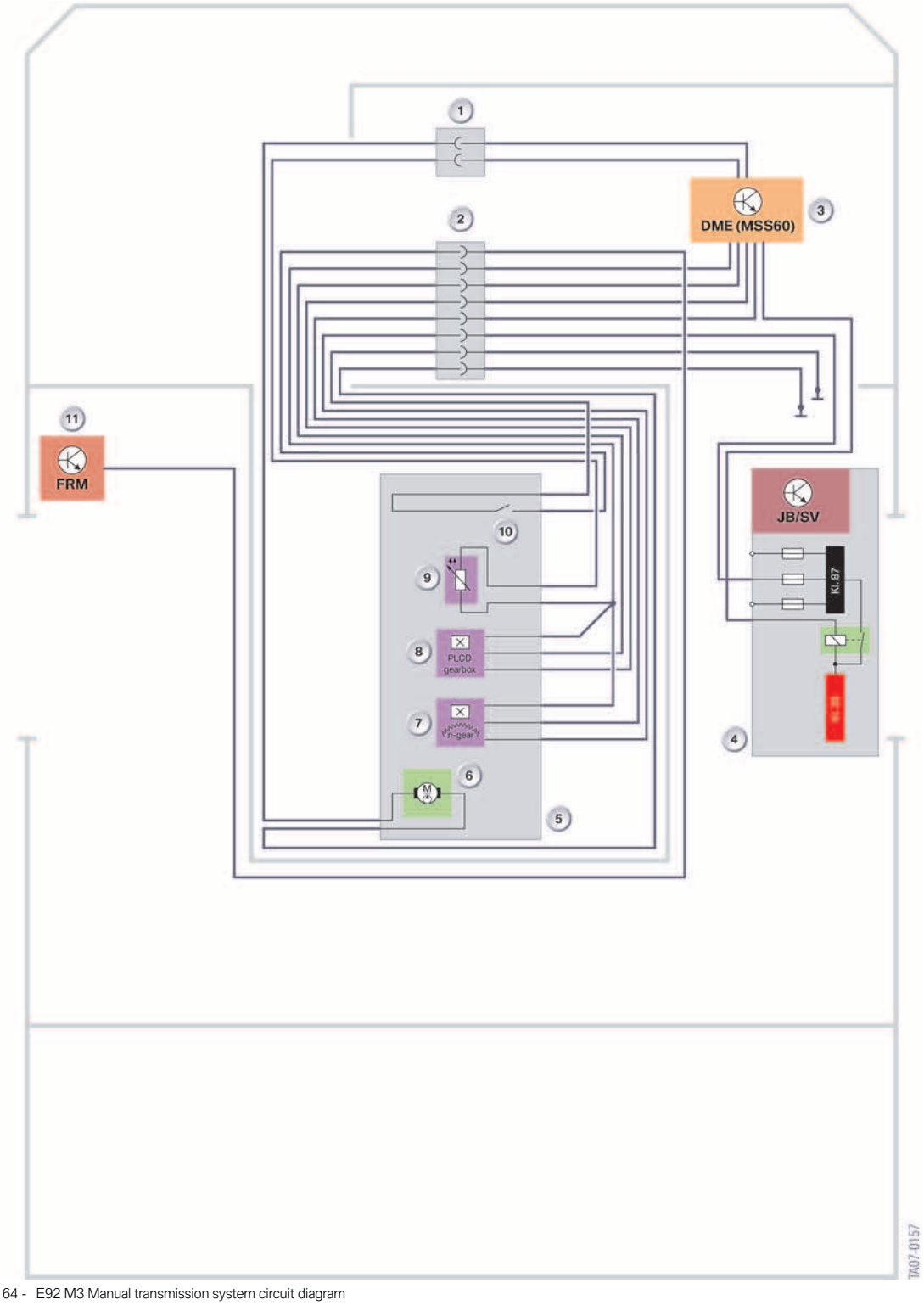
63 - E92 M3 Drive train

Via the self-adjusting SAC double-disc clutch, the power flow from the S65B40 engine is forwarded to the 6-gear manual gearbox (GS6-53BZ). This gearbox is based on the 6-speed transmission used in the US release of the E60 M5. In contrast to this gearbox, however, the M3 features electrically controlled transmission oil cooling.

A further highlight of the M range is located behind the M3 drive shaft. This is the fully-variable limited slip differential transmission, which was first used in the E46 M3, and has now been adapted to the demands of the E92 M3. Appropriately adjusted output shafts ensure the distribution of power flow to the rear wheels.

The details are described in the following chapters.

Manual transmission GS6-53BZ

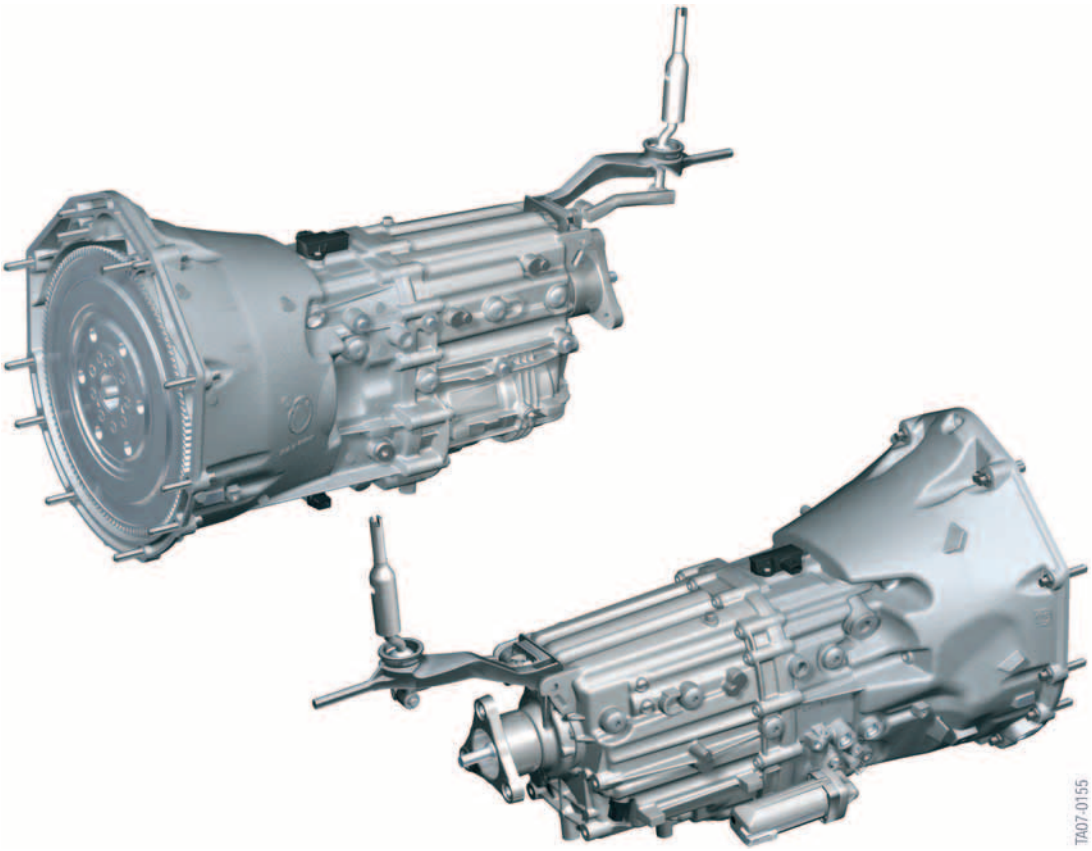


64 - E92 M3 Manual transmission system circuit diagram

Index	Explanation	Index	Explanation
1	Plug-in connection for engine wiring harness	7	Engine speed sensor, transmission input
2	Plug-in connection for vehicle wiring harness	8	Zero gear sensor (selector gate)
3	MSS60 Engine control system	9	Transmission oil temperature sensor
4	Junction box/distribution box	10	Reversing light switch
5	Transmission housing	11	Footwell module
6	Electrical transmission oil pump		

The following sensors are fitted on manual gearbox housings:

- Zero gear sensor (selector gate)
- Engine speed sensor, transmission input
- Transmission oil temperature sensor.



