Technical training.
Product information.

F87 Complete Vehicle

BMW Service

General information

Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:

Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

Information status and national-market versions

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

This document basically relates to the European version of left hand drive vehicles. Some operating elements or components are arranged differently in right-hand drive vehicles than shown in the graphics in this document. Further differences may arise as the result of the equipment specification in specific markets or countries.

Additional sources of information

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

- Owner's Handbook
- Integrated Service Technical Application.

Contact: conceptinfo@bmw.de

The information contained in this document forms an integral part of the technical training of the BMW Group and is intended for the trainer and participants in the seminar. Refer to the latest relevant information systems of the BMW Group for any changes/additions to the technical data.

Information status: **October 2015**
BV-72/Technical Training

F87 Complete Vehicle

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1. Introduction

For customers who place particularly high demands on the performance of their 2 Series BMW, BMW M GmbH now offers a BMW M2 based on the F22 BMW 235i Coupé. This has an even more powerful engine and is equipped with a modified F80 BMW M3 chassis and suspension including the variable M differential lock. The modifications are designed for an exciting driving experience that encompasses the powertrain, chassis, suspension, bodywork and interior.

With the F87 BMW M2, customers benefit from the company's extensive know-how in development and production of M vehicles. Sporty visual styling, rigorous use of lightweight components and a powerful, performance-orientated engine.

The F87 BMW M2 will be built at the Leipzig plant in Germany. The market introduction of the F87 BMW M2 will take place in the US in March 2016.

1.1. History

1.1.1. E82 BMW M Coupé

The first M Coupé based on a BMW 1 Series made its debut in May 2011 and approx. 6,300 vehicles were delivered up to 2012.

E82, M Coupé, front side view

The BMW M Coupé was powered by the N54B30T0 engine with twin turbocharger. In the BMW M Coupé, this engine produced 250 KW / 335 hp with a torque of 500 Nm / 369 lb-ft in overboost mode (450 Nm / 332 lb-ft in normal operation).

F87 Complete Vehicle

1. Introduction

E82, M Coupé, rear side view

The chassis and suspension as well as the interior and exterior were adapted specifically for the M model of the E82 M Coupé.

F87 Complete Vehicle

1. Introduction

1.2. Vehicle profile F87 BMW M2

F87, BMW M2

- **Design and aerodynamics:** Two-door high-speed sport Coupé. M-specific characteristics in front, side and rear area. Aerodynamic design in front, side and rear area and vehicle underbody.
- **Engine/Transmission:** 3-liter 6-cylinder engine, TVDI engine. Efficient, with even more powerful and more spontaneous linear power development. 2 selectable engine dynamic control programs. M Double-clutch Transmission with Drivelogic as an option. Electronically controlled M rear-axle differential lock as standard.
- **Engine sound:** Sporting character in the lower and upper engine speed and power range. Active Sound Design (ASD), which makes the engine sound in the vehicle interior a desirable overall experience in combination with the original sound.
- **Steering:** Direct and precise variable M Servotronic (EPS) with selectable Servotronic support (in two stages). M steering wheel including M shift paddle.
- **Chassis and suspension/Chassis and suspension dynamics design:** Optimum driving precision and adapted interaction of steering, tires, suspension and damping action through M-specific setup. Dynamic Stability Control (DSC) with M dynamic mode setup.

F87 Complete Vehicle

1. Introduction

- **Seating comfort:** M sports seats in Dakota Black leather with “Polar Blue” seam stitching.
- **Ergonomics, interior equipment:** Instrument cluster with red needles and white dials, M seat, M-specific decorative strips, M footrest, M door sill cover strips and knee pad on center console.
- **BMW ConnectedDrive:** Assistance systems and mobility services from the BMW ConnectedDrive scope, collision warning, lane departure warning, speed limit info, city collision warning.

F87 Complete Vehicle

2. Technical Data

All technical data is based on vehicles with manual gearboxes.

Designation	Unit	F22 M235i	F80	F87
Engine range		N55B30O0	S55B30T0	N55B30T0
Engine control		MEVD 17.2.G	MEVD17.2.G	MEVD 17.2.G
Transmission type designation		K transmission	K transmission	K transmission
Length	[mm]	4454	4671	4468
Width	[mm]	1774	1870	1854
Height	[mm]	1408	1383	1410
Number of seats		4	4	4
Luggage compartment volume	[l]	390	445	390
Maximum speed	[km/h] mph	250 / 270* 155 / 168*	250 / 280* 155 / 174*	250 / 270* 155 / 168*
Acceleration 0 - 100 km/h (0–60 mph)	[s]	5.2 (4.9)	4.3 (4.1)	4.5 (4.4)
Nominal engine power at engine speed	[kW / bhp] [rpm]	240 / 326 5800–6000	317 / 425 5500–7300	272 / 365 6500
Power-to-weight ratio (DIN)	[kg/kW]	6.1	4.8	5.5
Torque at speed	[Nm (lb-ft)] [rpm]	450 (332) 1300–4500	550 (406) 1850–5500	465 (343) 1400–5560
Aerodynamics				
c_x (drag coefficient)		0.33	0.34	0.35
A (area)	[m^2]	2.14	2.29	2.21
c_x x A (drag)	[m^2]	0.71	0.78	0.77
Vehicle curb weight				
US	[kg (lbs)]	1590 (3505)	1601 (3530)	1565 (3450)
Gross Vehicle Weight	[kg (lbs)]	1964 (4330)	2401 (4500)	2009 (4330)
US Rear axle load	[kg (lbs)]	1080 (2380)	1129 (2490)	1080 (2380)
Fuel consumption City Country Totals	[l/100 km]	 10.9 6.4 8.1	 12 6.9 8.8	 11.6 6.7 8.5
Approx. fuel tank capacity	[l]	52	60	52
CO^2 emissions	[grams per kilometer]	189	204	199
Exhaust emission standards		ULEV II	ULEV II	ULEV II

*= with Increased Top Speed Limiter (SA 840) standard on the F87

F87 Complete Vehicle

2. Technical Data

2.1. BMW EfficientDynamics measures

- TwinPower Turbo technology.
- Gasoline direct fuel injection with Valvetronic.
- Automatic engine start-stop function.
- 7–speed M double-clutch transmission with Drivelogic as optional equipment SA 2MK / or a 6–speed manual gearbox as standard.
- M Servotronic (EPS).
- Shift point display.
- Map-controlled oil pump.
- Brake energy regeneration.

F87 Complete Vehicle

3. Body

3.1. Bodyshell

3.1.1. Chassis and suspension components and rigidity concept

Front area of vehicle

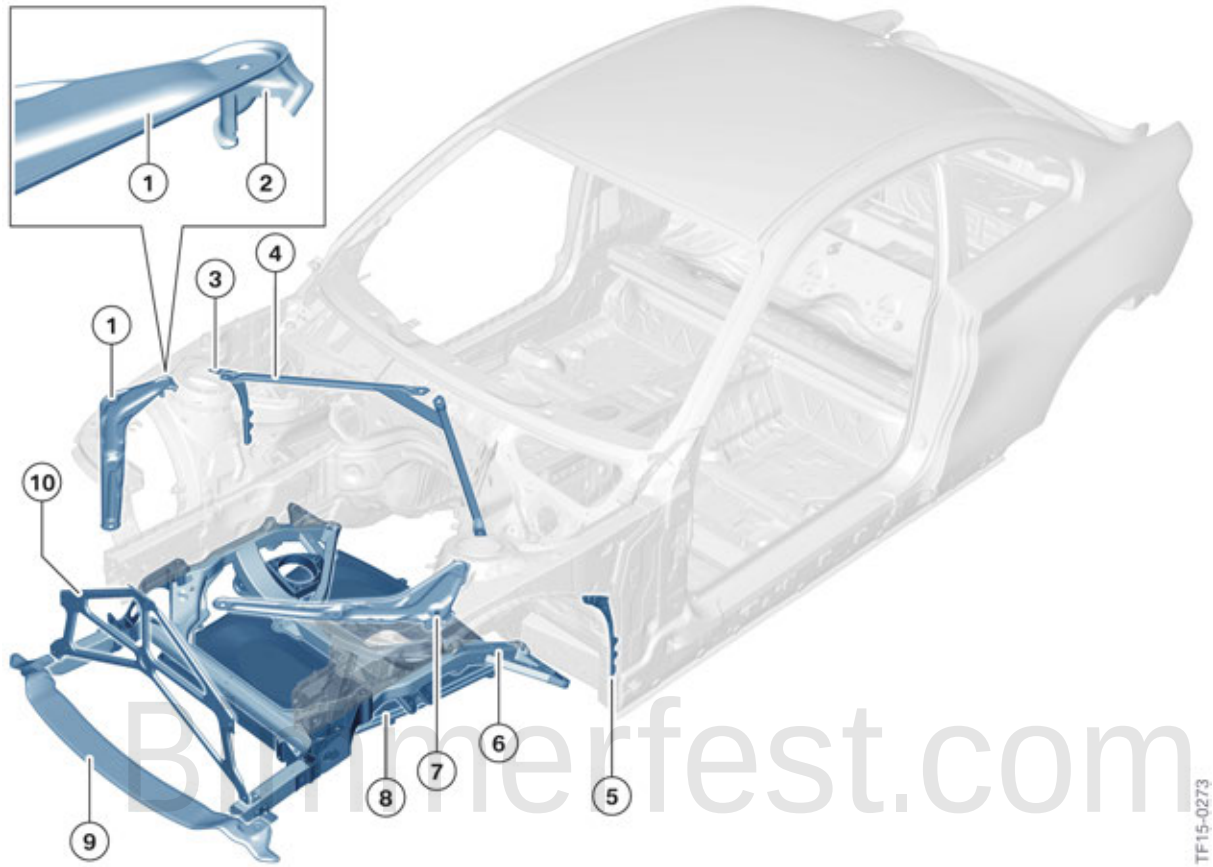
In contrast to the F22, different measures are implemented in the front area of the vehicle to increase rigidity. Individual components were adopted from the F23 as well as F80/F82 and F83.

The following measures were implemented in the front area of the vehicle for the connection of the chassis and suspension components and to increase the vehicle rigidity:

- Front-end struts.
- Strut brace.
- Front axle support with additional connection in the side sill area.
- Stiffening plate.
- Carrier support struts.
- Cross member, bottom.
- Front-end reinforcements of the engine supports by stiffening module made of aluminium in front of the cooling module.

F87 Complete Vehicle

3. Body



F87, measures in the front area

Index	Explanation
1	Front-end strut, right (adopted from F23)
2	Front-end strut connection to carrier support (adopted from F23)
3	Carrier support strut, right (adopted from F82)
4	Strut brace (adopted from F23)
5	Carrier support strut, left (adopted from F82)
6	Front axle support with additional connection (adopted from F80)
7	Front-end strut, left (adopted from F23)
8	Stiffening plate (adopted from F80)
9	Cross member, bottom (adopted from F80/F82 and F83)
10	Stiffening module (adopted from F80/F82 and F83)

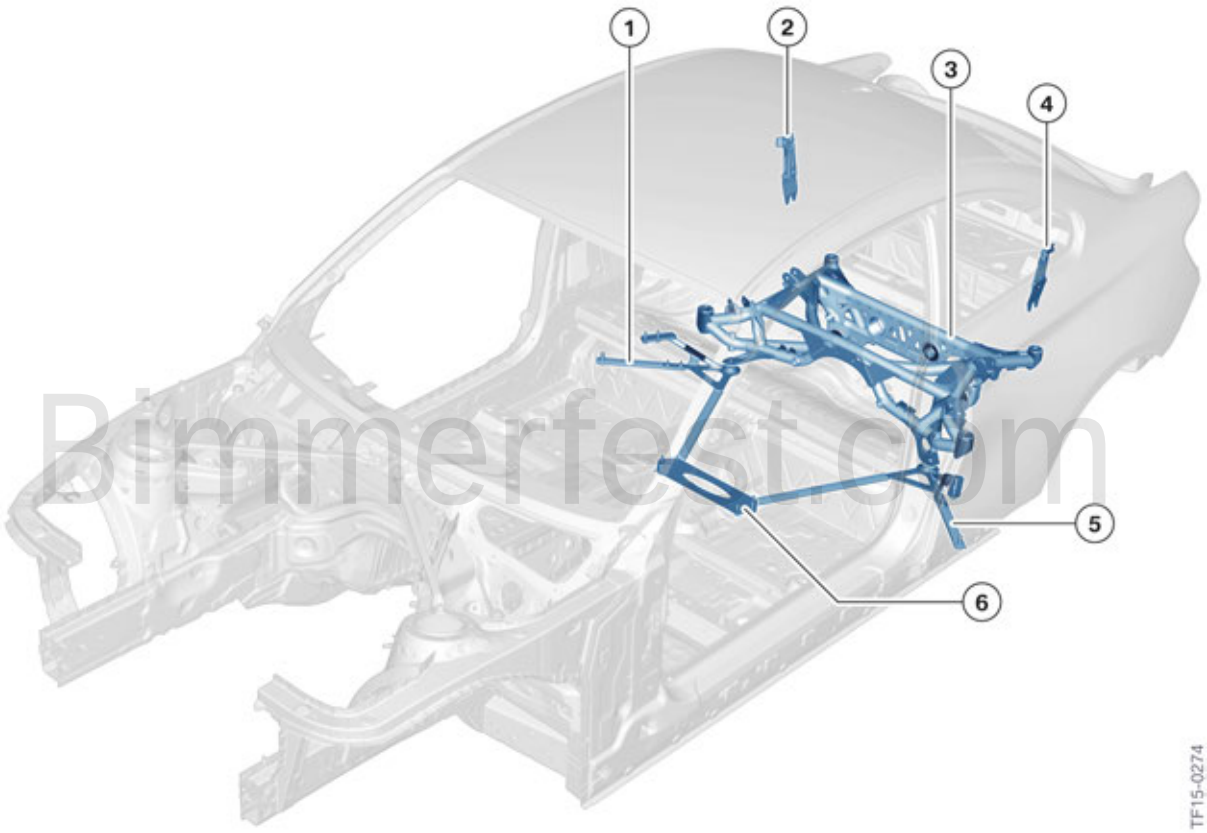
F87 Complete Vehicle

3. Body

Rear area of the vehicle

The following measures were implemented in the rear area of the vehicle for the connection of the chassis and suspension components and to increase the vehicle rigidity:

- Direct screw connection of the rear axle support to the body without the use of rubber mounts.
- Double strut assembly in underfloor area.
- Additional struts in the luggage compartment area to support the spring strut domes.



F87, measures in the rear area

Index	Explanation
1	Tunnel-side sill area, double strut, right (new development for F87)
2	Spring strut support, right
3	Rear axle support (adopted from F80/F82 and F83)
4	Spring strut support, left
5	Tunnel-side sill area, double strut, left (new development for F87)
6	Double strut mounting

F87 Complete Vehicle

3. Body

3.2. Exterior

3.2.1. Front view

Bumper, front

An M-specific front bumper panel is used on the F87 BMW M2. This features flaps at the bottom to reduce lift at the front axle. It is painted in the vehicle color. The shaped element that serves as an impact absorber under the bumper panel is adapted to the new geometry of the bumper panel of the F87. Due to the necessary air inlets no fog lights are installed. The ornamental grilles at the bottom and on the left and right are fitted as separate parts and have a black, grained finish. The frame and the double-rib longitudinal bars of the BMW M kidney grill are finished in high-gloss black as standard for the F87 BMW M2 and feature the M2 model designation.

F87, front view

In addition, the Air Curtain was integrated in the front bumper panel and the neighboring wheel arch panel. Together with the underbody panelling, a rear spoiler gurney flap and the exterior mirrors, the Air Curtain also contributes to the aerodynamic concept of the new F87 BMW M2.

