Technical training.
Product information.

F85/F86 Complete Vehicle

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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.

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F85/F86 Complete Vehicle

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1. Introduction

The BMW M family is being enhanced with the addition of the F85 (BMW X5 M) and F86 (BMW X6 M) vehicle types. The F85 and F86 replace the successful E70 M and E71 M vehicles and also continue the typical M driving experience in the Sports Activity Vehicle/Sports Activity Coupé segment. As is already the case with the E70 M and E71 M, the F85 and F86 are equipped with the M TwinPower turbo engine, M Sport automatic transmission, xDrive, Dynamic Performance Control, Dynamic Drive, Vertical Dynamics Management (VDM) and M Servotronic.

The new BMW X5 M/BMW X6 M will be launched onto the market in the first quarter of 2015.

1.1. M history

In 1972 the then BMW Motorsport started out with the legendary M1. For over 40 years today's BMW M GmbH has been developing BMW M vehicles with a motorsport pedigree based on the standard production models.

The typical M driving experience was also made to come alive for the first time in the Sports Activity Vehicle/Sports Activity Coupé segment in July 2009. The E70 M and E71 M were the first M vehicles with M TwinPower turbo engine, M Sport automatic transmission, xDrive, Dynamic Performance Control, Dynamic Drive and run-flat tires.

E70 M and E71 M

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1. Introduction

1.2. F85 X5 M vehicle outline description

F85 X5 M

- **Design and aerodynamics:** 5-door high-performance sports activity vehicle (SAV). M-specific characteristics in front, side and rear area. Unique aerodynamic design in front, side and rear area and vehicle underbody.
- **Engine/Transmission:** 4.4-liter 8-cylinder Turbo-Valvetronic direct injection engine. Even more powerful and even more spontaneous, linear power development. Choice of three engine dynamics control programs. Even faster, more precise gear changes. M-specific gearshift characteristics with BMW M 8-speed automatic transmission variant (with Drivelogic program). Dynamic Performance Control (QMVH) for even better propulsion power distribution on the rear axle and increased driving safety.
- **Engine sound:** Distinctly sporty in the lower and upper engine speed and power ranges and a more emotive starting sound.
- **Steering:** Direct and precise with M Servotronic. M leather steering wheel including M gearshift paddles and M Mode buttons.
- **Chassis and suspension/driving dynamics setup:** Sporty suspension, without excessively hard running characteristics even in sport mode. Increased driving precision thanks to sportily optimized interaction of steering, suspension and damping. M Dynamic Mode (MDM) instead of Dynamic Traction Control (DTC). Rear-biased setup of xDrive for a sporty driving style in MDM and DSC-OFF mode.

F85/F86 Complete Vehicle

1. Introduction

- **Seating comfort:** M sports seat including M logo and high-quality upholstery in BMW Individual Merino leather.
- **Ergonomics, interior equipment:** BMW Individual Merino leather, M instrument cluster, M Drive menu, M head-up display with M direction on start-up, M fit, M-specific decorative strips, M footrest and sill trims.
- **Vehicle electrical system:** LED light technology for headlights and fog lights. HiFi loudspeaker system for maximum listening pleasure. Active Sound Design ASD for M-specific engine sound in the vehicle interior.

F85/F86 Complete Vehicle

1. Introduction

1.3. F86 X6 M vehicle outline description

F86 X6 M

- **Design and aerodynamics:** 5-door high-performance sports activity coupé (SAC). M-specific characteristics in front, side and rear area. Unique aerodynamic design in front, side and rear area and vehicle underbody.
- **Engine/Transmission:** 4.4-liter 8-cylinder Turbo-Valvetronic direct injection engine. Even more powerful and even more spontaneous, linear power development. Choice of three engine dynamics control programs. Even faster, more precise gear changes. M-specific gearshift characteristics with BMW M 8-speed automatic transmission variant (with Drivelogic program). Dynamic Performance Control (QMVH) for even better propulsion power distribution on the rear axle and increased driving safety.
- **Engine sound:** Distinctly sporty character in the lower and upper engine speed and power ranges and a more emotive starting sound.
- **Steering:** Direct and precise with M Servotronic. M leather steering wheel including M gearshift paddles and M Mode buttons.
- **Chassis and suspension/driving dynamics setup:** Sport suspension, without excessively hard running characteristics even in sport mode. Increased driving precision thanks to sportily optimized interaction of steering, suspension and damping. M Dynamic Mode (MDM) instead of Dynamic Traction Control (DTC). Rear-biased setup of xDrive for a sporty driving style in MDM and DSC-OFF mode.