65 - E92 M3 Manual transmission GS6-53BZ

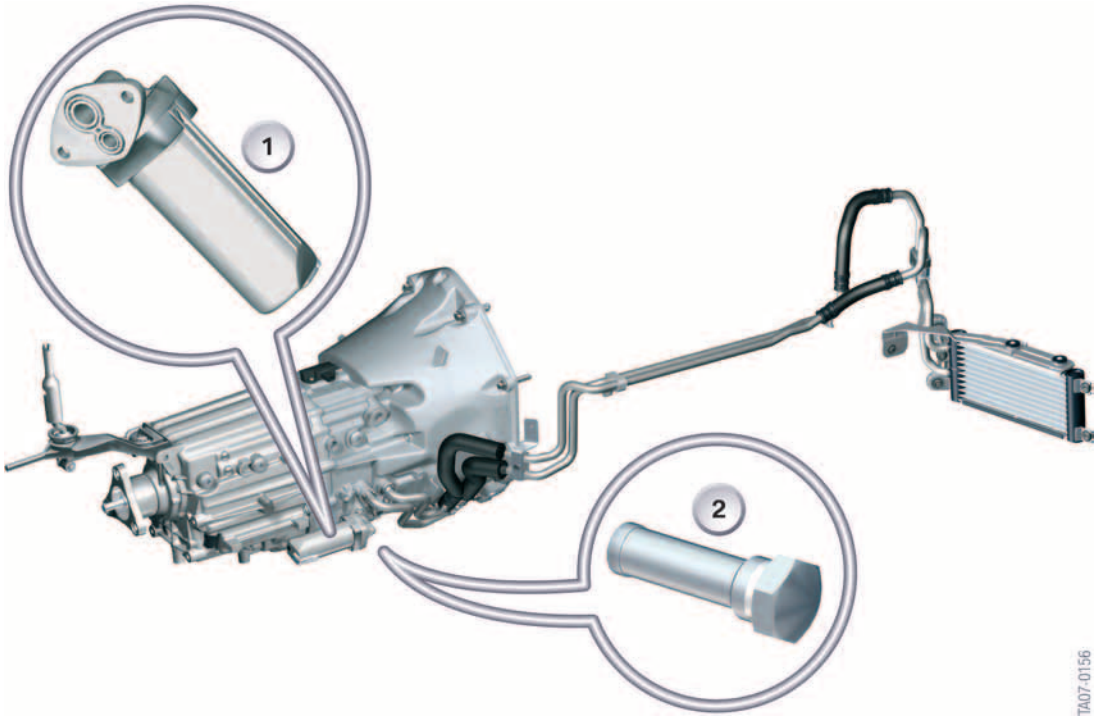
The signals of these sensors are monitored and evaluated by the MSS60.

When reverse gear is engaged, the reversing light switch mounted on the gearbox issues an earth signal to the footwell module (FRM) to activate the reversing lights.

The transmission oil pump is controlled by the MSS60 depending on the transmission oil temperature.

The activation threshold is approx. 130 °C and the deactivation threshold is approx. 110 °C.

Should the transmission oil temperature rise above approx. 145 °C due to a fault, the temperature value is gradually reduced in accordance with the engine speed in increments of 150-500 rpm, to a minimum of 5,000
rpm. 5,000 rpm is also the value in the event of a failure of the ATF temperature sensor.



66 - E92 M3 Manual transmission oil circuit diagram

Index	Explanation	Index	Explanation
1	Gearbox oil pump	2	Screw oil filter

An electrical gear-oil pump is used to pump gear oil from the gearbox to the gearbox oil cooler. A screw oil filter is located below the oil pump.

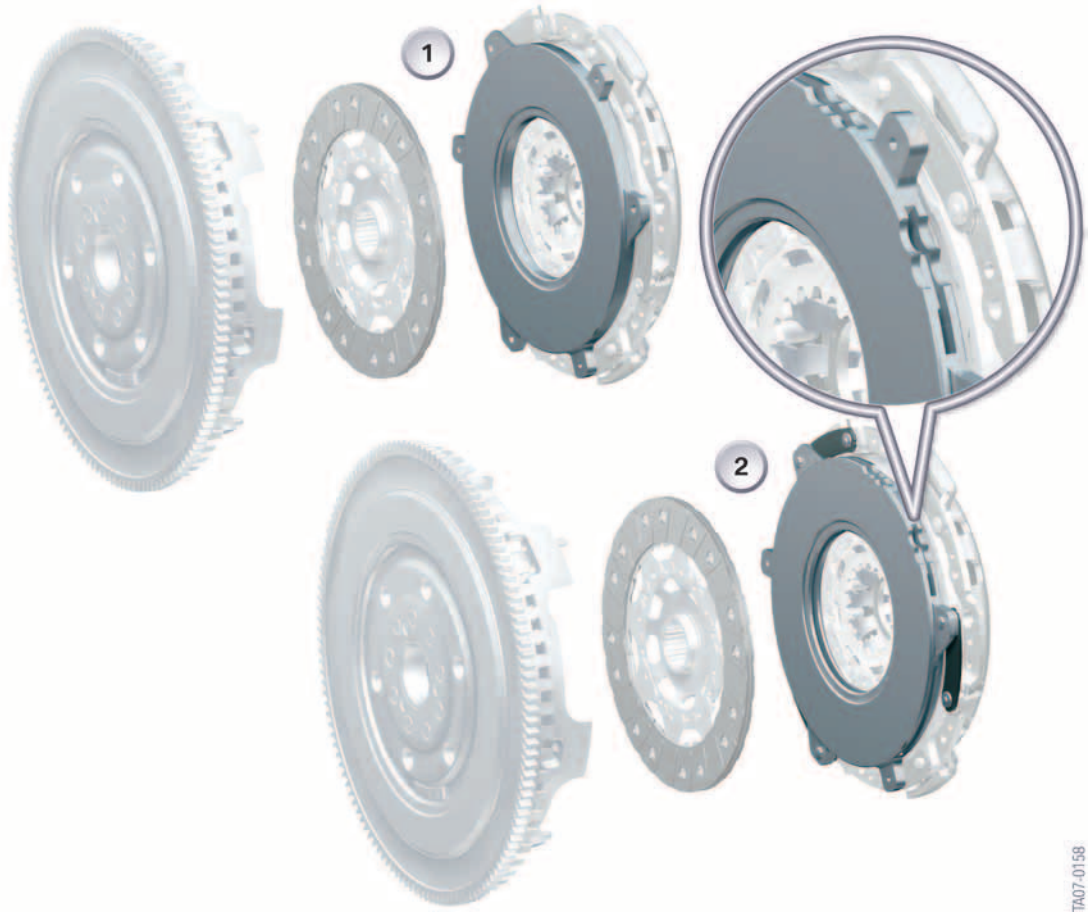
The transmission housing has been adapted for the oil cooler connection. The oil pump is mounted on the manual transmission housing.

The gear oil is replaced and the screw oil filter is checked or cleaned during the running-in inspection, and later according to service specifications (estimated after every third engine oil change).

Designation/Unit of Measurement	E92 M3	E46 M3 Coupé	E92 335i
Manual transmission gear ratio Gear 1/2/3/4/5/6/R	GS6-53BZ 4.055/2.396/1.582/ 1.192/1/0,872/3.678	S6S420G 4.227/2.528/ 1.669/1.226/1/ 0.828/3.746	GS6-53BZ 4.055/2.396/1.582/ 1.192/1/0,872/ 3.678
Rear-axle final drive gear ratio [:1] fully variable M limited slip differential	3.85 Yes	3.62 Yes	3.08 No

⚠ For fault symptoms with engine speed limitation, the gear oil temperature should also be considered as a possible cause. ◄

Clutch



67 - Comparison of the S65B40 double-disc clutch and the S85B50 manual clutch

Index	Explanation	Index	Explanation
1	E6X M5/M6 SAC manual transmission clutch	2	E92 M3 SAC clutch

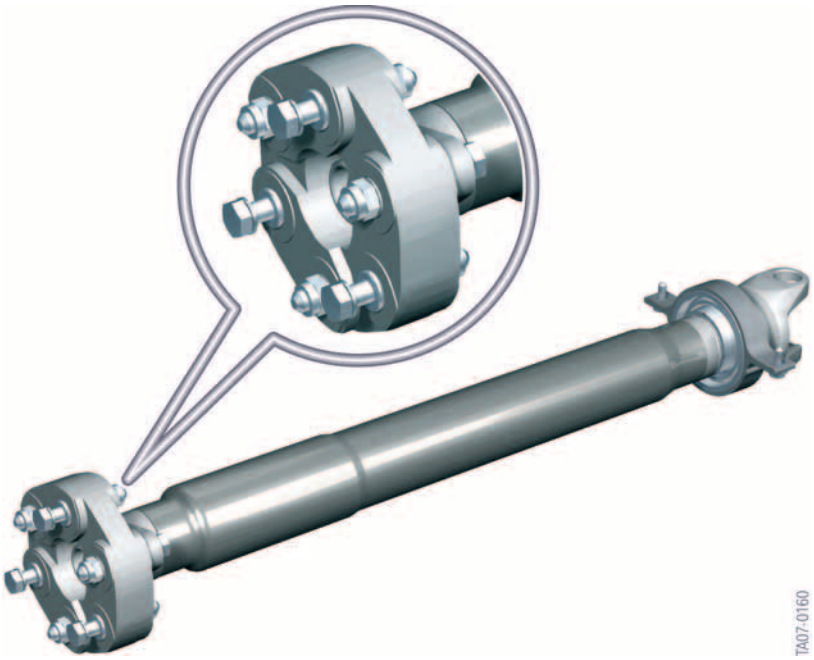
It is the first time that a double drive plate clutch has been used on an M3.
The clutch and the dual-mass flywheel are based on the E6x M5/M6 US (manual gearbox), but their combined weight has been reduced by 4 kg.
The contact plate and the transfer plate form a single unit with the integrated clutch driving plate.