F87 Complete Vehicle

3. Body

3.2.2. Side view

F87, side view

Exterior mirror and sill

The exterior mirrors have been adopted from the F22 M235i, but feature mirror caps painted in the vehicle color. The mirrors are heated and are auto-dimming as standard equipment with integrated side repeaters. They feature memory and fold-in functions and the passenger side mirror has an automatic dip function.

The full side sill panels are also aerodynamically optimized and are a new part for the F87 BMW M2.

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3. Body

F87, side gill

Front fender

The front fenders have a specific design for the F87 BMW M2 and are made of aluminium.

Striking design features include the M gills and the “M2” logo on the front left and right fenders.

Wheel arch cover

The wheel arch cover and the covers of the steering unit are a new design.

Side frame

The side frame on the left and right and the inner C-pillars are completely new parts for the F87.

Rim design

Forged 19" M light-alloy wheels are used as standard at the front and rear. Mixed tires with the sizes 245/35 ZR 19 at the front and 265/35 ZR 19 at the rear are used. For more information please see the chapter "Wheels/Tires".

F87 Complete Vehicle

3. Body

F87, rim design

Index	Explanation
1	19" M standard wheel

3.2.3. Rear quarter panel and rear view

Rear quarter panel

The rear quarter panel was widened and adapted to accommodate the modified chassis and suspension components and the larger track width of the new F87 BMW M2.

The 4 round exhaust tailpipes with tailpipe trims in high-gloss chrome are a striking design feature.

F87 Complete Vehicle

3. Body

F87, rear view

The rear quarter panel also contains the fuel filler flap with cover, which is also a new part for the F87 BMW M2.

Wheel arch cover

The wheel arch cover has been adapted to the new quarter panel.

Rear bumper

The rear bumper panel comprises of 2 parts, the M-specific bumper cover at the top and the diffuser at the bottom. The diffuser visually accommodates the exhaust system and is aerodynamically optimized. The M-specific bumper cover is supported at the quarter panels on the left and right by F87-specific mounts. The PDC sensors are painted in the vehicle color. The impact absorber under the bumper cover is adapted to the new geometry of the bumper cover of the F87 BMW M2.

Rear spoiler/Gurney flap

A Gurney is an aerodynamic component and functions as a tear-off edge. The Gurney was so-called after a former Formula 1 driver. The Gurney reduces drag at the rear axle and contributes to the optimization of the driving dynamics.

F87 Complete Vehicle

3. Body

3.2.4. Vehicle underbody/cooling air routing and thermal protection

Underbody

The underbody is fully panelled as part of the aerodynamic concept of the F87 BMW M2 in order to reduce and uniformly distribute the lift at the front and rear axles. This highlights and optimizes the driving dynamics concept, particularly at higher speeds. The underbody panelling was adapted in terms of the cooling and flow around and through the drive components and chassis and suspension components, without compromising the aerodynamic concept.

Underbody panelling and thermal protection

The following underbody panels and heat insulation elements were newly adapted for the F87 BMW M2:

- The front engine compartment shielding is new for the F87 BMW M2.
- The left and right underbody panelling has been adopted from the F80 BMW M3.
- The left and right underbody panelling extension at the rear has been newly adapted for the F87 BMW M2.
- The underbody panelling at the rear right and left has been newly adapted for the F87 BMW M2.
- The heat insulation for the fuel filler pipe has been newly adapted for the F87 BMW M2.
- The heat insulation for the luggage compartment floor is new for the F87 BMW M2.
- The heat insulation for the rear silencer is new for the F87 BMW M2.
- The heat insulation at the rear of the rear silencer is new for the F87 BMW M2.

Cooling air routing

The following cooling air routing was newly adapted for the F87 BMW M2:

- Cooling air routing for the radiator is new.
- Cooling air routing for the external radiator is new.
- Cooling air routing for the engine oil cooler is new.

F87 Complete Vehicle

3. Body

3.3. Interior

Various insulation materials were omitted in the area of the interior in order to reduce weight.
As a result of this omission of insulating material, it was possible to achieve a weight saving of approx. 11 kg / 24 lbs compared with the F22.

3.3.1. Driving area and steering wheel

M driving area

F87, driving area

On the F87 BMW M2, carbon fiber interior trim is installed as standard on the following interior components:

- Dashboard
- Center console
- Door handles

F87 Complete Vehicle

3. Body

M leather steering wheel

The M leather steering wheel with multifunction elements has a magnesium frame. It is based on the steering wheel introduced with the F80 BMW M3. Above the thumb rests are the M gearshift paddles with M shift logic in combination with M double-clutch transmission, left downshift, right upshift.

In comparison to the F22, the radial diameter of the steering wheel was reduced by 8 mm and the outer diameter by 2 mm. The steering wheel rim is reinforced to 31.6 mm in comparison to the standard version and optimized in terms of ergonomics, from a round to an oval cross-section which improves the grip.

The colored M stitching is another difference to the F2x. The M leather steering wheel in the double-spoke design with a stainless steel center trim and with M inscription is black leather. Steering wheel heating is an option and included in the optional Executive Package ZEC.

The switch block has been taken from the F2x vehicles in the F87 BMW M2.

F87, M steering wheel

F87 Complete Vehicle

3. Body

3.3.2. Seats

M sports seat

M sports seats familiar from the optional equipment range of the F22 are used in the F87 BMW M2. They are covered as standard with Black Dakota leather. M-specific blue contrast stitching is used on the seats as an option LCNL. The "M" brand logo is embossed in the backrest under the head restraints.

F87, seats

F87 Complete Vehicle

4. Engine/Powertrain

4.1. Engine N55B30T0

F87, N55B30T0 engine

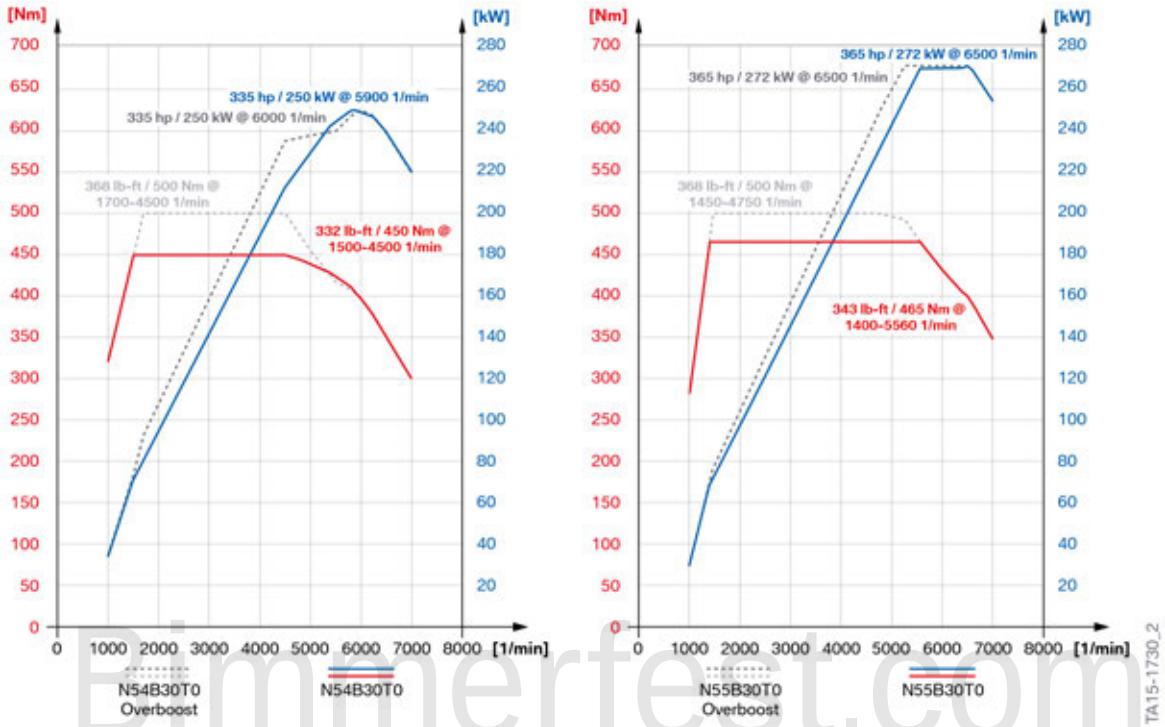
The N55B30T0 engine is the power plant for the F87 BMW M2. It is a further development of the N55B30O0 engine from the BMW M135i and BMW M235i, which is familiar from the current BMW 1 Series and 2 Series models.

This document describes only the differences compared with the N55B30O0.

F87 Complete Vehicle

4. Engine/Powertrain

4.1.1. Engine comparison



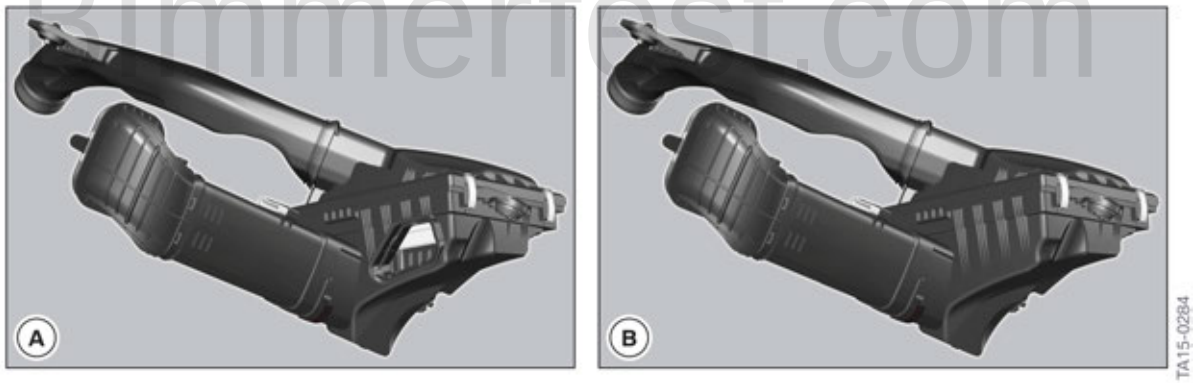
Performance diagrams

	Unit	N54B30T0	S55B30T0	N55B30T0
Series		E82 M	F80	F87
Model designation		BMW M Coupé	BMW M4	BMW M2
Design		R6	R6	R6
Displacement	[cm³]	2979	2979	2979
Firing order		1–5–3–6–2–4	1–5–3–6–2–4	1–5–3–6–2–4
Turbocharging		M TwinPower Turbo	M TwinPower Turbo	TwinScroll Turbo
Bore/stroke	[mm]	84.0 / 89.6	84.0 / 89.6	84.0 / 89.6
Power at engine speed	[kW (HP)] [rpm]	250 / 340 5900	317 / 431 5500–7300	272 / 370 6500
Power output per liter	[kW/l]	83.9	106.4	91.3
Torque at engine speed	[Nm (lb-ft)] [rpm]	450 +50 overboost (332 +37 overboost) 1500–4500	550 (406 +37 overboost) 1850–5500	465 +35 overboost (343 +26 overboost) 1400–5560
Compression ratio	[ε]	10.2:1	10.2:1	10.2:1
Valves per cylinder		4	4	4
Fuel rating	[RON]	98	98	98

	Unit	N54B30T0	S55B30T0	N55B30T0
Fuel	[RON]	91–98	95–98	95–98
Fuel consumption complying with EU	[l/100 km]	9.6	8.8	8.5
CO_2 emissions	[grams per kilometer]	224	204	199
Digital Motor Electronics		MSD 81	MEVD17.2.G	MEVD17.2.G
Exhaust emissions legislation		ULEV II	ULEV II	ULEV II
Maximum speed	[km/h] mph	250 / 270* 155 / 168*	250 / 280* 155 / 174*	250 / 270* 155 / 168*
Acceleration 0–100 km/h (0–60 mph)	[s]	4.9 (4.7)	4.3 (4.1)	4.5 (4.4)

*= with Increased Top Speed Limiter (SA 840) standard on the F87

4.1.2. Intake manifold



N55 engine, intake silencer comparison

Index	Explanation
A	Intake silencer on N55B30T0 engine
B	Intake silencer on N55B30O0 engine

Intake air system

The air intake system is in principle comparable with that of the N55B30O0 engine. The most important changes in the air intake system are adaptation of the intake silencer housing. On the N55B30T0 an additional opening is provided in the bottom housing section, to optimize the power potential and for dethrottling purposes.

F87 Complete Vehicle
4. Engine/Powertrain

4.1.3. Engine mechanics

Crankshaft bearings

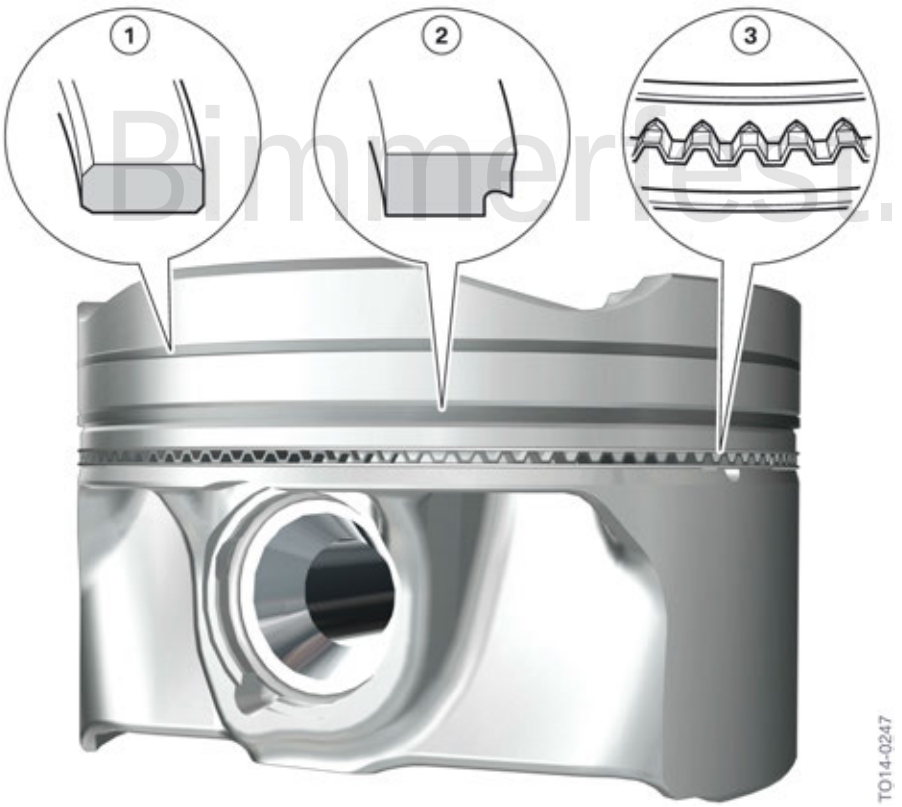
The crankshaft main bearing shells were adopted from the S55 engine.

Adaptations were necessary in order to satisfy the higher requirements. The crankshaft bearings are lead-free. A three-material S703C electroplated bearing is used as a material combination for the lower bearing shells. For the upper bearing shells a two-material bearing made from aluminium R25 is used. The axial bearing is effected at the fourth bearing position.

Piston

The pistons were adopted from the S55 engine.

Adaptations were necessary on the first piston ring, the plain rectangular compression ring. This had to be adapted as regards the material pairing to a liner made of grey cast iron. This is in contrast to the S55 engine, where this is LDS-coated.



N55 engine, piston with wrist pin and piston rings

Index	Explanation
1	Plain compression ring
2	Stepped compression ring
3	ES oil scraper ring

F87 Complete Vehicle
4. Engine/Powertrain

4.1.4. Oil supply

Differences in the oil supply in the N55B30O0 and N55B30T0 engines

The oil supply was adapted in the N55B30T0 for race circuit suitability:

- Additional oil sump cover to restrict oil movements at high acceleration.
- Additional suction pump to return the oil to the rear area of the oil sump during high lateral and longitudinal acceleration.
- Extraction from the exhaust turbocharger in the event of high lateral acceleration.