F85/F86 Complete Vehicle

1. Introduction

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- **Vehicle electrical system:** LED light technology for headlights and fog lights. HiFi loudspeaker system for maximum listening pleasure. Active Sound Design (ASD) for M-specific engine sound in the vehicle interior.

F85/F86 Complete Vehicle

2. Technical Data

2.1. Comparison of E70 M/E71 M with F85/F86

Designation	Unit	E70 M	E71 M	F85	F86
Engine series		S63B44O0	S63B44O0	S63B44T2	S63B44T2
Engine control		MSD85.1	MSD85.1	MEVD 17.2.H	MEVD 17.2.H
Transmission type designation		6HP26S	6HP26S	M8HP75	M8HP75
Length	[mm]	4851	4876	4894	4923
Width	[mm]	1994	1983	1985	1989
Height	[mm]	1764	1684	1717	1689
Number of seats		5	4	5	5
Luggage compartment volume	[liters] (cubic feet)	620 – 1750	570 - 1450	650 - 1870 (35.8 - 76.7)	550 - 1525 (26.6 - 59.7)
Top speed	[km/h] (mph)	250*/156*	250*/156*	250*/156*	250*/156*
Acceleration 0 - 60 mph	[s]	4.7	4.5	4.0	4.0
1000 m stationary start	[s]	23.5	23.5	22.6	22.6
Nominal engine power at engine speed	[kW / bhp] [rpm]	408/555 6000	408/555 6000	423/567 6000 - 6500	423/567 6000 - 6500
Power-to-weight ratio (DIN)	[kg/kW]	5.6	5.6	5.4	5.4
Torque at speed	[Nm](lb-ft) [rpm]	680 (500) 1500 - 5650	680 (500) 1500 - 5650	750 (553) 2200 - 5000	750 (553) 2200 - 5000
Aerodynamics					
c_x (drag coefficient)		0.38	0.38	0.38	0.37
A (frontal area)	[m^2]	2.90	2.85	2.93	2.89
c_x x A (drag)	[m^2]	1.10	1.08	1.11	1.07
Curb weight					
US	[kg](lbs)	2435 (5368)	2415 (5324)	2386 (5260)	2352 (5185)
Rear axle load section, empty (DIN)	[%]	47.9	47.2	48.4	47.3
Load capacity	[kg] (lbs)	600 (1322)	600 (1322)	695 (1532)	685 (1510)
Permissible gross weight	[kg] (lbs)	2935 (6471)	2840 (6261)	2971 (6550)	2951 (6505)
Permissible towed weight	[kg]	3000	3000	2970	2950

F85/F86 Complete Vehicle
2. Technical Data

Designation	Unit	E70 M	E71 M	F85	F86
Fuel consumption	[l/100 km]	13.9	13.9	11.1	11.1
Approx. fuel tank capacity	[l](US gal)	85 (22.4)	85 (22.4)	85 (22.4)	85 (22.4)
CO^2 emissions	[grams per kilometer]	325	325	258	258
Exhaust emission standards		LEV II	LEV II	ULEV 2	ULEV 2

* Electronically regulated.

2.2. BMW EfficientDynamics measures

- TwinPower Turbo technology
- Gasoline direct fuel injection with Valvetronic
- Automatic engine start-stop function
- Efficient 8-speed M automatic transmission
- M Servotronic (EPS)
- Use of ancillary components as required (air conditioning compressor)
- Brake energy regeneration

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3. Body

3.1. Exterior trim

3.1.1. Front

Bumper, front

The single-piece M-specific bumper panel is extensively identical in design for the F85 and F86 and has M-specific flaps for reducing lift on the front axle. It is, including the standard ultrasonic sensors for Park Distance Control (PDC) and the number plate baseplate, painted to match the exterior body color. LED technology fog lights are fitted as standard. The grilles have a black grained finish.
The optional Surround View camera and the ultrasonic sensor for the Parking Manoeuvring Assistant (PMA) is integrated similarly to the F15/F16 production vehicle at side front.