The following changes have been made compared to the E6x M5/M6 gearbox clutch:
The weight of the clutch and the dual-mass flywheel has been reduced.
The transfer plate is hollow cast and shaped, similar to an internally ventilated brake disc. This increases heat dissipation and hence the permissible thermal load of the clutch.

⚠ The clutch and the dual-mass flywheel are permanently connected and are balanced as a single unit. They can only be replaced in a set. ◄

Propeller shaft and output shafts

68 - E92 M3 Axle drive components



69 - E92 M3 Front propeller shaft with flexible clutch

The flexible clutch of the front propeller shaft is taken from the E6x M5/M6.

The front drive shaft is hollow and has a graduated cross section.

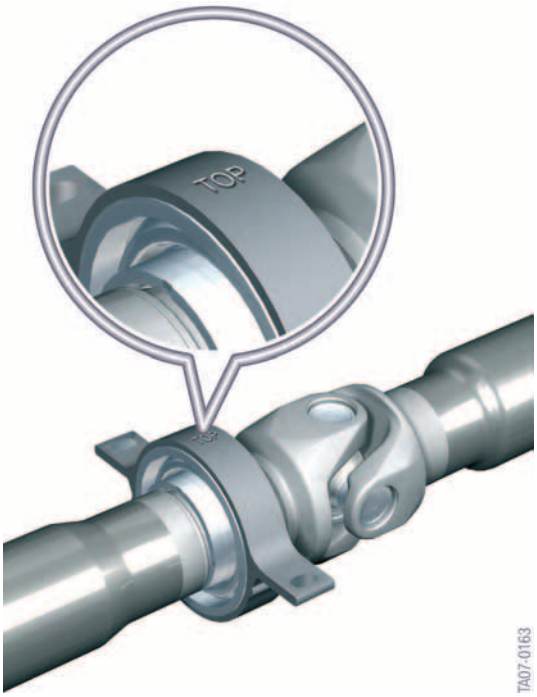
The rear propeller shaft is also a tubular construction and has an equal cross section along its entire length. The thickness of the tubing and the geometry of the front and rear propeller shaft have been adapted to handle the increased driving power. Both propeller shafts are fitted with the same constant velocity joints that are used on the E60 M5.

70 - E92 M3 Rear propeller shaft

⚠ The centre bearing can be mounted in two directions. It is important that the bearing is mounted with the word "TOP" facing the body. ◄

Both output shafts are hollow and have a graduated cross section. The external axle shaft joint is new. The internal axle shaft joint is based on the joint used in the E60 M5. The left and right output shafts are different in length.

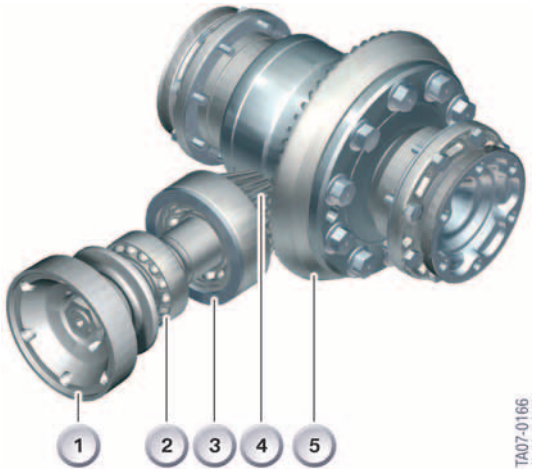
71 - E92 M3 Axle drive with output shafts



72 - E92 M3 Output shaft centre bearing

Final drive

In principle, the final drive is assembled in the same way as in the E6x M5/M6. It is, however, a separate new development.
The bevel gear shaft bearing is a friction-optimized, double-row, angular-contact ball bearing. The gear ratio between the bevel gear and the crown gear has been adapted to the engine speed and gearbox ratio of the M3.



73 - E92 M3 Final drive

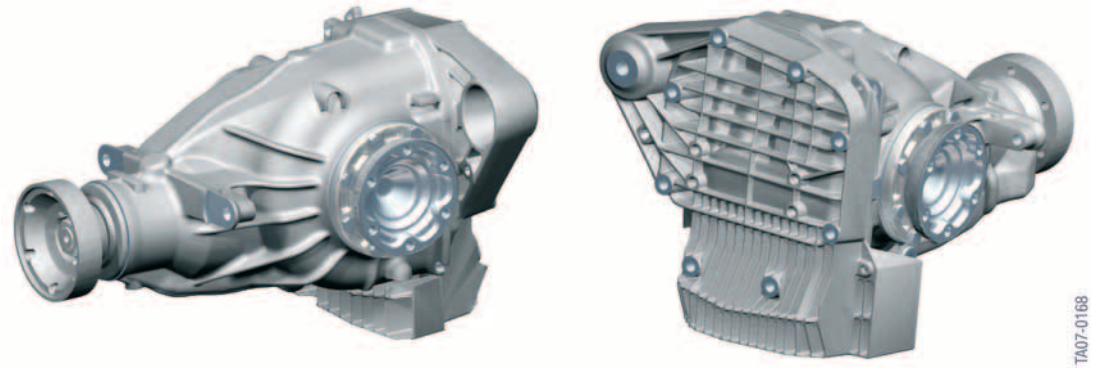
The final drive ratio is 3.85:1.

The 215 gear set (crown wheel diameter 215 mm) has been temperature and noise optimized. A friction-reduced gearing is used.

The housing of the final drive has been adapted to accommodate the double-row angular-contact ball bearing.

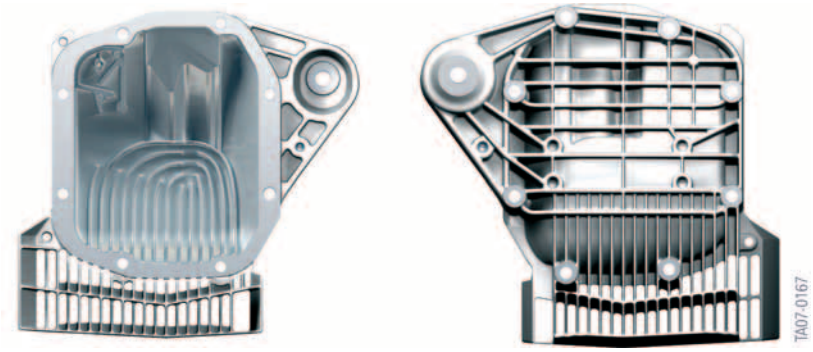
The flanges for the propeller and drive shafts are the same as those used on the E6x M5 and M6.

Index	Explanation
1	Propeller flange
2	Front double-row angular-contact ball bearing
3	Rear double-row angular-contact ball bearing
4	Bevel gear
5	Crown gear



74 - E92 M3 Transmission housing

⚠ Due to their function, the shafts of the right and left stub axles in the final drive have different lengths. In an idle state, this results in a noticeably different vertical clearance of both flanges, which is a feature of the design.
This does not affect the function and is not a cause for complaint.
This uneven clearance applies for all models with fully variable M slip differential and may affect either the right or the left flange, depending on the version and model. ◄



75 - E92 M3 Final drive end cover

The transmission housing end cover has been modified to ensure optimum gear oil cooling and bevel gear lubrication. The end cover has more ribs, which improves heat exchange.

The internal styling of the end cover is adapted according to the size of the differential and the final drive ratio.

This M final drive also has three bearings, with two front bearing and one rear bearing.

Fully variable M differential with locking action

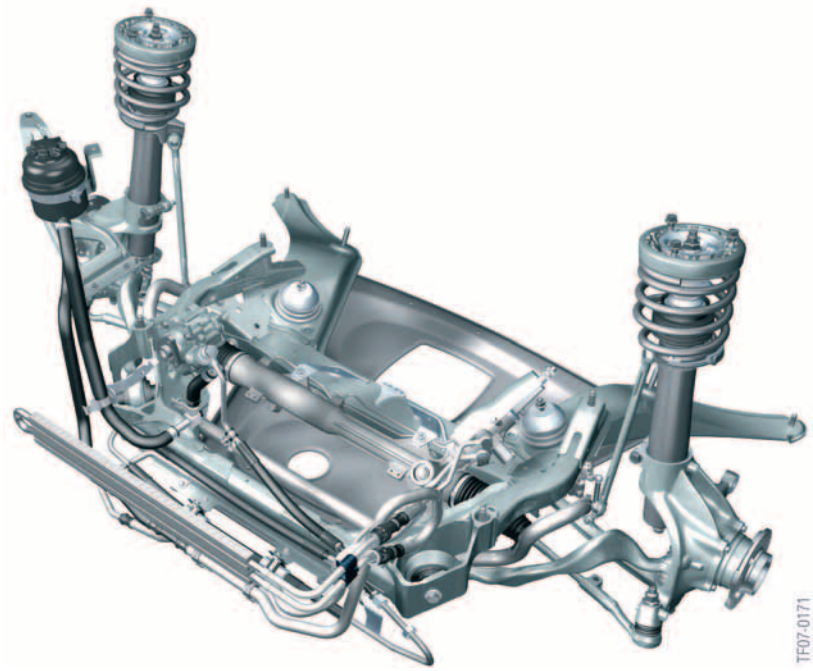
This unique limited slip differential design is based on the E46 M3 and the E6x M5/M6 limited slip differential, where it is described in detail.
The function of the limited slip differential has been adapted to ensure that the M3 develops the best traction at different engine speeds and in every road situation.