With these changes the oil supply can be guaranteed up to a longitudinal acceleration of 0.61 g. This can even be achieved up to - 1.2 g in the case of deceleration. Also with lateral acceleration, for example during cornering, this structure enables a secure oil supply up to constant 1.2 g.

Oil sump

The oil sump of the N55B30T0 engine is a common part from the S55 engine and is made of aluminium. Production of the oil sump from magnesium for the S55 engine resulted in a weight saving of approx. 1000 g / 2.2 lbs as compared with the aluminium oil sump for the N55 engine. During ongoing production, the magnesium oil sump was also changed to an aluminium oil sump for the S55 engine. An additional oil sump cover in the oil sump also restricts the oil movements during longitudinal and lateral acceleration.

N55 engine, oil sump

Index	Explanation
A	Oil sump, inner
B	Oil sump from the outside
1	Additional oil sump lid
2	Oil separator

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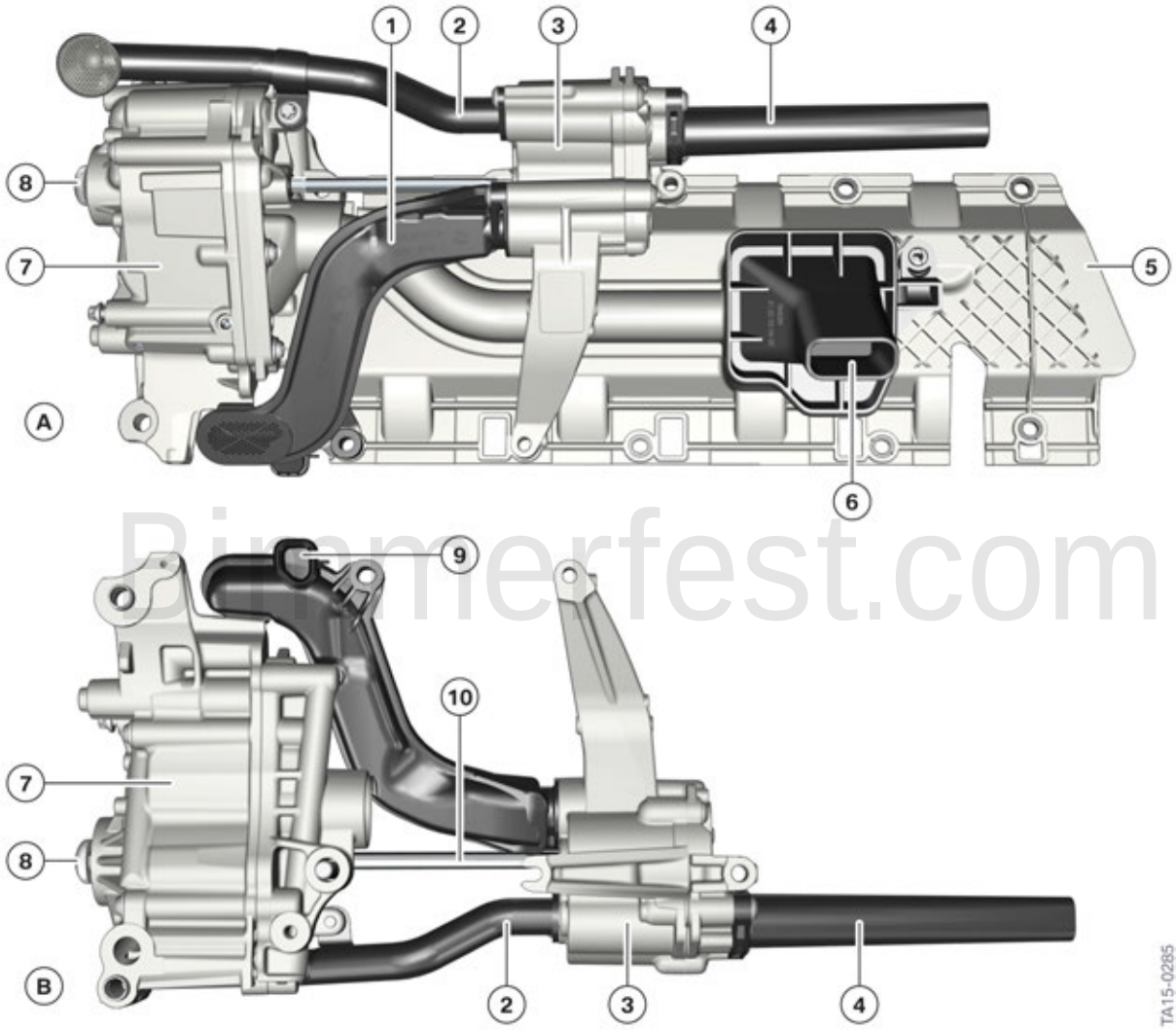
4. Engine/Powertrain

Suction pump

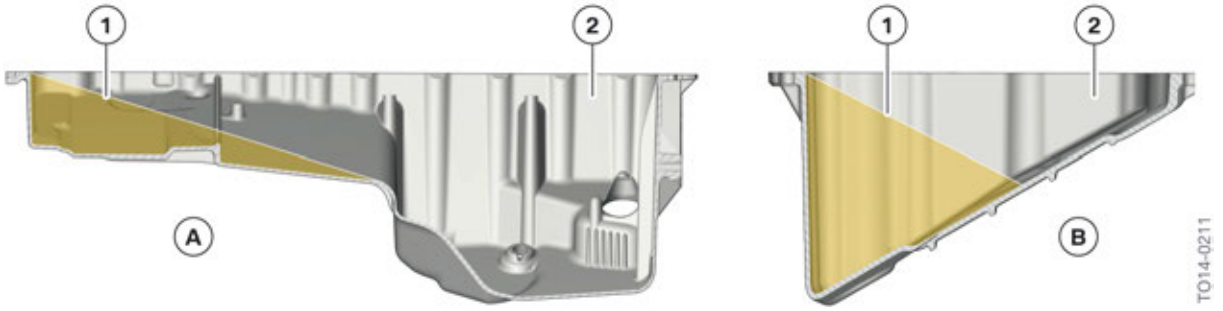
In order to adapt the oil supply to motor racing requirements, a second oil pump was installed as a backup. The second oil pump, the so-called suction pump, supports the return flow of the oil from the exhaust turbocharger and from the front areas of the oil sump back to the rear area of the oil sump.



N55 engine, oil pump connected to suction pump

Index	Explanation
A	Oil pump unit with oil deflector and intake snorkel from below
B	Oil pump unit without oil deflector and intake snorkel from above
1	Twin-branch exhaust pipe, oil sump right and exhaust turbocharger
2	Intake pipe, left, oil sump, front
3	Suction pump
4	Return flow
5	Oil deflector

Index	Explanation
6	Suction pipe
7	Oil pump
8	Oil pump drive
9	Suction pipe, exhaust turbocharger
10	Link



N55 engine, engine oil level

Index	Explanation
A	Negative longitudinal acceleration (braking)
B	Lateral acceleration (dynamic cornering)
1	Engine oil level during braking and cornering
2	Oil sump

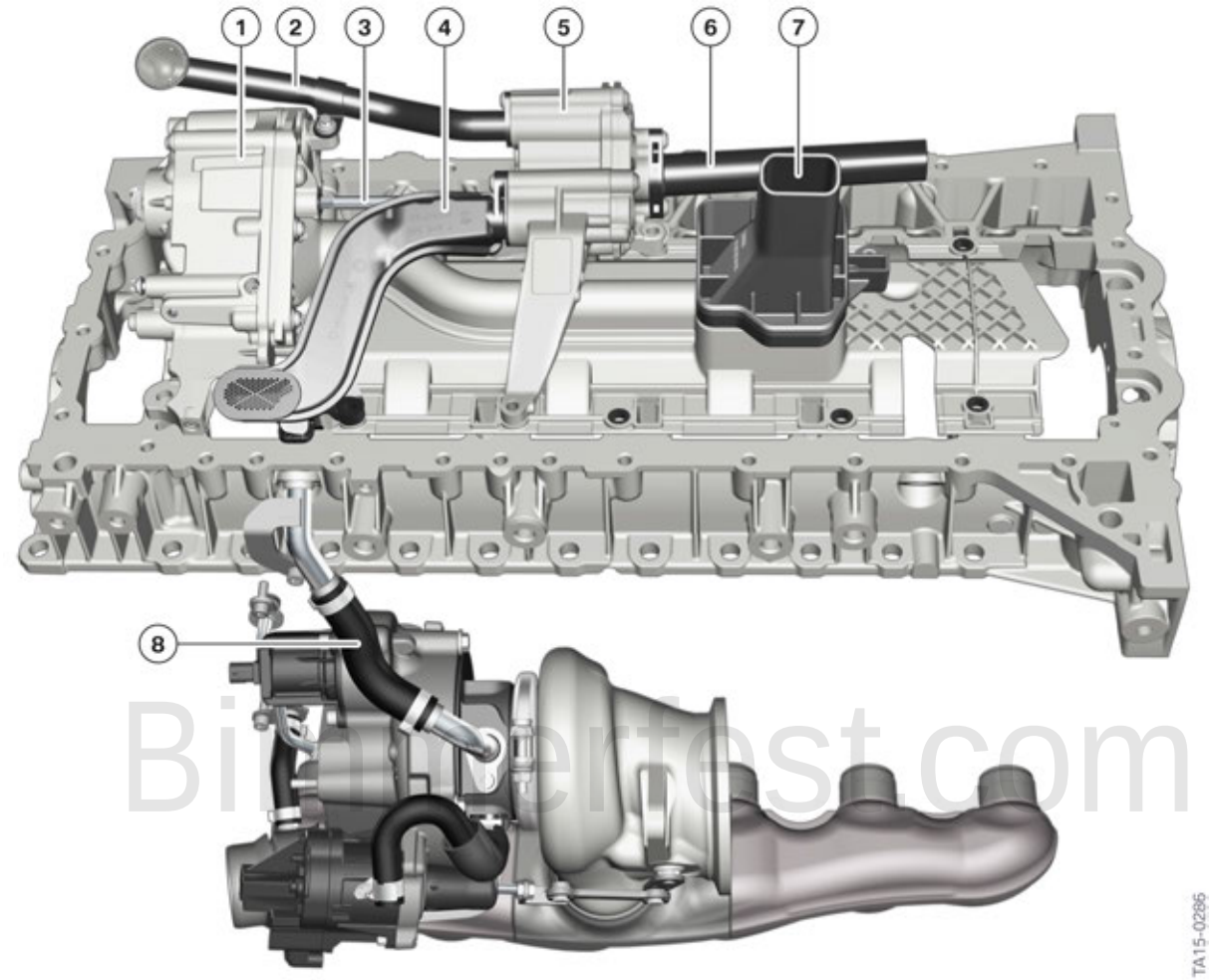
In these driving situations, the engine oil is drawn by the suction pump through the suction pipes (2/4) from the front part of the oil sump during longitudinal acceleration, or from the side parts of the oil sump during lateral acceleration. The oil drawn in is delivered via the return flow (6) back to the rear part of the oil sump. There the oil pump can re-absorb the oil via the oil deflector with intake pipe (7) and deliver it to the engine lubrication points.

Also at the bearing positions of the exhaust turbocharger the engine oil may collect due to the centrifugal force during lateral acceleration conditions. This prevents a normal backflow to the oil sump and thus also a supply of fresh cool engine oil at the bearing positions.

To counteract this effect, at the bearing positions of the exhaust turbocharger the engine oil is continuously drawn in by the suction pump and delivered to the oil sump.

F87 Complete Vehicle

4. Engine/Powertrain

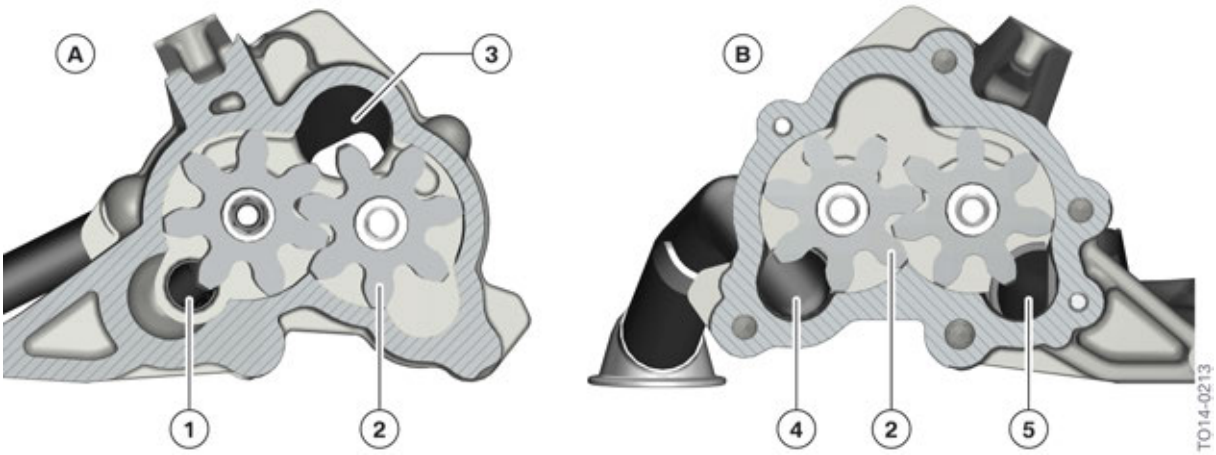


N55 engine, oil suction on exhaust turbocharger

Index	Explanation
1	Oil pump
2	Intake pipe, left, oil sump, front
3	Link
4	Twin-branch exhaust pipe, oil sump right and exhaust turbocharger
5	Suction pump
6	Return flow
7	Oil deflector with intake pipe
8	Oil return lines, exhaust turbocharger (extraction)

The suction pump is a twin-flow gear pump. The outer chambers of the gear pump serve as suction chambers. In addition to the suction pipes in the front oil sump, the suction pipe in combination with the oil return line for the exhaust turbocharger is also connected at the suction chambers.

The inner chamber is a pressure chamber. Via the pressure chamber the engine oil drawn in is delivered back to the rear oil sump via the return flow. The engine oil in the rear oil sump is available again to the oil pump by the intake pipe.



N55 engine, suction pump

Index	Explanation
A	Suction pump, rear part
B	Suction pump, front part
1	Suction pipe, exhaust turbocharger
2	Gear pump
3	Return flow
4	Intake pipe, left, oil sump, front
5	Suction pipe, oil sump, front right

4.1.5. Exhaust turbocharging

Overboost

On the N55B30T0 engine, the torque is increased from 465 Nm/343 lb-ft to 500 Nm/369 lb-ft (overboost) by a brief increase in the charging pressure of 0.1 bar above the normal charging pressure.

Blow-off valve

A blow-off valve without diaphragm from the N20 engine is used in the N55B30T0 engine.

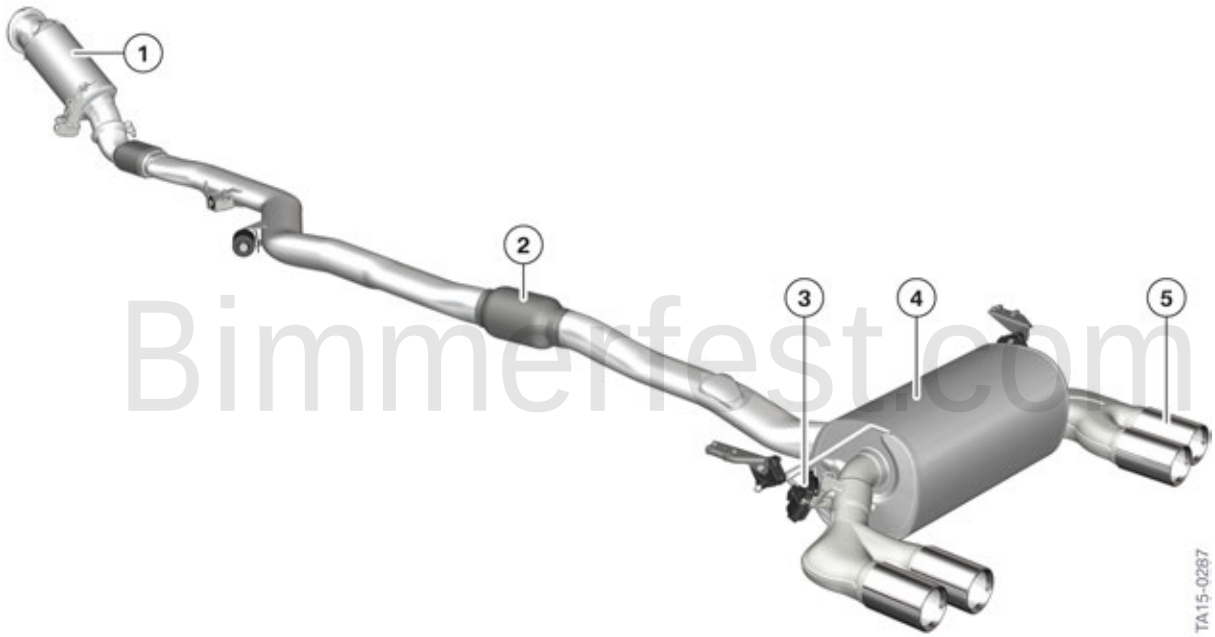
F87 Complete Vehicle
4. Engine/Powertrain

4.1.6. Exhaust system

The exhaust system was newly developed for the F87 BMW M2.

Differences in the exhaust system:

- Vacuum operated exhaust flap replaced by electrical exhaust flap.
- Dethrottling of the exhaust system for optimum gas exchange.
- Exhaust routing adapted to F87 BMW M2.
- Sporty exhaust sound combined with ASD to the vehicle occupants.



F87, exhaust system with electrical exhaust flap controller

Index	Explanation
1	Upstream catalytic converter
2	Center silencer
3	Electrical exhaust flap controller
4	Rear silencer
5	Twin tailpipe

F87 Complete Vehicle

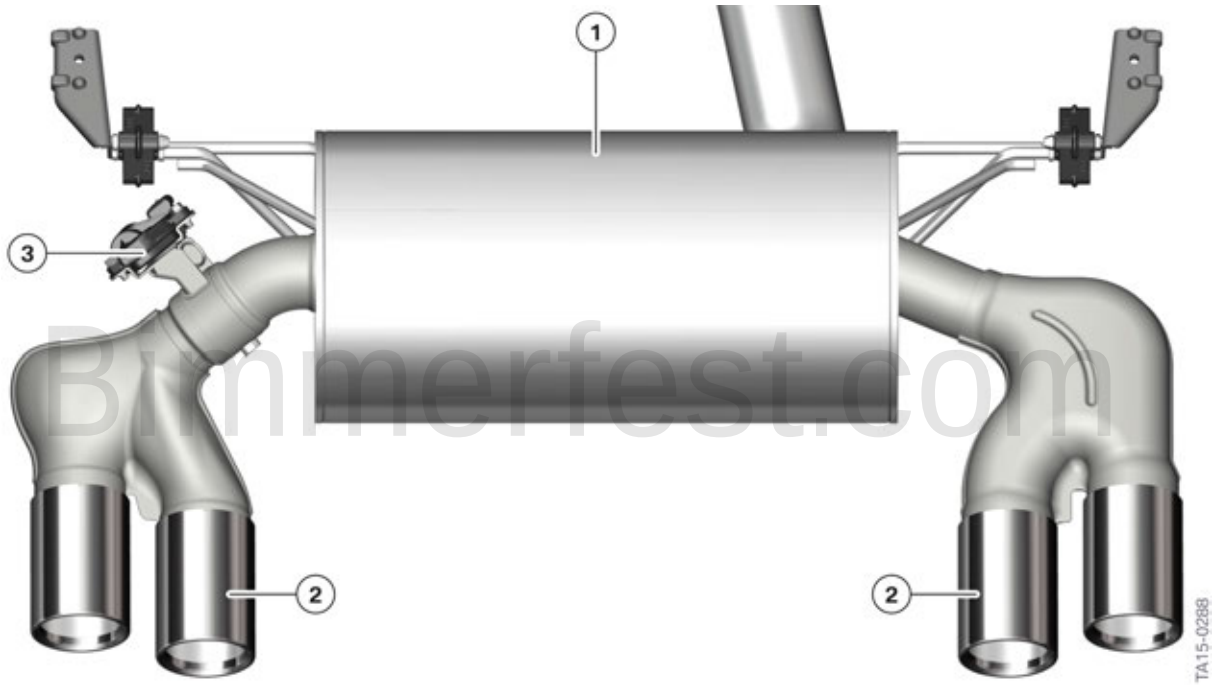
4. Engine/Powertrain

The exhaust sound of the F87 BMW M2 is much more powerful and emotional than in the F2x standard vehicles. The exhaust flap is closed when the engine is idling with the vehicle stationary, in the lower engine speed range in all speed ranges and when the driving experience switch is in **COMFORT** position.

In the upper engine speed ranges, the flap opens depending on the load.

When the driving experience switch is in **SPORT** and **SPORT+** positions, the exhaust flap is fully open when the engine is idling while the vehicle is stationary and in the lower gears.

In the higher gears, the exhaust flap is closed in the critical ranges. The same applies in the upper engine speed ranges depending on the load.



F87, rear silencer with electrical exhaust flap controller

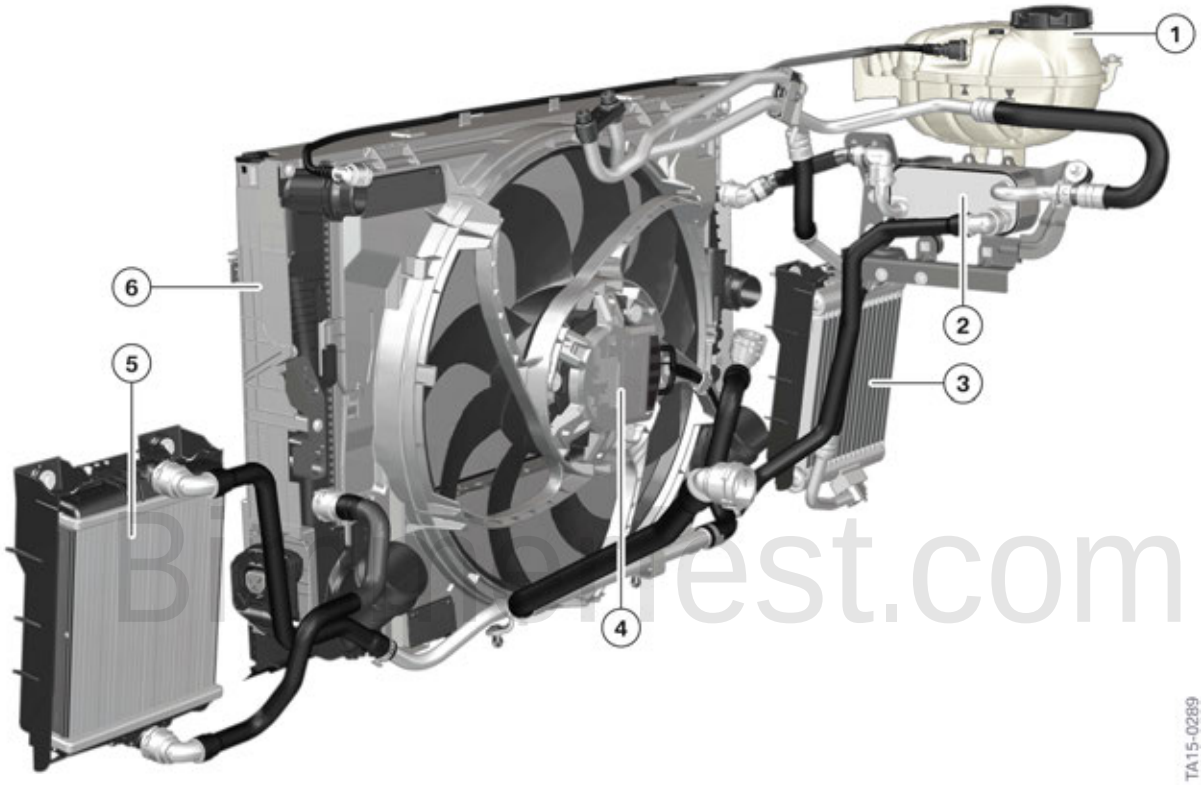
Index	Explanation
1	Rear silencer
2	Twin tailpipe
3	Electrical exhaust flap controller (EAKS)

F87 Complete Vehicle

4. Engine/Powertrain

4.1.7. Cooling

An additional external coolant-air heat exchanger is installed at the front left. There is an additional engine oil-air heat exchanger at the front right. An engine oil-coolant heat exchanger is installed under the coolant expansion tank. In addition, an electric fan with 850 W is also used.



F87, radiator assembly

Index	Explanation
1	Coolant expansion tank
2	Engine oil-to-coolant heat exchanger
3	Engine oil-air heat exchanger
4	Electric fan
5	Separated coolant/air heat exchanger
6	Radiator assembly with radiator

An additional electrical 50 W coolant pump circulates the coolant from the external coolant-air heat exchanger via the engine oil-coolant heat exchanger back to the radiator.

The systems for charge air cooling, vehicle interior heating and the other engine cooling components correspond to those in the N55B30O0 engine.

4.1.8. Engine electrical system

In the area of the engine electrical system, a different spark plug is used in comparison with the N55B30O0 engine. The spark plug of the N55B30T0 engine is from the S55 engine. The ignition wiring harness was also adopted from the S55 engine. All other components in the area of the engine electrical system of the N55B30T0 engine correspond to those of the N55B30O0 engine.

4.1.9. Service information

Engine oil filling

Similarly to other BMW M vehicles with S engines, an engine oil change is scheduled at 2000 km (1200 miles) running-in check on the F87 with the N55B30T0 engine.

4.2. Transmission

4.2.1. Manual gearbox

A manual gearbox is standard on the F87 BMW M2. It is an adapted K-transmission, which is known from the production vehicles of BMW AG or the F80/F82 and F83. The following components were already adapted in the F80/F82 and F83:

- Weight reduction compared with predecessor gearbox.
- Smaller size and thus lower weight.
- Improvement of the shifting comfort thanks to use of new type of carbon friction lining at the synchronisation units.
- Reduction of noise level.
- Increased efficiency due to dry sump lubrication (“churning” in the oil is prevented, specifically designed oil ducts). This made it possible to reduce heat generation to such an extent that external cooling is no longer required.

Engine speed adaptation for a gear change (double clutch)

Engine speed adaptation function for the manual gearbox is used in F87 BMW M2. The engine speed adaptation underlines the sporty character of the new F87 BMW M2.

In addition, the engine speed adaptation is used to reduce the drag torque and also improve the driving stability in the dynamic limit range.

The engine speed adaptation includes the following components and functions:

- New gear sensor detects the gearshift request by the x-y-axis and communicates directly with the engine control unit.
- The clutch switch has two stages and communicates directly with the DME.
- Engine speed adaptation characteristic corresponds to the selected driving mode.
- There is no reverse gear switch since detection takes place by a gear sensor.

The engine speed adaptation function in the F87 BMW M2 differs from the F10 BMW M5 in the following area:

- There is no engine speed recording by the synchronisation unit.
- Detection of the transmission input speed took place at a gear wheel (constant gear) in the transmission. The transmission ratio had to be calculated from the wheel speed (calculated back to transmission output speed) and transmission input speed.

The engine speed adaptation function is active with different characteristics in all positions and modes of the driving experience switch (COMFORT, SPORT, SPORT+, Traction (M dynamic mode)). The engine speed adaptation function is not active in the switch position DSC-OFF.

The neutral sensor is capable of self-diagnosis and if necessary can input a fault in the fault memory. An additional display is not effected. After replacement of the gear sensor it must be re-taught using the BMW diagnosis system.

4.2.2. Gearshift lever and gearshift fork

The gearshift lever and gearshift fork used in the F87 BMW M2 are identical with the parts from the F80, F82 and F83 with manual gearbox.

4.2.3. Clutch

A double-disc clutch in combination with a dual-mass flywheel is used for the manual gearbox. The operating principle of the clutch is identical to the double-disc clutch systems already used.

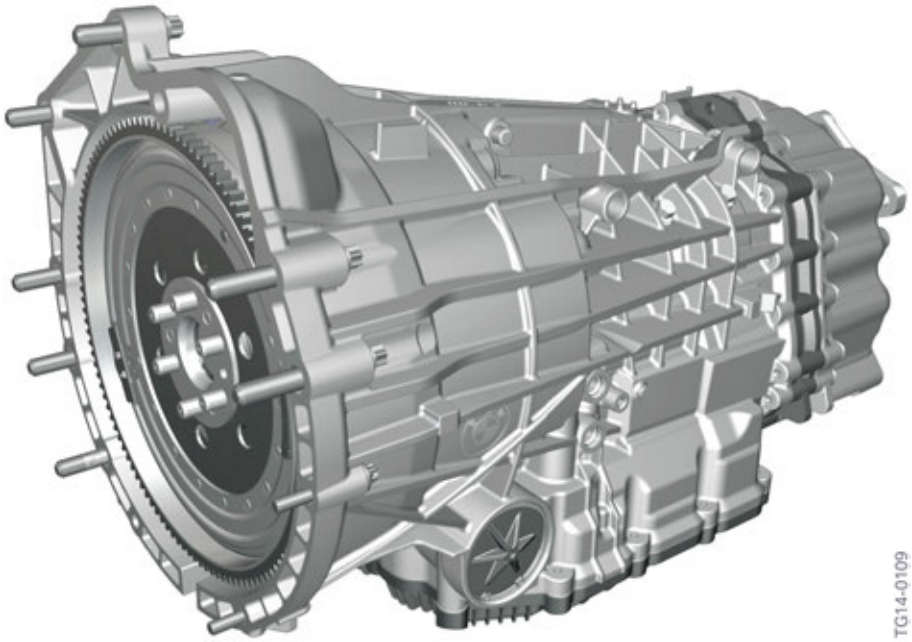
4.2.4. M double-clutch transmission (M DKG) with Drivelogic

The GS7D36BG M DKG with Drivelogic is used as optional equipment.

The double-clutch transmission used in the new F87 BMW M2 corresponds technically to the double-clutch transmission in the F80, F82 and F83.

The M double-clutch transmission with Drivelogic was used for the first time in the E93 BMW M3 with the S65B40 engine with high-speed concept and has the designation GS7D36SG there.

F87 Complete Vehicle
4. Engine/Powertrain



F87, external view, M DKG Drivelogic

The Drivelogic system matched to the M double-clutch transmission provides different driving programs which are assigned to the switch positions COMFORT/SPORT and SPORT+ of the driving experience switch on the center console.

In automated D mode with the driving experience switch in COMFORT position, upshifts and downshifts take place early and with reduced shift intensity. In driving program D with the driving experience switch in SPORT+ position, the gear shifts take place at higher engine speeds and are more dynamic. The automatic engine speed adaptation in the driving program D SPORT+ makes downshifts even more dynamic. In all three modes, the shift points and shift dynamics, among other things, are influenced by the accelerator pedal position: The further the accelerator pedal is pressed down, the later and more dynamic the gear shifts. In sequential mode, the driver determines the shift point. Only the dynamic characteristics of gearshifts are influenced in the driving programs S COMFORT to
S SPORT+.

Further information on the M double-clutch transmission can be found in the Training Reference Manual ST1402 F80/F82 Complete Vehicle.

4.2.5. Launch Control

Launch Control enables optimal acceleration when driving off on a smooth roadway.

During the first 5000 km (3100 miles) the launch control should generally not be used (see also the chapter on driving tips in the Owner's Handbook).