Chassis and suspension

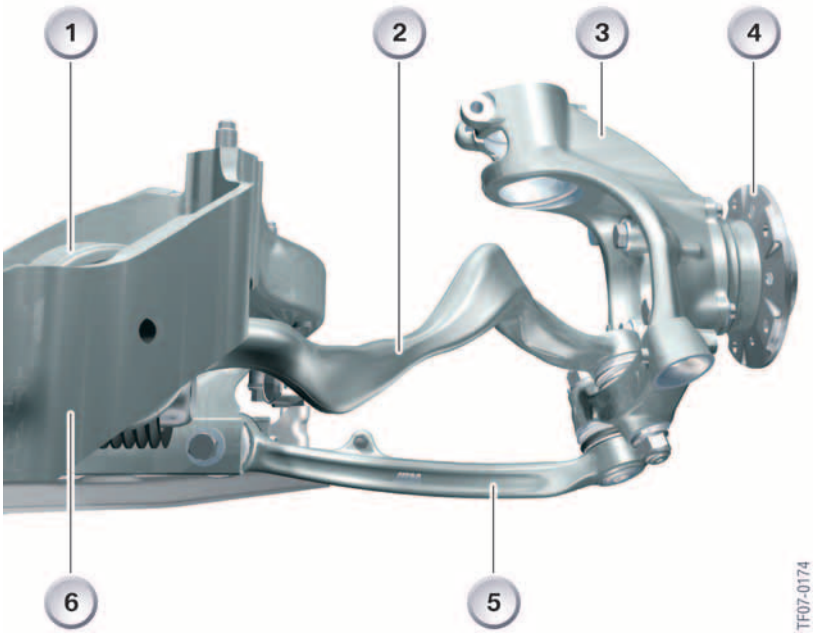
76 - E92 M3 Chassis

The chassis of the E92 M3 is based on the chassis of the series model E92. All modifications are described in the following chapters.

Components of the double-jointed spring strut front axle



77 - E92 M3 Complete front axle



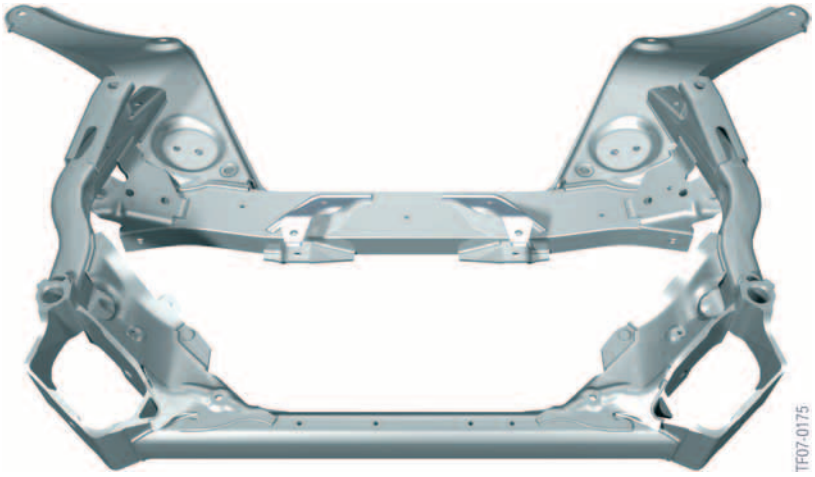
78 - Wheel suspension components

Index	Explanation	Index	Explanation
1	Rubber mount for tension strut	4	Wheel hub
2	Tension strut	5	Wishbone
3	Swivel bearing	6	Front axle carrier

Front axle data compared to the E92 335i:

Designation	E92 M3	Series E92 335i
Tyre type/Wheel rim type/Rim offset [mm]	245-40 ZR 18/8.5Jx18/ IS29	225-45 WR 17 RSC/8Jx17/ IS34
Tyre radius [mm]	305	295
Wheelbase [mm]	2761	2760
Track width [mm]	1540	1500
Total toe	16’	14’
Toe differential angle	2° 14’	1° 40’
Camber	-1°	-18’
Kingpin inclination	15° 2’	14° 7’
Kingpin offset [mm]	8.4	5.1
Trail [mm]	29.4	20.3
Trail angle	7° 8’	7° 5’

Front axle carrier

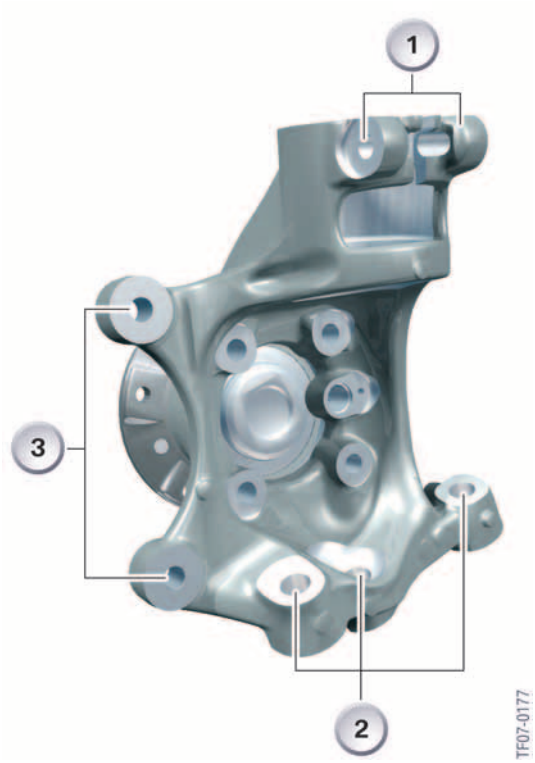


79 - Front axle carrier

The front axle carrier is an aluminium alloy construction. In order to ensure optimum strength and torsional rigidity, a high-pressure forming technique has been used to manufacture certain sections. Aluminium has been chosen for its lightweight and strength properties. The components of the front axle are joined together by an aluminium welding process.

Swivel bearing

80 - E92 M3 Swivel bearing (1)



81 - E92 M3 Swivel bearing (change to point 2)

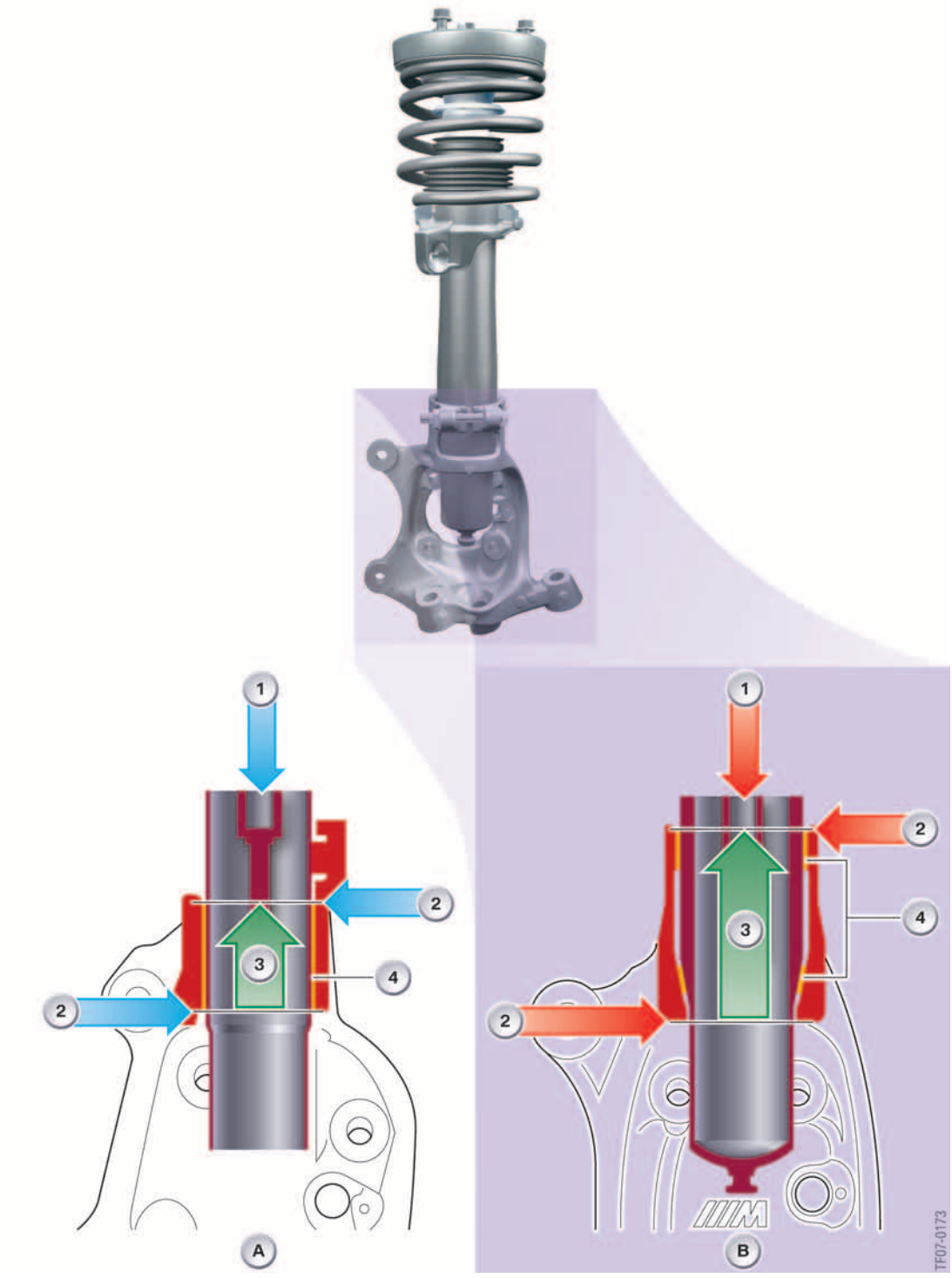
The 'M' swivel bearing is completely new. The bearing is made from an aluminium cast alloy, which reduces the weight by 500 grams.