The 2000 km (1200 mile) pre-delivery check must have been completed and reset/confirmed with the Integrated Service Technical Application (ISTA) (do not reset by the instrument cluster service function, as otherwise the launch control is not enabled).

Premature wear occurs as a result of the high load of the vehicle components with use of Launch Control.

Pre-configuring

Sequence	Precondition/Action
1.	The vehicle must be stationary, the engine must be running at idle and at operating temperature (approx. 10 km warm-up journey).
2.	Deactivate Dynamic Stability Control (DSC).
3.	Switch M gear selector switch to sequential mode
4.	Gently press and hold brake pedal with the left foot.
5.	Fully depress the accelerator pedal and hold this position.
6.	A flag symbol appears in the M instrument cluster (if not, check instructions and steps 1-5).
7.	An engine speed for pulling away of approx. 3500 rpm is set, which can be modified up or down by the operating elements of the cruise control by a maximum 500 rpm in 100 rpm increments.
8.	Release the brake pedal rapidly within 3 s.

Effect

- The Launch Control shifts up automatically up to the maximum speed using the shortest possible shift times and performance-optimized shift points. This takes place as long as the driver keeps the accelerator pedal fully depressed and a time limit of 22 s for acceleration is not exceeded.
- The start flag in the instrument cluster remains active.

Automatic deactivation

- The driver leaves (also if only temporarily) the accelerator pedal full load range during acceleration or the acceleration phase reaches a duration of 22 s.

If one of these pre-configuration conditions is not met, it is not possible to activate the Launch Control.

Also at excessive transmission oil temperature (e.g. repeat Launch Control or race-like start), activation is blocked up until an acceptable temperature threshold is reached.

The start flag goes out with every deactivation and the automatic forced upshift is cancelled.

4.2.6. Wheelspin start

During the first 5000 km (3100 miles), the wheelspin start should generally not be used (see also the chapter on driving tips in the Owner's Handbook).

The 2000 km (1200 miles) running-in check must have been completed and reset/confirmed with the Integrated Service Technical Application (ISTA) (do not reset by the instrument cluster service function, as otherwise the wheelspin start is not enabled).

Premature wear occurs as a result of the high load of the vehicle components with use of the wheelspin start.

Preheating/Precooling

Sequence	Precondition/Action
1.	The vehicle must be stationary, the engine must be running at idle and at operating temperature (approx. 10 km / 6 miles warm-up trip).
2.	Deactivate Dynamic Stability Control DSC.
3.	Select sequential mode or automated mode.
4.	Fully depress the accelerator pedal and hold this position.

Effect

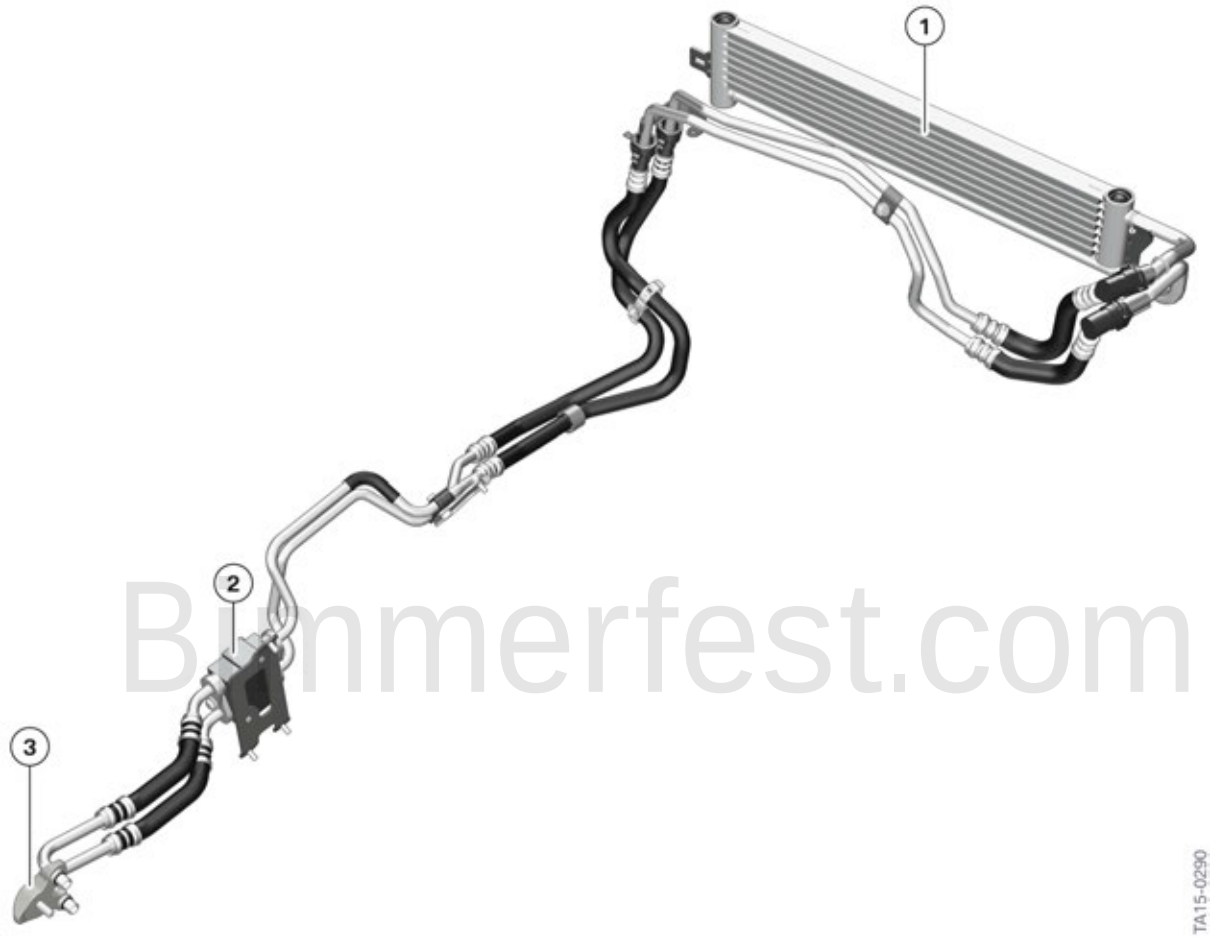
- The vehicle accelerates with maximum power and with corresponding wheel slip, depending on the surface.
- The driver must shift up manually in sequential mode so that the engine-speed limiter is not activated.
- The M double-clutch transmission performs the upshifts in the case of automated upshifting.

In addition to Launch Control and wheelspin start, the M double-clutch transmission also offers additional M functions such as Stability Clutch Control (opening the clutch to stabilize the vehicle in the event of oversteer) or “"Creep on Demand" (from vehicle standstill, the driver activates the "creep" function known from automatic transmissions by touching the accelerator).

F87 Complete Vehicle
4. Engine/Powertrain

4.2.7. Transmission oil cooling

A transmission oil cooler is used to cool the transmission oil.



F87, transmission oil cooling

Index	Explanation
1	Transmission oil cooler
2	Thermostat
3	Connection to M double-clutch transmission

The thermostat for cooling the transmission oil via the transmission oil-coolant heat exchanger has an opening temperature of 80 °C / 176°F.

4.2.8. Emergency gearbox release

The emergency gearbox release has been omitted like on the F80/F82 and F83. For towing away please observed the information in the Owner's Handbook of the vehicle.

4.2.9. Service information

Transmission oil circuit

Maximum cleanliness must be ensured for any work required on the oil circuit of the double-clutch transmission - regardless of whether it is the M DKG or AG DKG - e.g. after an accident, or if the oil circuit has to be opened due to a repair. This includes:

- Carefully clean the outer oil circuit areas before disassembly of the components or opening the oil circuit.
- Immediately close off openings and lines without delay after disassembly using clean original seal plugs. Do not use unsealed components or replacement parts of the oil circuit without checking for cleanliness and where possible competent repair.
- The workplace at which an M DKG is opened must be absolutely clean and protected against contamination. This also applies if work is interrupted. For example, by appropriate, clean and lint-free covers.

Lifetime oil filling

Similar to the F80/F82 and F83 with M DKG Drivelogic, **no** transmission oil change is currently planned.

Repair/Part exchange

Depending on the type of repair, the data status of the M DKG must be read out beforehand and read in again after the component has been replaced (e.g. replacement of mechatronics module).

Depending on the type of repair (e.g. dual clutch change), the "Neutral" gear selection position must be selected before the engine is stopped.

The current information and specifications in the documents in the Integrated Service Technical Application (ISTA) must be observed in each case.

F87 Complete Vehicle
4. Engine/Powertrain

4.3. Rear axle final drive

4.3.1. Active M Differential

This electronically/electromechanically controlled rear axle differential lock was developed especially for the F10 BMW M5 and is also used in the F80/F82/F83 and in the F87 BMW M2.

On the F87 BMW M2, the screw connection to the drive shaft is modified in comparison with the F80/F82/F83. It was necessary to adapt this screw connection because a conventional drive shaft is installed in the F87 BMW M2, in contrast to the F80/F82/F83 which have a CFRP driveshaft.

The M rear axle differential, size HAG 220 (crown wheel Ø 220 mm), is used with a M rear axle differential lock. The system designation for this is "regulated rear axle differential lock", the control unit designation is GHAS (German abbreviation for regulated rear axle differential lock).

The gear ratio of the rear axle differential 220 is 3.462:1.

This M rear axle differential II can be identified by an aluminium oil sump mounted from below and an externally visible electric motor.

F87, GHAS exterior view

Demand-controlled lock

The lock is a demand-controlled rear-axle differential lock which is active in the following situations:

- Acceleration
- Differential speed at the rear axle for straight-ahead driving under tension due to various coefficients of friction, left/right
- Dynamic cornering tensioned
- Power oversteer (drifting)
- Stabilization in coasting/overrun mode

Traction, handling and driving stability are optimized by adjusting a defined differential speed or differential torque at the rear axle.

The regulated M rear-axle differential lock works with a position-controlled electric motor and a ball ramp. The GHAS control unit is installed above the Rear Electronic Module (REM), in the side panel at the rear right.

Further information on the active M differential can be found in the Training Reference Manual ST1402 F80/F82 Complete Vehicle.

4.3.2. Service information

- For a replacement of the GHAS control unit, encoding (activation of vehicle-related characteristic curve) and then an initial calibration are necessary, followed by deletion of the fault memory.
- After the replacement of the entire M rear axle differential a calibration must be performed and then the fault memory must be deleted.
- For a replacement of the electric motor, electric motor plus intermediate gear or oil temperature sensor, only the fault memory must be deleted.

The final drive transmission oil is currently replaced at every 5th engine oil service.

⚠

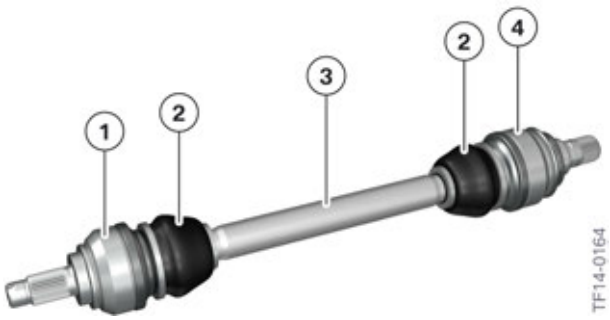
The current information and specifications in the Integrated Service Technical Application (ISTA) must be observed.

4.4. Half-shafts

As is typical for BMW M vehicles, the output shafts have a hollow design in order to make optimal use of the material 25CrV4 in relation to material usage, weight and rigidity.

In the F87, they transmit a torque of up to 6500 Nm.

In the same way as in the F80/F82 and F83, the F87 has hollow-bored trunnion mounts.



F87, output shaft

Index	Explanation
1	Joint drilled hollow on the wheel-side with trunnion mount
2	Boot
3	Hollow shaft
4	Joint drilled hollow at the rear axle differential with trunnion mount

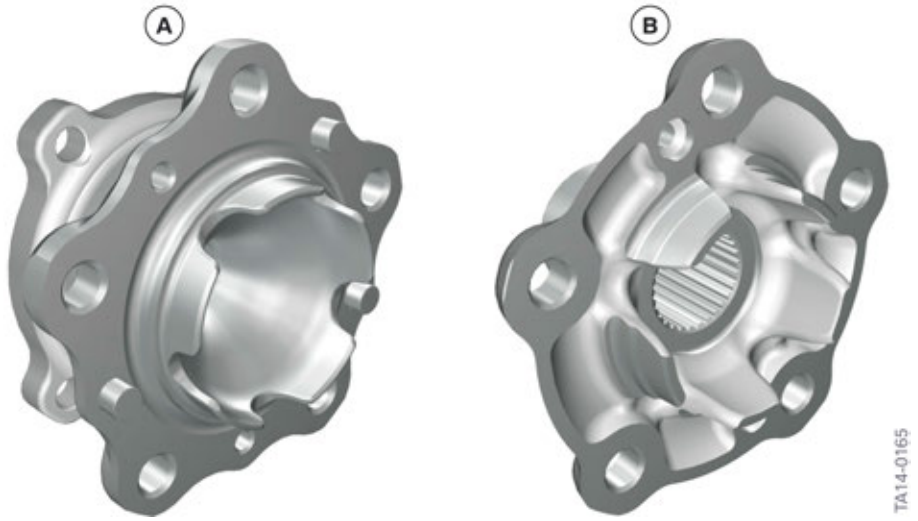
The special feature of the output shafts is the double-sided gearing. They are no longer flange-mounted at the rear axle differential and inserted in the wheel hub, but are inserted in the rear axle differential and in the drive flange. The procedure has thus changed for installation and removal.

The current information and specifications in the Integrated Service Technical Application (ISTA) must be observed.

4.5. Wheel flange

The wheel flanges at the front axle and the rear axle have been optimized in relation to their weight. Less material was used at locations subject to little stress and more material at heavily stressed locations.

These measures made it possible to achieve a weight saving of approx. 1.13 kg (2.8 lbs) in the new F87 compared with the E82.

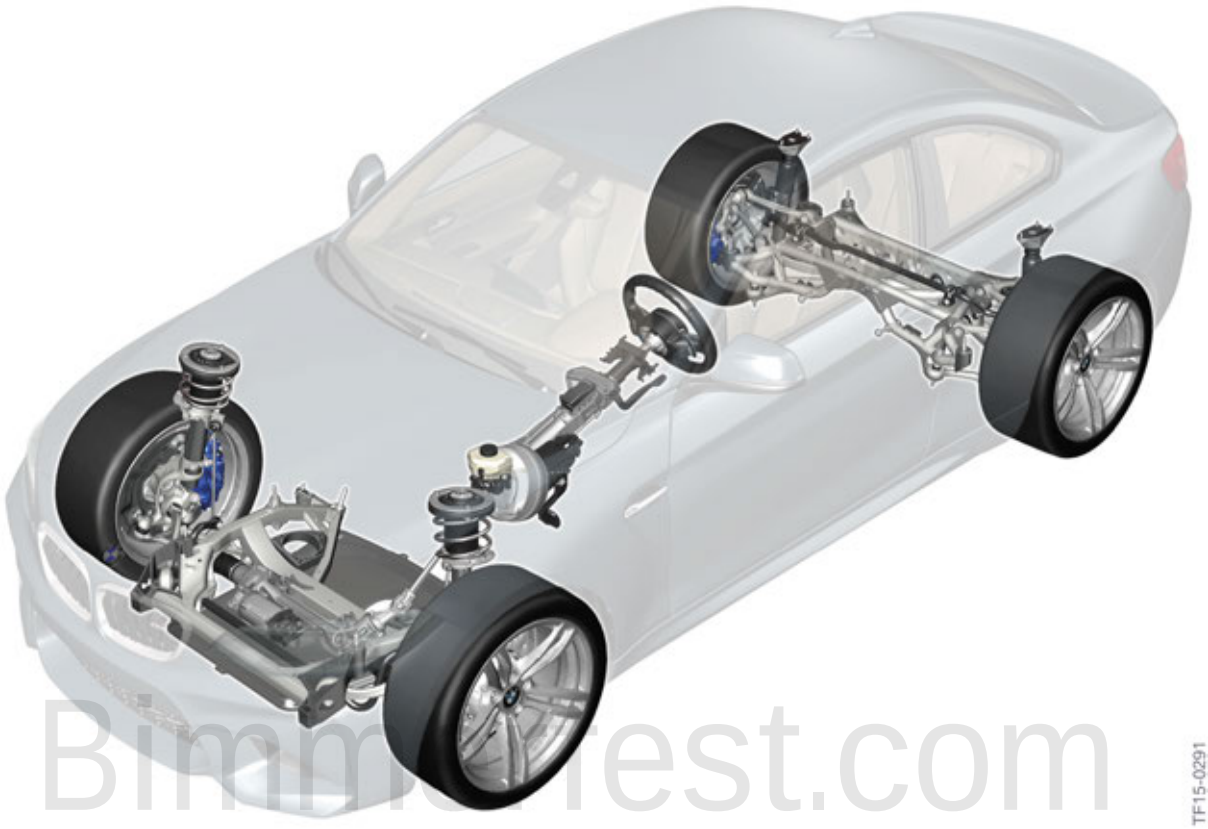


F87, wheel flange

Index	Explanation
A	Wheel bearing unit with wheel flange, front
B	Drive flange, rear

F87 Complete Vehicle

5. Chassis/Driving Dynamics Systems



F87, chassis and suspension

The chassis and suspension are based on the technology of the F80 BMW M3.