The following changes have been made to the front wheel carrier:

- Adjusted dimensions for the larger 'M' wheel.
- As described below, the method by which the spring strut is clamped into the swivel bearing has been changed.
- The geometric fixing points for the wishbone, tension strut and steering track rod have been selected to ensure optimum sports vehicle kinematics.
- Modified mounting position for the larger brake calliper.

Index	Explanation
1	Clamp connection of the spring strut support
2	Attachment points for the tension strut, wishbone and steering track rod
3	Brake calliper mounting

Spring strut connection to the wheel carrier



82 - E92 M3 Spring strut connection to the wheel carrier compared to the E92 series model

Index	Explanation	Index	Explanation
A	Spring strut support in the E92 series model	B	Spring strut support in the E93 M3
1	Vertical force (Z-axis)	1	Vertical force (Z-axis)
2	Upper and lower limit for supporting lateral and longitudinal force (X and Y axis)	2	Upper and lower limit for supporting lateral and longitudinal force (X and Y axis)
3	Clampheight 52 mm parallel fit	3	Clamp height 76 mm with parallel upper and conical lower fit
4	Parallel contact face	4	Upper cylindrical and lower conical contact face

As shown in the diagram, the clamp height has been increased on the Z-axis from 52 mm on the series E92 (left) to 76 mm on the E92 M3 (right).

The front spring strut now has an additional support. The wheel carrier has also been modified to compensate for the increased drive and dynamic forces.

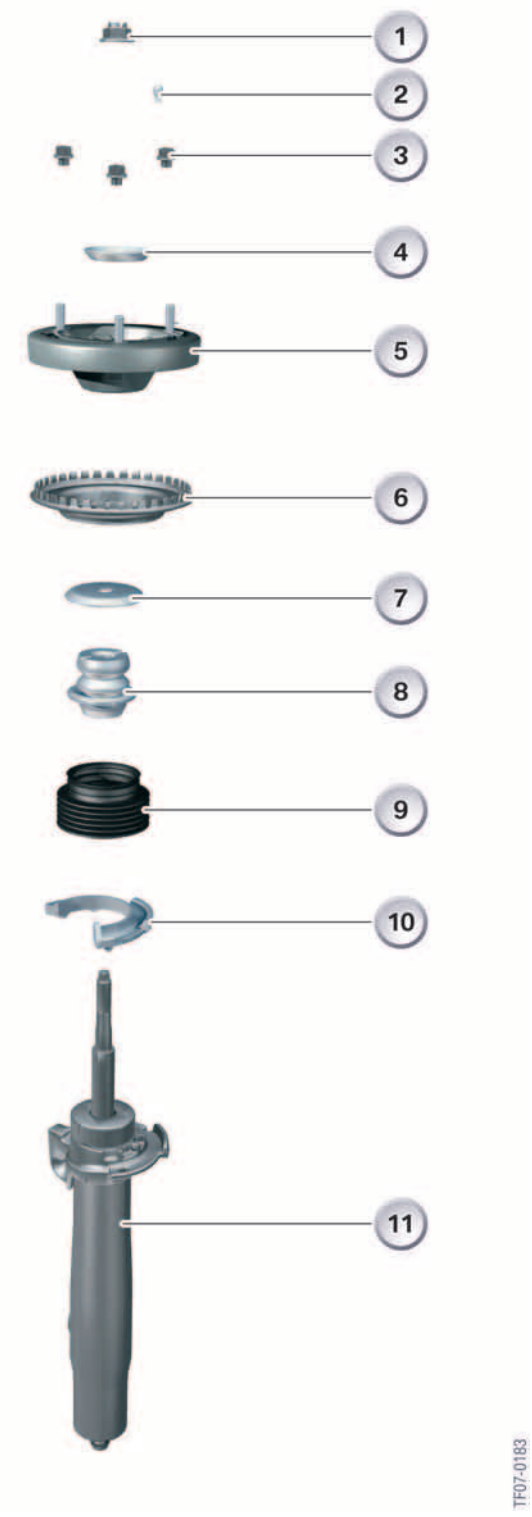
The lower contact face of the spring strut in the E92 M3 has a cone, which is positioned firmly in the wheel carrier. In the series E92, however, the front spring strut has a parallel construction and is only held in place by the clamping force.

This design change and the increased clamp height accommodate the increased reaction forces of the spring strut and increase the overall stability of the wheel suspension.

During assembly, the M3 spring strut is pulled into the lower cone using a new special tool.

⚠ Follow the new installation and removal process according to the service repair manual. ◄

Front spring strut



83 - E92 M3 Front spring strut

Index	Explanation
1	Retaining nut, shock absorber to support bearing
2	Dowel pin, support bearing to body
3	Mounting fixture, support bearing to body
4	Joint seat
5	Support bearing
6	Upper spring seat
7	Support disc
8	Additional damper/spring
9	Gaiter
10	Lower spring seat
11	Spring strut

The front steel suspension spring has a 95 mm compression and 100 mm rebound travel. A new spring concept supports lateral chassis stability. Depending on the vehicle weight (equipment), modified spring types are used.

Tension Strut

84 - E92 M3 Tension strut

The tension strut is similar to that used in the series E92, but features an 'M'-specific harder rubber mount.

Wishbone

85 - E92 M3 Wishbone

The M control arm is completely new and is connected to the axle carrier and wheel carrier by two ball joints. It is manufactured out of forged aluminium alloy.

Wheel bearing unit

86 - E92 M3 Wheel bearing unit

The M3 wheel bearing unit is identical to the E60 M5 wheel bearing unit. It has three dowel pins for the brake disc.

Front anti-roll bar

87 - E92 M3 Front anti-roll bar

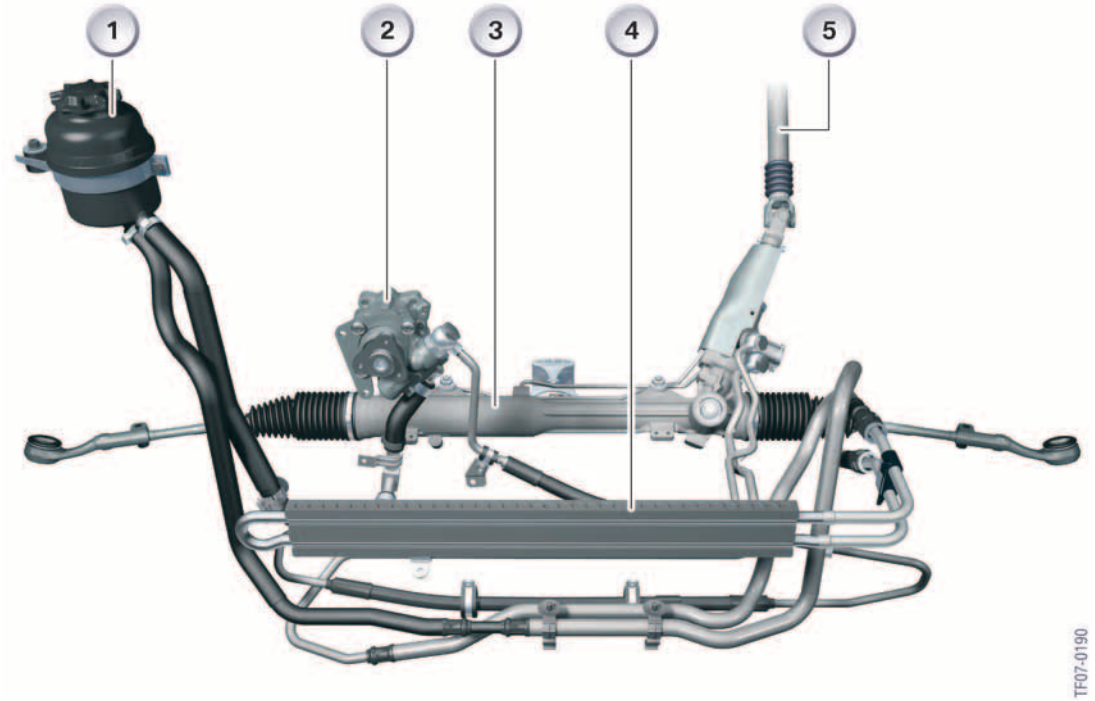
The weight-optimised front anti-roll bar was adapted for the M3 and has a special rubber bearing material for more direct response. The hinged brackets are made out of an aluminium alloy (series E92 steel).

Steering

The design of the rack-and-pinion steering system is the same as the series E92. The average variable overall ratio is 12.5 and hence sports-oriented (16 in the series E92). In the M3, the steering force support is controlled by the MSS60 via the Servotronic valve. A speed-dependent characteristic curve is stored in the MSS60 for this purpose. With the MDrive menu option, a second and even more sports-oriented characteristic curve can be activated (see the chapter on MDrive).

The steering oil is guided through a steering oil cooler before it returns to the oil reservoir.

The E92 M3 is not available with active steering.



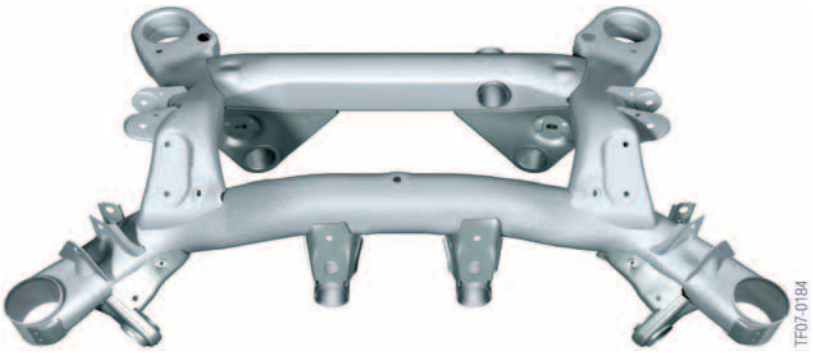
88 - E92 M3 Steering

Index	Explanation	Index	Explanation
1	Steering oil header tank	4	Steering oil cooler
2	Steering oil hydraulic pump	5	Steering wheel spindle
3	Steering transmission housing		

Components of the rear axle

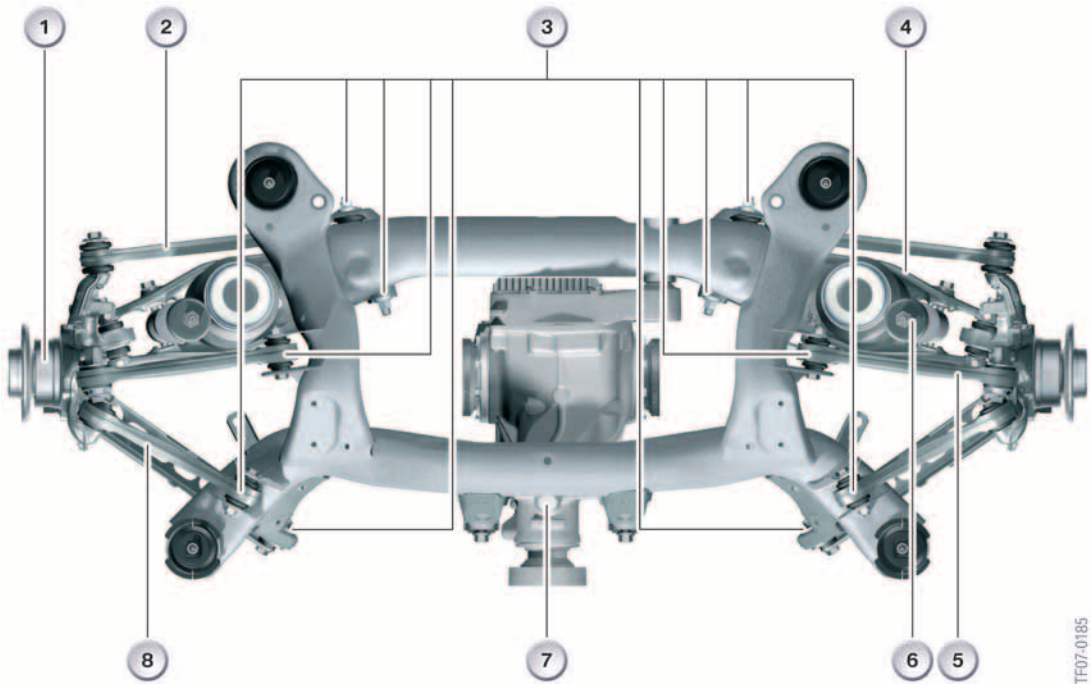
Rear axle carrier

The rear axle carrier is constructed from steel sections which are welded together. All mounting points for the rear axle and suspension components are formed or attached to the axle carrier making it an integral component.



89 - E92 M3 Rear axle carrier

Construction of rear axle



90 - E92 M3 Complete rear axle

Index	Explanation	Index	Explanation
1	Wheel carrier	5	Wishbone
2	Toe struts	6	Shock absorber
3	Connections from control arm to rear axle carrier	7	Rear axle carrier
4	Camber struts	8	Traction strut with semi-trailing arm below it

Nearly all components of the rear chassis have been revised,
the aim is to achieve optimum sports vehicle kinematics, chassis stability and a more precise and direct response, with a simultaneous reduction in weight.

This has been achieved by the careful selection of materials for the axle components and bearings, and through a modification of the axle geometry.

Among other modifications, the attachment points of the semi-trailing arm on the back rear axle carrier have been moved further inwards.

- Wheel carrier

  The attachment points for toe, camber, wishbone, longitudinal and traction struts have been positioned specifically for the 'M' model.
  Its overall dimensions allow for the larger M wheel to be fitted. The 'M' wheel carrier is fitted with a modified rubber mount connecting to the semi-trailing arm and a ball joint for the camber strut.

- Toe struts

  The new 'M' toe strut is forged from aluminium. It is one-piece and has two integrated ball joints.

- Camber struts

  The 'M' camber strut is a new lightweight component forged from aluminium. Its design reduces the unsprung mass of the vehicle.

- Wishbone

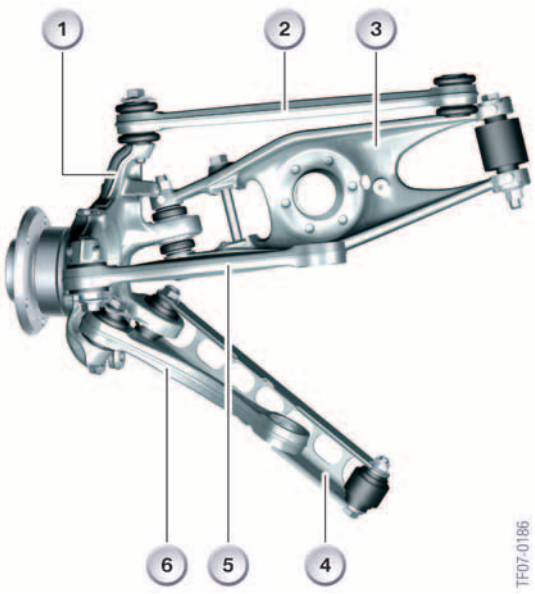
  The new 'M' wishbone is forged from aluminium and has a modified integrated ball joint and a rubber mount.

- Control Strut

  The semi-trailing arm is the only rear suspension strut that is taken from the series E92. It is connected further inwards on the rear axle carrier, only the rubber mount is new.

- Traction strut

  The geometry of the forged aluminium 'M' traction strut has been revised. It now has a new integrated rubber mount for the wheel carrier. The ball joint for the rear axle carrier has been taken from the series E92.



91 - E92 M3 Overview of rear axle struts

Index	Explanation
1	Wheel carrier
2	Toe strut
3	Camber strut
4	Control strut
5	Wishbone
6	Traction strut

Rear axle data compared to the E92 335i:

Designation	E92 M3	Series E92 335i
Tyre type/Wheel rim type/Rim offset [mm]	265-40 ZR 18/9.5Jx18 / IS23	255-40 WR 17 RSC/8.5Jx17/ IS37
Tyre radius [mm]	311	295
Wheelbase [mm]	2761	2760
Track width [mm]	1539	1513
Total toe	10’	18’
Driving axis angle	0°	0°
Camber	-1° 45’	-1° 30’

Rear shock absorbers

New ’M’ specific rear aluminium dampers are fitted to the M3. Electronic damper control - continuous (EDC-K), is available as an option.

The integrated lower damper rubber mount has a support sleeve that improves the rigidity and stability between the damper and the camber strut.

Wheels, tyres and brakes

Wheels and tyres

92 - E92 M3 series wheel

In the standard version, the cast 18" 'M' double spoke wheel (style 260) is available for the E92 M3, with the forged and polished 19" 'M' double-spoke wheel (style 220) available as an option. These are weight-optimized M3 light alloy wheels.
The tyres are also specifically selected for the M3. The Michelin Pilot Sport (PS2*) is currently fitted.