Designation	Unit	E82 M Coupé	F80/ F82/F83	F87
Wheelbase	[mm]	2,761	2,812	2,964
Front track width	[mm]	1,540	1,579	1,579
Rear track width	[mm]	1,539	1,603	1,603
Front axle		M two-joint spring-strut front axle	M two-joint spring-strut front axle	M two-joint spring-strut front axle
Steering		Hydraulic M rack-and-pinion steering with M Servotronic	Electrical rack-and-pinion steering (EPS) with M Servotronic	Electrical rack-and-pinion steering (EPS) with M Servotronic
Average overall ratio		12.5	15	15

F87 Complete Vehicle

5. Chassis/Driving Dynamics Systems

Designation	Unit	E82 M Coupé	F80/ F82/F83	F87
Steering wheel turns End stop-end stop		2.4	2.5	2.5
Rear axle		M 5–link rear axle	M 5–link rear axle	M 5–link rear axle
Axle ratio		3.154	3.462	3.462

5.1. Front axle

The front axle is based on the M two-joint spring strut front axle of the E9x M3 and is already used in the F80/F82 and F83. All components and bearings are new or adapted for M-specific use. As a typical M feature, the M front axle support is reinforced with a stiffening plate and was largely adopted from F80/F82 and F83.

The following parts were adapted on the front axle for the F87 BMW M2:

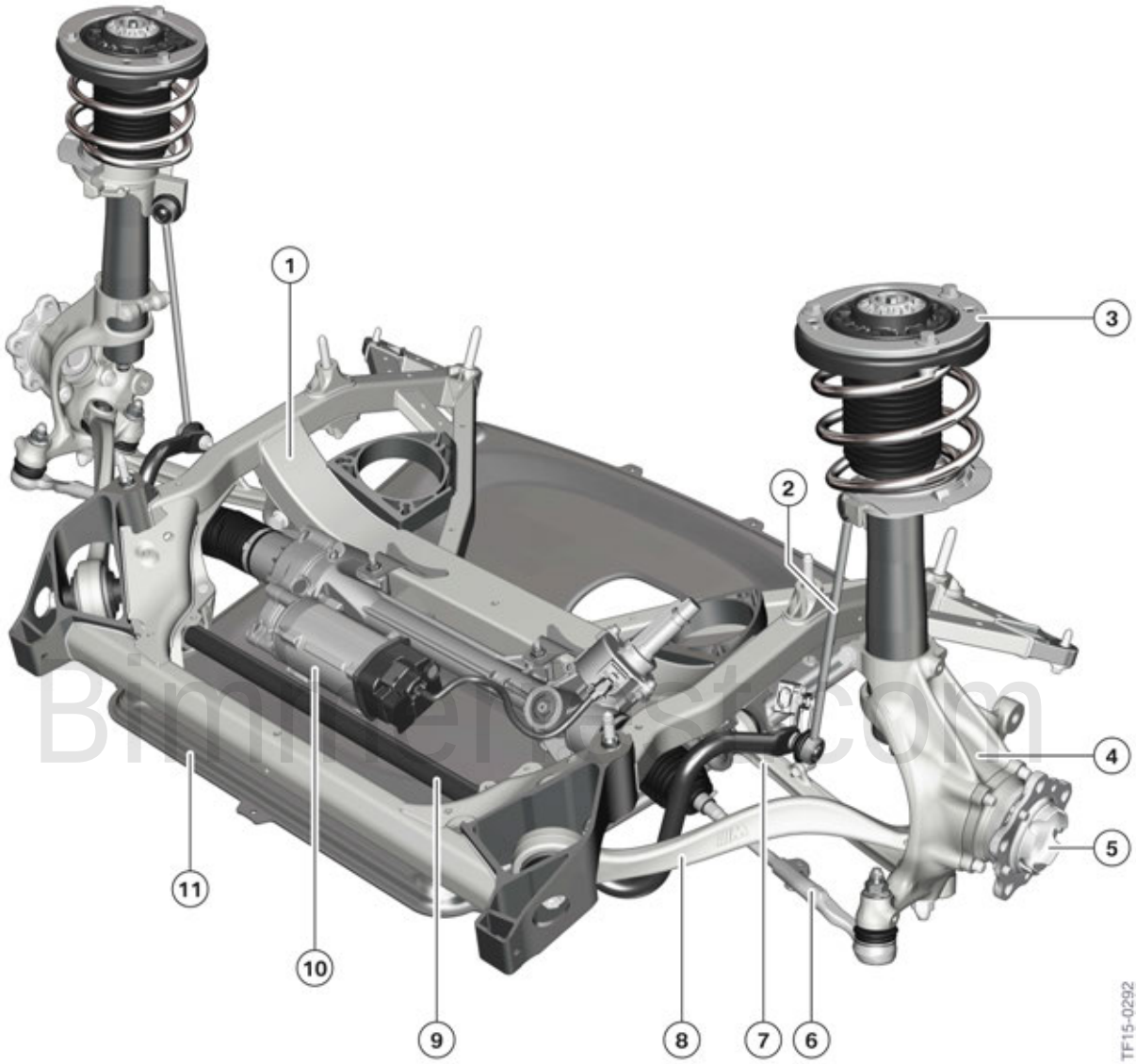
- Support bearing
- Conventional gas-pressure shock absorbers (from F80/F82 and F83) with F87 BMW M2-specific tuning
- Coil springs (from F80/F82 and F83)

The following components are new on the front axle for the F87 BMW M2:

- Anti-roll bar
- Engine support, right

F87 Complete Vehicle

5. Chassis/Driving Dynamics Systems



F87, two-joint spring strut front axle

Index	Explanation
1	M front axle support
2	M anti-roll bar link
3	M spring strut with support bearing
4	M swivel bearing
5	M wheel bearing unit with wheel flange
6	M tie rod
7	M wishbone

Index	Explanation
8	M trailing link with hydro mount
9	M anti-roll bar
10	M Servotronic (EPS)
11	M stiffening plate

The guide of the wheel for compression and steering is effected by the wishbone, the tension strut, the spring strut and the tie rod.

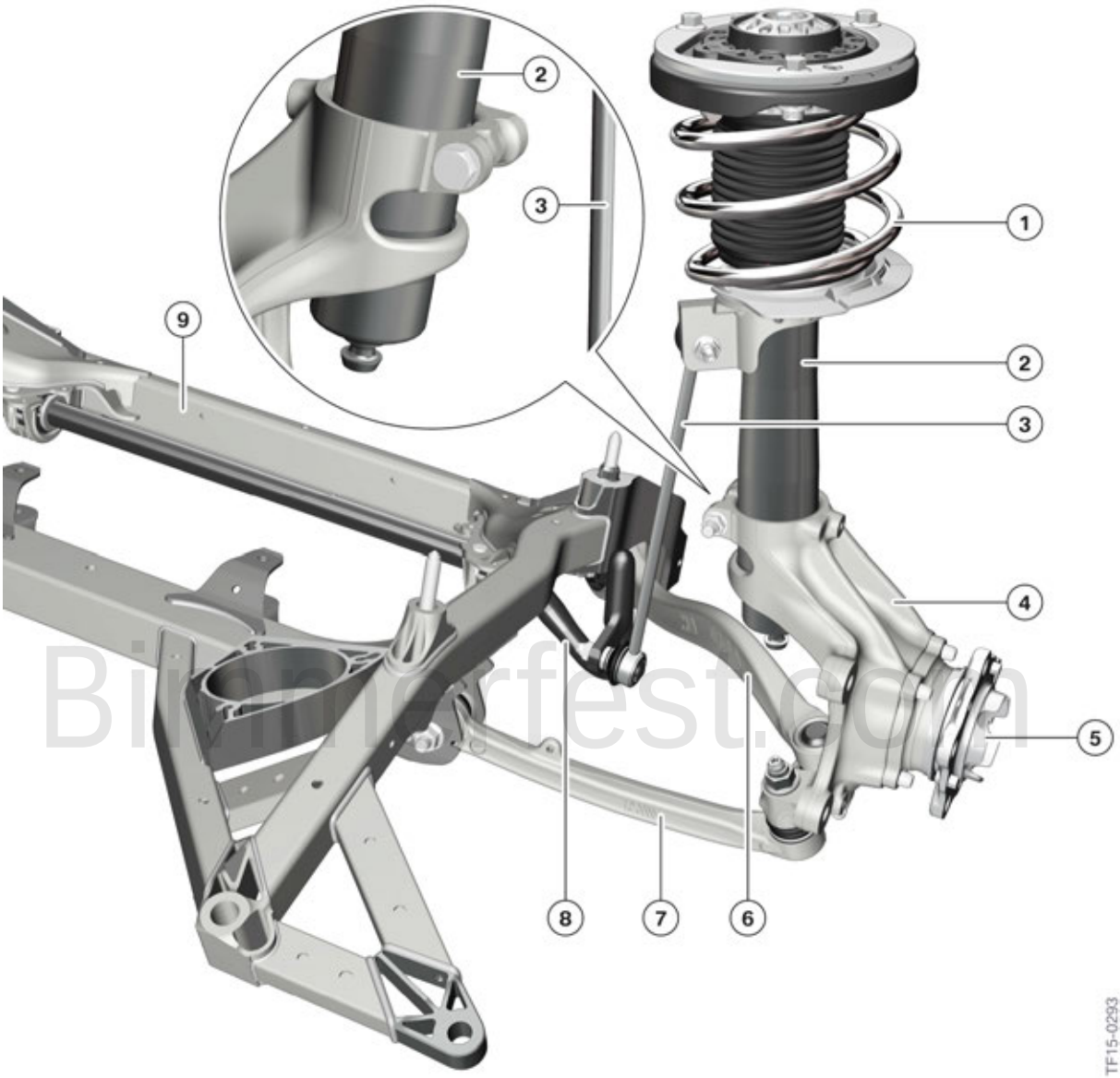
In order to guarantee a precise wheel guide in transverse direction of vehicle, the power transmission is effected from the swivel bearing to the front axle guide by ball joints with no play. In order to also guarantee this in a longitudinal direction, the chassis and suspension forces are transmitted by specially developed elastomer bearings for the F87 BMW M2 by the tension struts to the front axle support.

The stiffening plate and the additional screw connections of the axle support and the side sills also ensure an increase in the transverse rigidity of the front of the vehicle by approx. 30 %.

The connection between the spring strut and the swivel bearing was achieved by a clamp connection in the same way as on the E82 M and E9x M3 as well as F80/F82 and F83.

F87 Complete Vehicle

5. Chassis/Driving Dynamics Systems



F87, spring strut-swivel bearing connection

Index	Explanation
1	M spring
2	M spring strut
3	M anti-roll bar link
4	M swivel bearing
5	M wheel bearing unit with wheel flange

Index	Explanation
6	M tension strut
7	M wishbone
8	M anti-roll bar
9	M front axle support

The wishbone, wheel carrier, axle support and the stiffening plate are manufactured in an aluminium lightweight construction.

Further weight savings were achieved with the design of the spring strut in aluminium, as well as the tubular design of the anti-roll bar like in the E9x M3.

The front axle was designed particularly taking into account the tires, which were also newly developed for the F87 BMW M2.

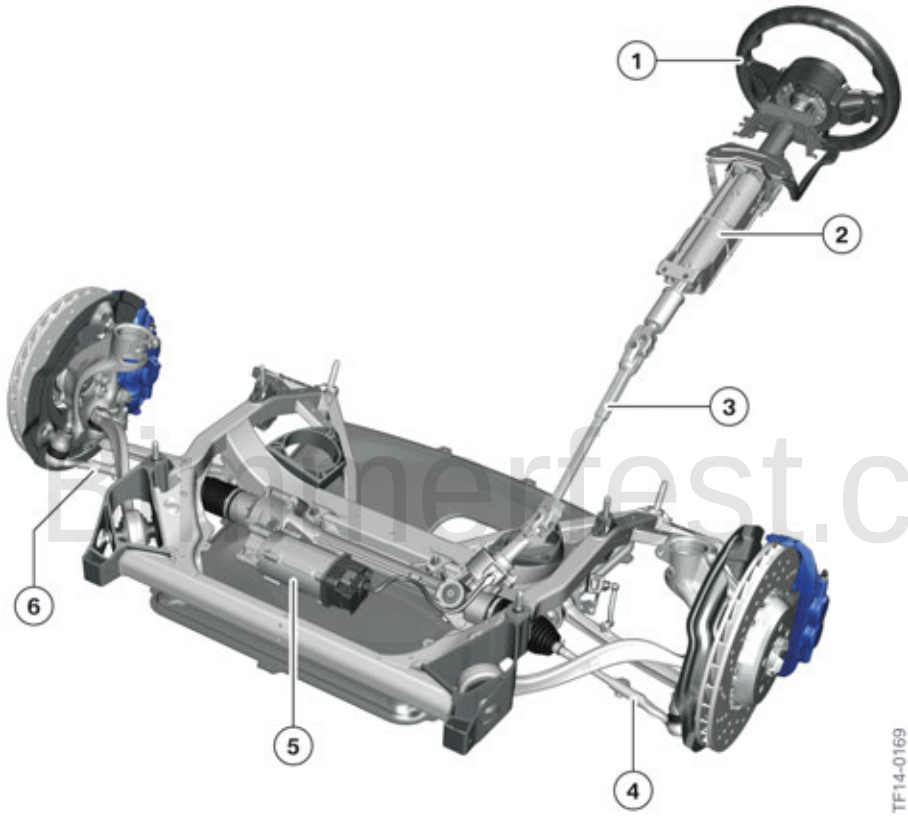
F87 Complete Vehicle

5. Chassis/Driving Dynamics Systems

5.1.1. Steering

Within the framework of the EfficientDynamics measures for the new F87 BMW M 2, the steering used is a rack-and-pinion steering with electrical steering assistance "M Servotronic based on an EPS", which was adopted from the F80/F82 and F83.

For power assistance during steering an electric motor is housed parallel to the rack at the steering gear housing, the power transmission is effected by a ball screw.