Wheel/tyre specification

Standard wheel:
Front
Wheel: 8.5 J x 18; IS 29; EH2+
Tyres: 245-40 ZR 18
Rear
Wheel: 9.5 J x 18; IS 23; EH2+
Tyres: 265-40 ZR 18

Optional:
Front
Wheel: 8.5 J x 19; IS 29; EH2
Tyres: 245-35 ZR 19 XL
Rear
Wheel: 9.5 J x 19; IS 23; EH2
Tyres: 265-35 ZR 19 XL

Winter wheel:
Front and rear
Wheel: 8 J x 18; IS 20; EH2+ (LM)
Tyres: 235-40 R 18 95V XL M+S
Chain type: Rudmatic approved for rear wheels

Brakes

93 - E92 M3 Front brake disc with brake calliper

For the E92 M3, the M Compound brake system with perforated brake discs and three 'M'-typical brake pad wear sensors is used, with a specifically adapted operating principle and dimensions.. The diameter of the brake discs has increased compared to the E46 M3 by 35 mm (M3 CSL 15 mm) at the front, and by 22 mm at the rear.

Brake system specification

Front brake:
Diameter 360 mm, thickness 30 mm, direction-specific ventilation,
single-piston floating calliper (lightweight metal alloy),
brake pad wear sensor right and left.

Rear brake:
Diameter 350 mm, thickness 24 mm, direction-specific ventilation, internal handbrake with 185 mm diameter (similar to E60 M5),
single-piston floating calliper (cast metal alloy),
brake pad wear sensor on right.

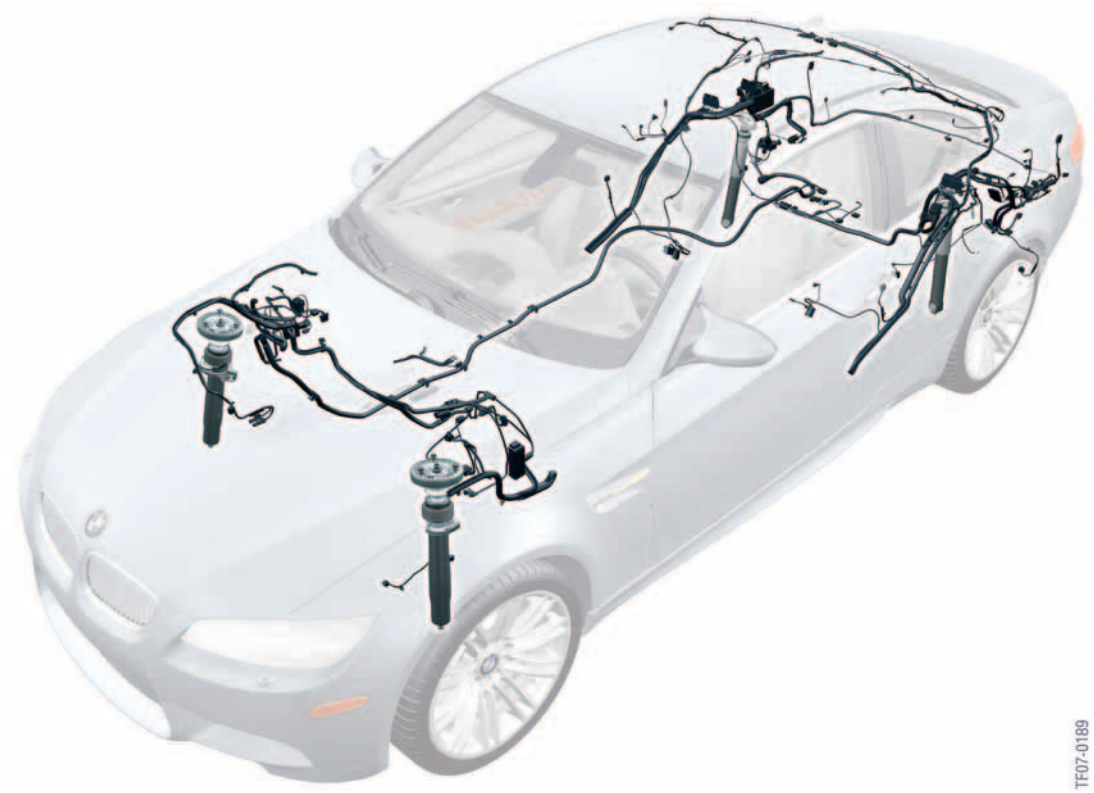
Dynamic Stability Control (DSC) MK60E5

The E92 M3 is equipped with the MK60E5 DSC system made by Continental Teves, which has been specifically adapted to its driving dynamics. The "civilian" version is installed in several models including the 6-cylinder series E92 and an M-specific version is installed in the E6x M5 and M6. The fundamental difference in both versions is the replacement of Dynamic Traction Control (DTC) with M Dynamic Mode (MDM). MDM has been adapted to suit sports car dynamism for experienced sports drivers. The permitted float angle and longitudinal slip in good environmental conditions (road, weather, etc.) are also equally high.

Furthermore, the driving-performance control (FLR), soft stop and Fading Brake Support (FBS) functions are not required in the 'M' version.
The braking readiness, "apply the footbrake and the handbrake until the discs and drums are dry" and the gradient assistant functions have been adapted appropriately.

The structure and the function of the DSC MK60E5 M application are described in more detail in the product information for the E60 M5.

Electronic Damper Control - Continuous (EDC-K)



94 - E92 M3 EDC-K

EDC-K is available for the first time in the E92 M3. EDC-K is an option and is based on the EDC-K in the E65.

Both dampers of one axis are always activated in parallel.
The valve is installed internally in the damper in the damper oil system.

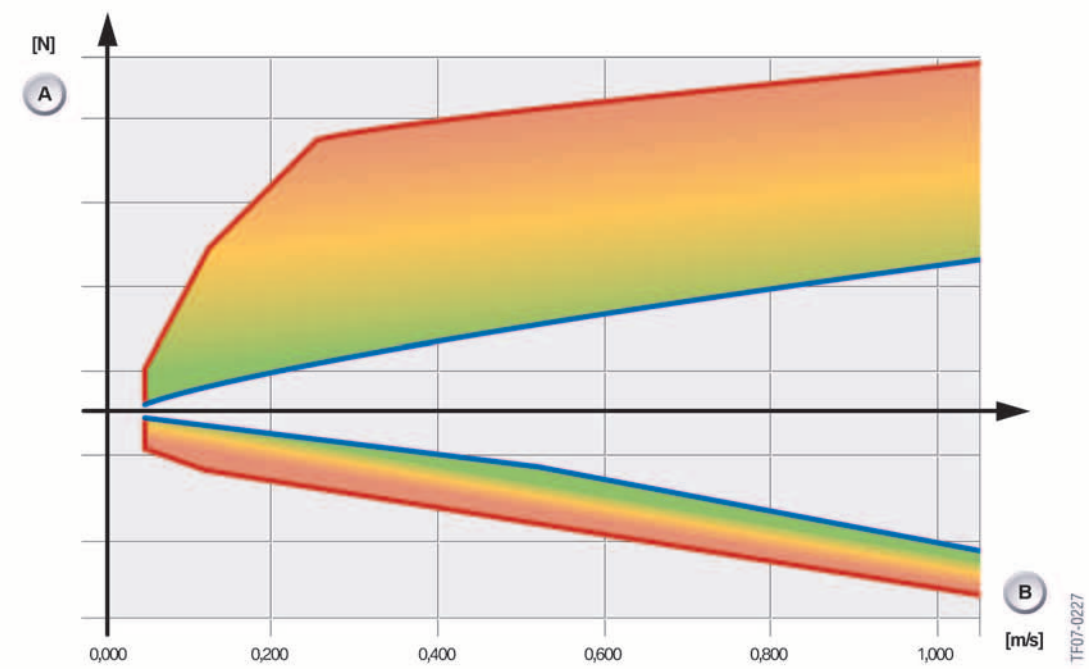
The driver can choose between three settings, the controlled programs "Comfort" and "Normal", or the uncontrolled fixed setting "Sport".
The program is selected using the EDC-K button on the centre console or preset via the MDrive menu and activated using the M button on the steering wheel (for more information, see the MDrive chapter).

The input signals come from two vertical acceleration sensors in the front wheel arches and a third sensor in the rear right-hand wheel arch.

The steering column switch cluster sends the steering angle to the F-CAN. This is transmitted together with the wheel speeds from the DSC to the PT-CAN and evaluated in the EDC-K control unit.

The longitudinal, lateral and vertical accelerations calculated as a result are used as a basis for regulation.

The EDC-K button signal enters the junction box and is transmitted to the EDC-K on the PT-CAN.



95 - Damping behaviour characteristic map

Index	Explanation	Index	Explanation
A	Damping force rebound phase (above) and compression phase (below)	B	Damper piston speed

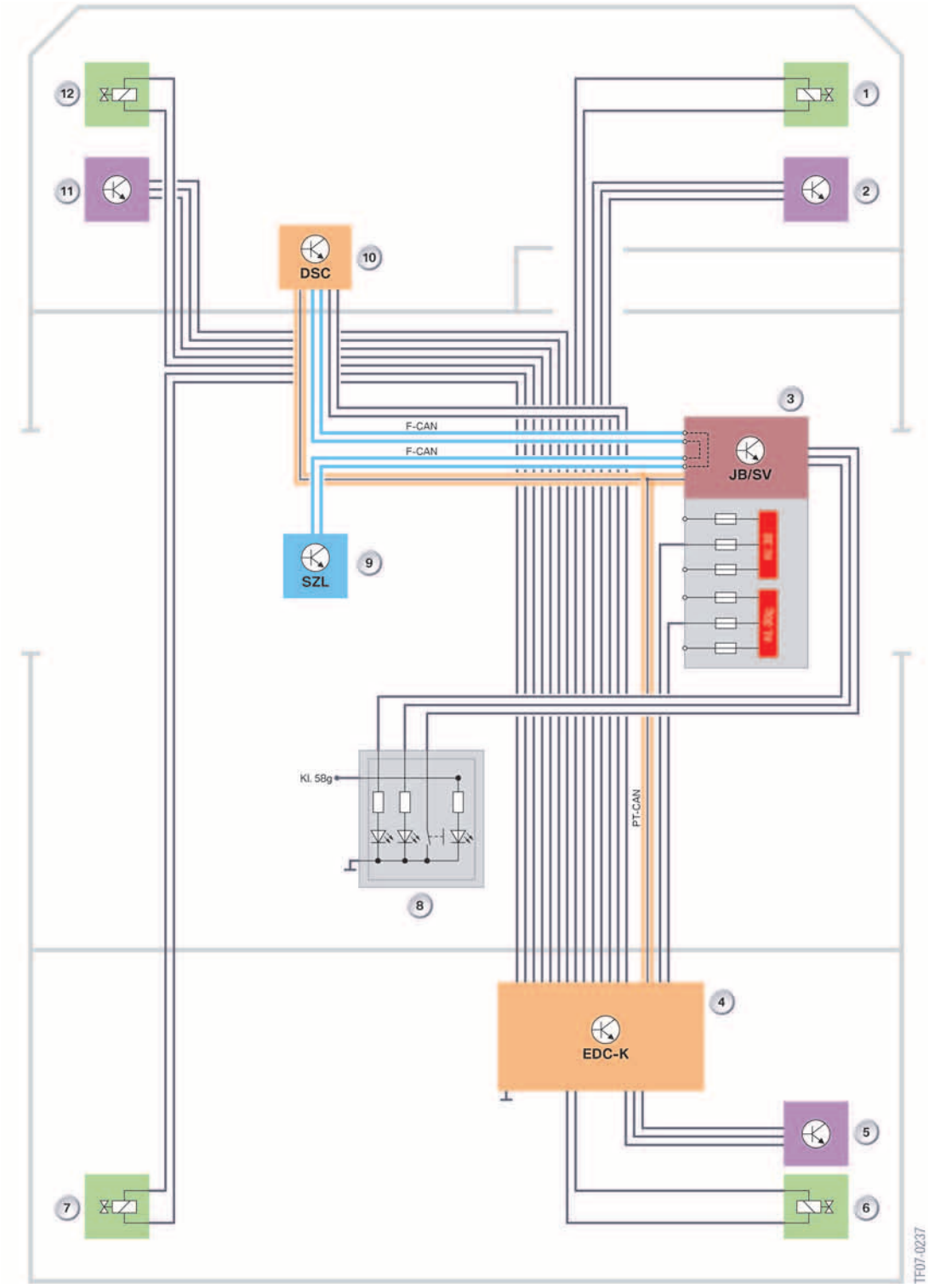
The compression phase, and in particular the rebound phase, of the shock absorbers can be adjusted by the EDC-K depending on the input signals in a smooth transition from relatively comfortable to a harder sports setting.

The structure and function of the EDC-K are described in detail in the training materials for the E65.
The EDC-K was adjusted for the E6x M5 and M6 and has now been adapted for the E92 M3.

The following legend refers to the graphic on the next page.

Index	Explanation	Index	
1	EDC valve, front right	7	EDC valve, rear left
2	Vertical acceleration sensor, front right	8	EDC button on centre console
3	Junction box/distribution box	9	Steering column switch cluster
4	EDC-K control unit	10	DSC control unit
5	Vertical acceleration sensor, rear left	11	Vertical acceleration sensor, front left
6	EDC valve, rear right	12	EDC valve, front left

EDC-K system circuit diagram



96 - E92 M3 EDC-K system circuit diagram

M3 concept

Engine and Technical Data

A maximum torque of 400 Newton meters at 3,900 rpm is reached. Approx. 85 percent (340 Nm) can be utilized beyond the enormous engine speed range of 6,500 rpm. The S65B40 attains 8,400 rpm, and therefore a value that was previously only reserved for racing car engines or exotic custom vehicles.

⚠ For safety reasons, due to the engine dynamics when the vehicle is stationary (i.e. without a road-speed signal), it is already down-controlled at 7,000 rpm to prevent the engine speed from increasing into an impermissible range. ◄

S65B40O0 Engine

Crankshaft

⚠ The identification marking of the bearing shells is engraved on the crankcase and on the first crank web. ◄

Connecting rods

⚠ The large connecting rod eye is asymmetrically ground to reduce the length of the engine. This means that the installation is direction-specific.

For the workshop, bearing shells are available in a repair stage (for more information, see the service documentation). ◄

Camshaft drive

The VANOS adjustment units are an integral component of the valve control and are mounted on the relevant camshaft by a central bolt.

⚠ The central bolts of the inlet and exhaust side have a CCW thread, please refer to the repair instructions. ◄

VANOS

The compact double VANOS system fitted to the S65 engine operates at normal oil pressure, unlike the S85 engine (which uses high oil pressure). The low-pressure system means that the high-pressure pump and additional pressure lines and reservoir are unnecessary.

The setting angle of the inlet camshaft is 58° in relation to the crankshaft. The exhaust camshaft has a setting angle of 48°. As in the S85 engine, this VANOS also reaches an adjustment rate of 360° camshaft per second.

⚠ The service instructions should be followed exactly. TheVANOS adjustment unit must not be disassembled. ◄

MSS60 Engine control system

Ion current combustion monitoring

In the S65, the ion current electronic system is integrated into each ignition coil and the ion current control devices are not required.

For the purposes of smoothing the voltage and electromagnetic compatibility, an "ignition suppression capacitor" is installed in the wiring harness of each cylinder bank (in the S85 this is in the ion current control device). This is electrically connected using terminal 87 and the vehicle earth.

⚠ If the ignition suppression capacitor is defective, this can lead to faults in the communications and/or audio electronics when the engine is running. ◄

⚠ For design reasons, the firing order 1-5-4-8-7-2-6-3 is used in the S65, instead of the firing order 1-5-4-8-6-3-7-2 more commonly employed in BMW V8 engines. ◄

Cooling System

Fan operation

The adjusted fan speed increases in a linear fashion as the cycle ratio increases. The rated speed (n_{Nom}) in the M3 is the same as the maximum number of revolutions (2,400 rpm).

The engine speed of the M3 is controlled in a linear relationship with the cycle ratio (10-91 %), starting with 800 rpm ($^1/_3$ of n_{Nom}) up to 2,400 rpm.

⚠ In the E6x M5/M6 (600 W fan), from a 92 % to 95 % cycle ratio, an additional unregulated increase in engine speed to at least 2,700 rpm (n_{max}) is realized. ◄

Fan self-diagnosis and fault signal

⚠ A fault message is issued with a delay of approx. one minute, since the electronic fan system first executes a triple internal test cycle. ◄

Drive train

Manual transmission GS6-53BZ

The gear oil is replaced and the screw oil filter is checked or cleaned during the running-in inspection, and later according to service specifications (estimated after every third engine oil change).

⚠ For fault symptoms with engine speed limitation, the gear oil temperature should also be considered as a possible cause. ◄

Clutch

⚠ The clutch and the dual-mass flywheel are permanently connected and are balanced as a single unit. They can only be replaced in a set. ◄

Propeller shaft

⚠ The centre bearing can be mounted in two directions. It is important that the bearing is mounted with the word "TOP" facing the body. ◄

Final drive

⚠ Due to their function, the shafts of the right and left stub axles in the final drive have different lengths. In an idle state, this results in a noticeable different vertical clearance of both flanges, which is a feature of the design.
This does not affect the function and is not a cause for complaint.

This uneven clearance applies for all models with fully variable M slip differential and may affect either the right or the left flange, depending on the version and model. ◄

Chassis and suspension

Components of the double-jointed spring strut front axle

Swivel bearing

Spring strut connection to the wheel carrier

During assembly, the M3 spring strut is pulled into the lower cone using a new special tool.

⚠ Follow the new installation and removal process according to the service repair manual. ◄

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