F87, steering

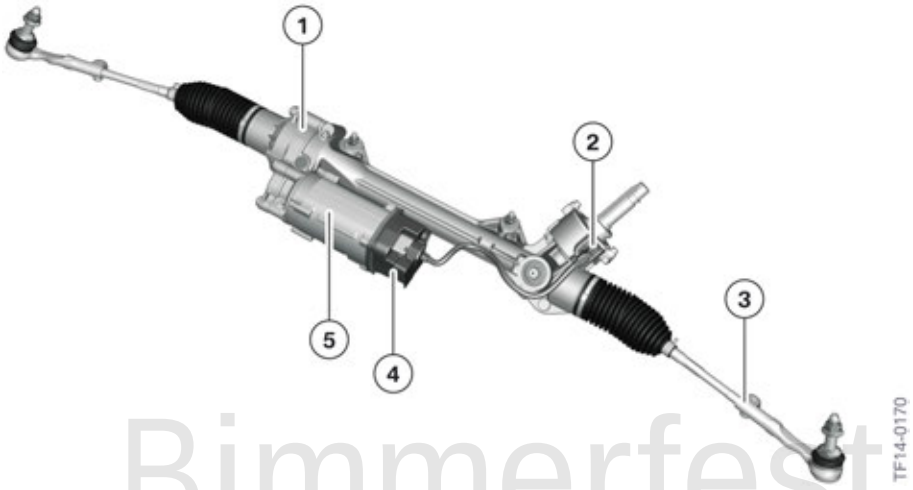
Index	Explanation
1	M steering wheel
2	Adjustable steering column
3	Steering column
4	M tie rod, left
5	M Servotronic (EPS)
6	M tie rod, right

F87 Complete Vehicle

5. Chassis/Driving Dynamics Systems

The M Servotronic (EPS) is a separate development for the F80/F82 and F83 and was adopted for the F87 BMW M2. With this measure the development of the steering was able to be coordinated to the typical M properties. Special attention was paid here to the typical M features:

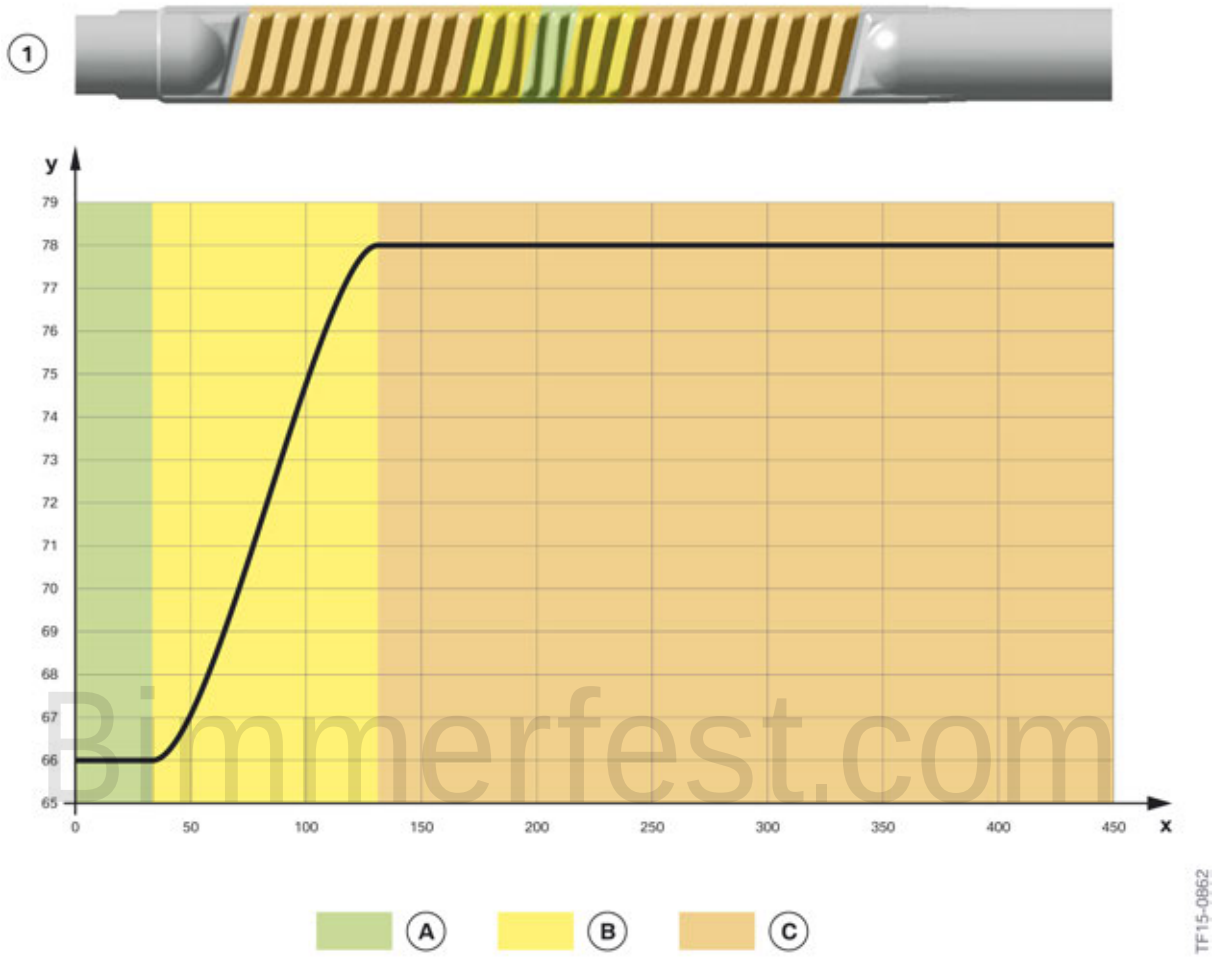
- Direct steering sensation
- Driving condition feedback
- Dynamic driving in the limit range



F87, M Servotronic (EPS)

Index	Explanation
1	Reduction gear
2	Steering-torque sensor
3	Tie rod
4	Control unit, M Servotronic (EPS)
5	Electric motor with rotor position sensor

The ratio of the M Servotronic (EPS) was also adapted. The rack ratio increases by 8 % after every eighth of a steering wheel revolution.



F87, ratio of the variable rack geometry

Index	Explanation
A	More indirect steering gear ratio in the center position of the variable rack (0° - 45°)
B	Transitional range (45° - 130°)
C	Direct steering gear ratio outside the center position of the variable rack (> 130°)
x	Steering angle in °
y	Steering gear ratio in mm/steering wheel turn
1	Variable rack geometry (Integral Active Steering)

The variable steering gear ratio is implemented through the stroke-dependent gear geometry of the rack. Around the center position of the steering gear, the steering system behaves accurately with steady directional stability. As the steering angle moves away from the center position, the ratio becomes increasingly more direct.

5.1.2. Servotronic

The Servotronic function known from conventional hydraulic steering systems is also used in the M Servotronic (EPS) and is installed in the F87 BMW M2 as standard. It is a M Servotronic, which functions according to the same operating principle as in production vehicles. 2 steering characteristics (COMFORT, SPORT) can be selected by a push button operation by the driving experience switch on the center console. This allows the steering assistance to be selected according to the desired purpose and wishes.

5.1.3. Steering angle sensor

The steering angle information in the F87 BMW M2 is not recorded by the Electronic Power Steering (EPS) and not via a separate sensor on the steering wheel, but is instead calculated back for the steering wheel based on the motor position angle of the EPS motor.

The EPS transmits the position of the rack to the ICM control unit via FlexRay. During this process, the EPS calculates the absolute position of the rack based on the current motor position of the EPS motor and the number of complete revolutions performed by the motor starting from the zero position (straight-ahead driving position).

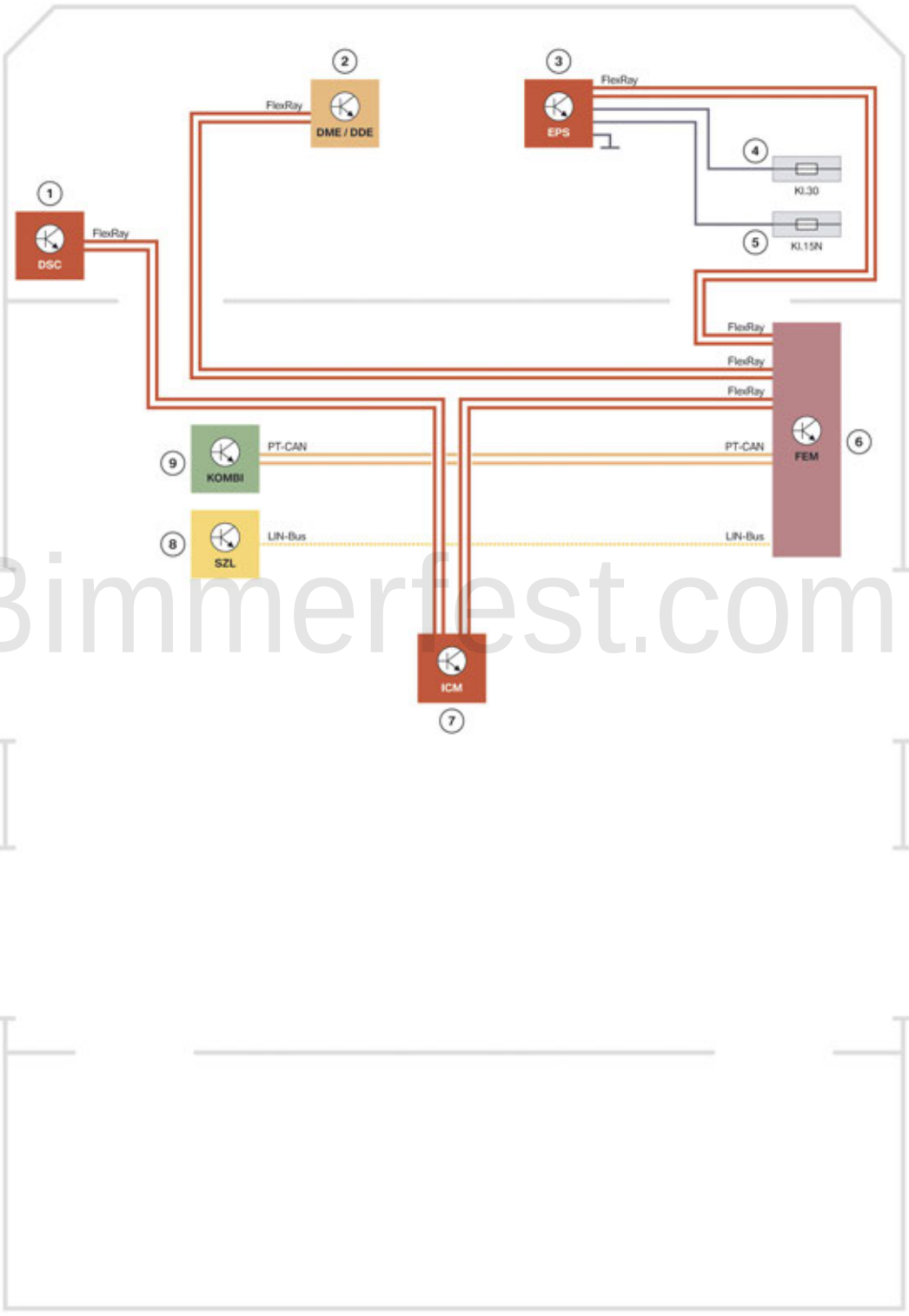
Taking this position as the starting point, the ICM control unit determines the wheel-specific steering angle among other things using the stored ratio parameters (rack to wheel-specific steering angle) and transmits this via FlexRay. This wheel-specific steering angle is used by the DSC among other things as a reference variable for internal control functions.

In cases where the absolute value is not available from the EPS (loss of Terminal 30 or programming procedure), the absolute value is determined through interaction between the ICM and EPS using an adaptation function in which the steering wheel is turned from end stop to end stop (e.g. straight-ahead position -> left -> right -> straight-ahead position).

F87 Complete Vehicle

5. Chassis/Driving Dynamics Systems

5.1.4. System wiring diagram, M Servotronic (EPS)



F87, EPS system wiring diagram

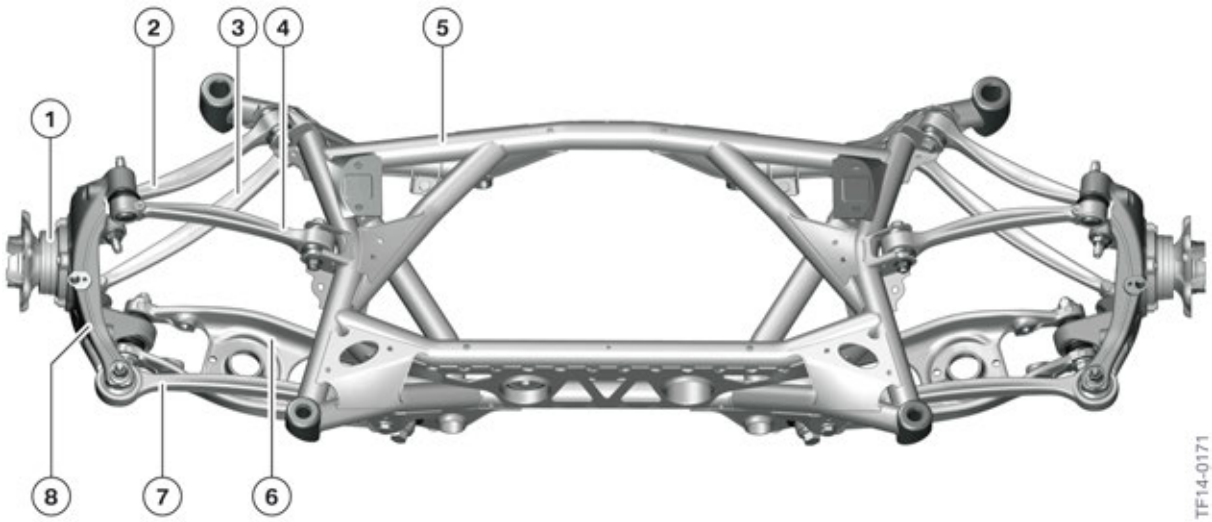
Index	Explanation
1	Dynamic Stability Control (DSC)
2	Digital Motor Electronics (DME)
3	M Servotronic (EPS)
4	Power distribution box, front
5	Power distribution box, engine compartment
6	Front Electronic Module (FEM)
7	Integrated Chassis Management (ICM)
8	Steering column switch cluster (SZL)
9	Instrument panel (KOMBI)
Terminal 15N	Ignition (after-run)
Terminal 30	Terminal 30

5.2. Rear axle

The M rear axle is based on the five-link rear axle from the E9x M3 and is already used in the F80/F82 and F83.

The following parts were adapted on the rear axle for the F87 BMW M2:

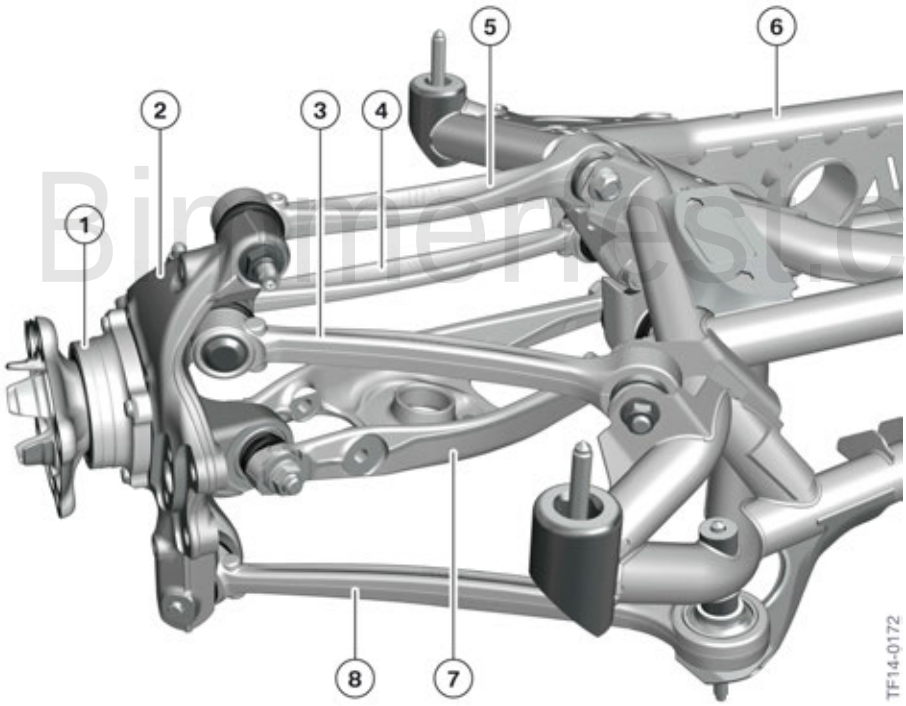
- Anti-roll bar (from F80/F82 and F83) with F87 BMW M2-specific setup.
- Conventional gas-pressure shock absorbers (from F80/F82 and F83) with F87 BMW M2-specific tuning.
- Progressive coil springs with F87 BMW M2-specific setup.



F87, five-link rear axle

Index	Explanation
1	M wheel bearing unit with drive flange
2	M control arm
3	M trailing arm
4	M wishbone
5	M rear axle support
6	M camber control arm
7	M track control arm
8	M hub carrier

All trailing arms and also the wheel carrier are manufactured in aluminium forging technology. This design reduces the unsprung masses of the components responsible for wheel guidance.

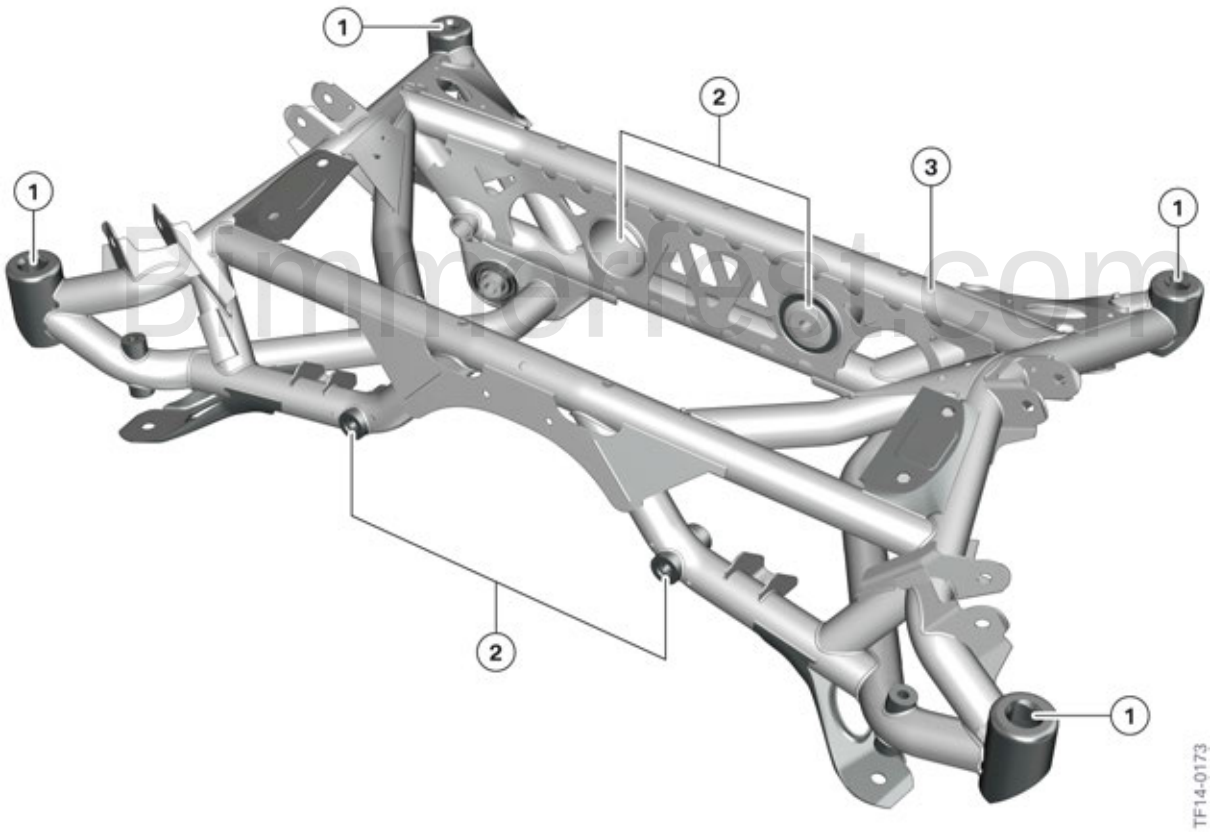


F87, five-link arrangement with wheel carrier

Index	Explanation
1	M wheel bearing unit with drive flange
2	M hub carrier
3	M control arm
4	M track control arm

Index	Explanation
5	M wishbone
6	M rear axle support
7	M camber control arm
8	M trailing arm

The rear axle support itself is made from steel pipe which is similar to a steel pipe grid frame. This design is characterized by maximum rigidity and minimal weight. The M rear axle support is fixed to the body without a bearing. This fixed screw connection directly to the body ensures an optimized wheel guide and thus enhanced directional stability. In addition, through the use of diagonal struts a direct transmission of the longitudinal forces applied during braking to the body structure was achieved.



F87, rear axle support

Index	Explanation
1	Attachment point, rear axle at body (fixed screw connection without rubber mount)
2	Attachment point for rear axle differential (GHAS)
3	Rear axle support

Further weight savings were achieved by designing the spring strut in aluminium, as in the E9x M3.

The rear axle was designed particularly taking into account the tires, which were also newly developed for the F87 BMW M2.

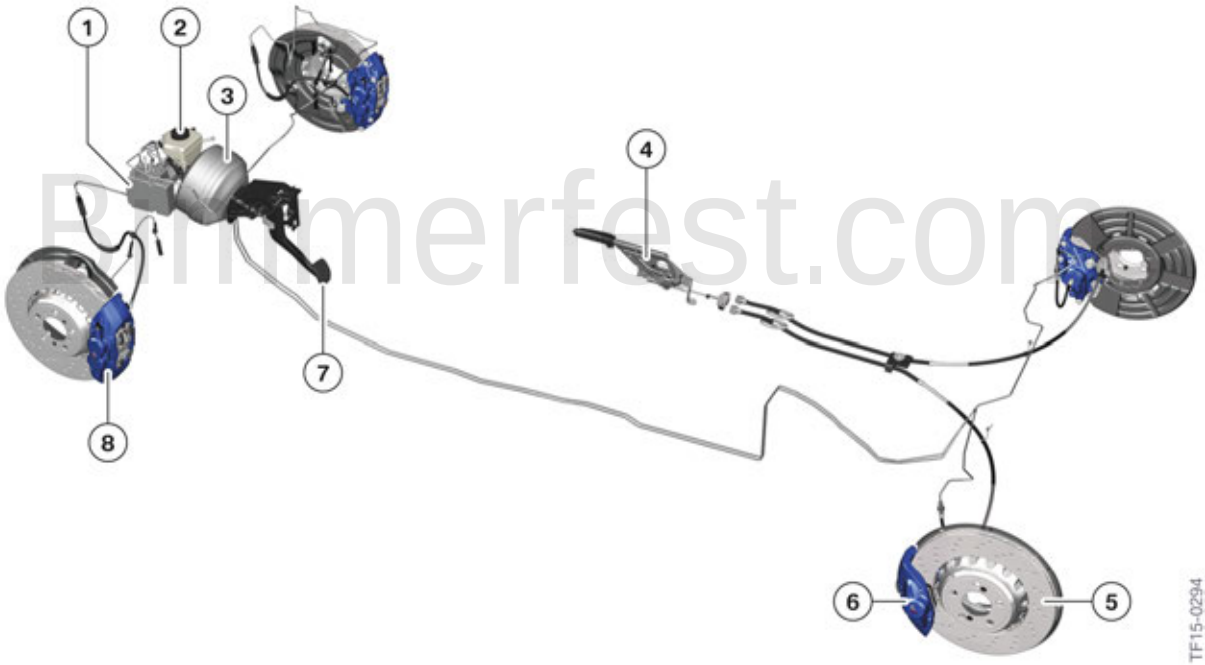
5.3. Brakes and wheels/tires

5.3.1. Brakes

The brake system of the F87 BMW M2 is based on the M compound brake from the F80/F82 and F83.

The following components are new in the brake system for the F87 BMW M2:

- Parking brake bowden cables.



F87, brake system

Index	Explanation
1	Dynamic Stability Control (DSC)
2	Brake fluid expansion tank
3	Brake servo (left-hand drive vehicle)
4	Parking brake lever

Index	Explanation
5	Rear brake disc
6	Rear double-piston fixed caliper
7	Brake pedal
8	Front four-piston fixed caliper

Designation	Unit	E82 M Coupé	F80/F82/F83	F87
Front brake		1 piston, floating caliper	4 pistons, fixed caliper	4 pistons, fixed caliper
Brake disc, front	[mm]	360 x 30	380 x 30	380 x 30
Rear brakes		1 piston, floating caliper	2 pistons, fixed caliper	2 pistons, fixed caliper
Brake disc, rear	[mm]	350 x 24	370 x 24	370 x 24
Parking brake		mechanical	mechanical	mechanical

The front brake has been adopted completely from the F80/F82 and F83. It is a large perforated M compound brake disc combined with a four-piston fixed caliper. All brake calipers will be blue with a colored M logo regardless of the exterior vehicle color.

F87, front brake

The rear brake has been adopted completely from the F80/F82 and F83. The rear brake caliper is a double-piston fixed caliper.

Dynamic Stability Control (DSC)

The MK 100 from Continental is used as a Dynamic Stability Control (DSC) system. The characteristic maps of the DSC are M-specific and are adapted to the M compound brake system.

F87 Complete Vehicle

5. Chassis/Driving Dynamics Systems

5.3.2. Wheels/tires

Standard equipment

F87, standard wheels

Index	Explanation
A	19" 437 M with mixed performance tires

The following wheel/ tire combinations are offered:

F87 Complete Vehicle
5. Chassis/Driving Dynamics Systems

Standard equipment

Designation	E82 M Coupé	F80/F82	F87
Light alloy EH2+ wheel rims, standard wheel front	9J x 19 light alloy	9J x 18 IS 29 Styling 513M Forged	9J x 19 IS 29 Styling 437M Cast
Light alloy EH2+ wheel rims, standard wheel rear	10J x 19 light alloy	10J x 18 IS 40 Styling 513M Forged	10J x 19 IS 40 Styling 437M Cast
Standard tires, front	245/35 ZR 19	255/40 ZR 18 Michelin Pilot Super Sport	245/35 ZR 19 Michelin Pilot Super Sport
Standard tires, rear	265/35 ZR 19	275/40 ZR 18 Michelin Pilot Super Sport	265/35 ZR 19 Michelin Pilot Super Sport

5.4. Dynamic handling control systems

The M-specific setup of the driving dynamics (longitudinal and transverse) took place, among other things, on the Nordschleife of the Nürburgring. The main criteria were handling and the lap times.

5.4.1. Transverse dynamics management

Integrated Chassis Management

The ICM is the transverse dynamics system network. This control unit coordinates the interaction between the M Servotronic (EPS), DSC, engine control, M DKG and the regulated rear axle differential lock (GHAS).

5.4.2. Longitudinal dynamics management

Longitudinal dynamics management is performed by the Dynamic Stability Control DSC. The Dynamic Stability Control DSC MK 100 from Continental is used in the F87.

M dynamic mode and DSC OFF mode

In M Dynamic Mode (MDM) the control threshold of the brake interventions is expanded/raised and the engine power reduction by ASC is applied significantly later. This enables driver-oriented, dynamic and sporty drivability.

It is possible to switch between DSC ON, DTC ON (M dynamic mode) and DSC OFF by means of the driving experience switch and DTC button. The button obtains its mass from the ICM and sends back a mass signal upon actuation to the ICM. ICM forwards this information on the FlexRay data bus to DSC.

F87 Complete Vehicle
6. Electrics/Electronics

6.1. Driving experience switch

The driving experience switch has 3 modes.

- COMFORT
- SPORT
- SPORT +

The following systems are influenced by the 3 modes:

- Engine response
- Engine speed adaptation
- Load-reversal damping
- Active Sound Design (ASD)
- Electrical exhaust-flap controller
- M DKG Drivelogic
- M Servotronic EPS
- Automatic engine start-stop function (MSA)
- M dynamic mode/DSC

The following states can be additionally activated by the DTC button:

- DSC on
- DTC on (M dynamic mode on)
- DSC off

F87 Complete Vehicle

6. Electrics/Electronics

F87, M dynamic mode

If M dynamic mode is selected by the DTC button, this is indicated to the driver in the instrument cluster by display of a skid symbol and the text "TRACTION".

The following table shows how the individual systems are influenced by the driving experience switch and the DTC button:

F87 Complete Vehicle
6. Electrics/Electronics

	COMFORT	SPORT			SPORT+	MDM	DSC OFF
		A+F	A	F			
1 	Comfort	Sport	Comfort	Sport	Sport	Comfort	Sport
2 	ON	ON			MDM	MDM	DSC Off
3 	Comfort	Sport	Sport	Comfort	Sport	Comfort	Off
4 	Comfort	Sport	Sport	Comfort	Sport+	Comfort	Sport
5 	Comfort	Sport	Sport	Comfort	Sport+	Comfort	Sport
6 	Comfort	Sport	Sport	Comfort	Sport	Comfort	Sport
7 							
8 							

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F87, driving experience switch and DTC button assignments

Index	Explanation
A	Sport configuration “Drive”
F	Sport configuration “chassis and suspension”
1	Driving experience switch/DTC button
2	Steering mode
3	Longitudinal moment management mode
4	Engine speed adaptation mode
5	Load-reversal damping mode
6	Accelerator pedal characteristic mode
7	Active Sound Design ASD/exhaust-flap controller mode
8	Automatic engine start-stop function mode

With the M double-clutch transmission, the following modes are additionally influenced by the driving experience switch and the DTC button:

F87 Complete Vehicle
6. Electrics/Electronics

F87, driving experience switch and DTC button assignments for M DKG

Index	Explanation
A	Sport configuration “Drive”
F	Sport configuration “chassis and suspension”
1	Driving experience switch/DTC button
2	Driving mode (S-sequential mode/D-automated mode)
3	Drivelogic mode
4	Automatic engine start-stop function mode

F87 Complete Vehicle
6. Electrics/Electronics

6.2. M instrument cluster

The M instrument cluster is based on the high version of the instrument cluster from the F2x. The respective scales of the instrument cluster are market- and vehicle-specific.

F87, instrument cluster euro design

The following M-specific changes exist in comparison to the F2x:

- M-typical red needles, fuel gauge with white needle, dial illumination in white (also during the day without driving light), M model inscription.
- Welcome text “M2”.
- Orange night-time illumination (like F22).
- Engine temperature display integrated in on-board computer BC.
- Speed and engine speed display correspond to the drive concept (300 km/h in 30 km scale divisions, 8,000 rpm).

F87, engine temperature display

The display of the engine temperature is a calculated value generated from the coolant temperature and engine oil temperature.

6.3. Active Sound Design

The Active Sound Design (ASD) is described in the Technical Reference Manual ST1201 F10 M5 Complete Vehicle.

6.4. M Lap Timer app

This free app is an add-on for ambitious driving on the race track and enables precise analysis of the personal driving style.

The smartphone with the installed BMW M Laptimer app is connected to the vehicle by a USB cable or the appropriate snap-in adapter.

The BMW M Lap Timer app not only records acceleration, braking points, lap times and high forces. The data is also prepared in the form of graphics and the journey is played back with the real values as a virtual test drive.

In addition, the journeys of different drivers can be analyzed and compared.

F87 Complete Vehicle

6. Electrics/Electronics

F87, M Laptimer app

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