Unlike the F15/F16, on the F85/F86 there is **no** air curtain integrated in the front bumper panel and the adjoining wheel arch panel. The air breather contributes, together with the gill, the underbody panelling, a rear spoiler on the F86 and the exterior mirrors, to the aerodynamic concept of the F85/F86.

The F85/F86 is equipped as standard with Xenon headlights and LED fog lights.

F85/F86 front view

Radiator (kidney) grille

The frame and the double-rib kidney bars of the BMW M radiator grille have black high-gloss struts as standard for the F85/F86.

Cooling air routing

The new air duct is identical for the F85 and F86. New cooling air routing for all radiators/coolers: multifunction air routing, air duct for brakes, air duct for auxiliary radiator and air duct with additional air guide for the additional low-temperature cooler.

The air inlet areas for the required cooling air on the front bumper panel have been enlarged and optimized in such a way that the F85/F86 has 50 % more inlet area for cooling air than the E7x M. This measure has positive influence on the cooling power for charge air cooling, A/C condenser cooling, engine cooling, engine oil cooling, transmission cooling and oil cooling of the ARS system.

F85/F86 Complete Vehicle

3. Body

Front end

The air intake duct and the mounting arrangement for the intake silencer are identical for the F85 and F86. An aluminium extruded section cross-member, including two additional brackets for the intake silencer, is installed to accommodate the now body-mounted intake silencer.

F85/F86 M air intake duct and intake silencer

F85/F86 Complete Vehicle

3. Body

3.1.2. Side

Fenders

While sharing the same basic design, the front fenders on the F85 and F86 differ from each other geometrically. Distinctive design features include the so-called M gills and the X5 M/X6 M model inscriptions on the front left and right fenders. In addition, for the first time in a BMW X M vehicle the air breathers are used on the left and right in the fenders, which are integrated in the typical M gill.

F85/F86 M gill elements with integrated air breather

Exterior mirrors

The exterior mirrors have an M-specific design with a double-rib character. They are heated and electrochromic as standard, and have a memory and fold-in function as well as an automatic parking function for the passenger side mirror. The turn indicators are integrated in the exterior mirror caps.

Wheel arch trims/rims

The painted front and rear wheel arch trims on the F85 and F86 have the same design as the wheel arch trims on the F15/F16 with M Sport package.

Side sills

The M side sills on the F85 and F86 have the same design as the F15/F16 side sill with M Sport package.

Trim strips

All the trim strips, with the exception of the roof trim strips, come in BMW Individual high-gloss Shadow Line.

Roof trim strips

The roof trim strips on the F85 come in matt black while those on the F86 are painted in the body color.

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3. Body

F85

F85 side view

F86

F86 side view

F85/F86 Complete Vehicle

3. Body

3.1.3. Rear

Exhaust tailpipes

The four round exhaust tailpipes, which are typical of BMW M vehicles, are a distinctive design feature.

Trailer tow hitch

A specifically adapted trailer tow hitch is used on the F85/F86.

F85 rear

F85 rear view

The M-specific bumper panel is designed in three pieces. The panel of the upper bumper with PDC is painted to match the body exterior color. The lower diffuser is painted to match the body exterior color apart from the black grained finish center grille.

F85/F86 Complete Vehicle

3. Body

F86 rear

The M-specific bumper panel is designed in four pieces. The panel of the upper bumper with PDC is painted to match the body exterior color. The upper bumper panel is separated from the diffuser by a black grained finished rear trim. The lower diffuser is painted to match the body exterior color apart from the black grained finish center grille.

The F86 also features a rear spoiler on the tailgate which improves the aerodynamics and accentuates the vehicle's sporty appearance.

F86 rear view

F85/F86 Complete Vehicle

3. Body

3.1.4. Underbody and thermal protection

Underbody

The stiffening plate has been adopted from the F15/F16 with N63B44O1 engine. The engine compartment shielding is a new part with an integrated air outlet for the additional upstream low-temperature charge air cooler and the additional transmission oil cooler. Only the F85/F86 have this part.

In order to achieve an additional optimization in terms of reducing the lift on the F85/F86, M-specific air guides in front of the front wheels that differ geometrically from the F15/F16 have been developed in a wind tunnel.

The center underbody panelling is omitted. In its place an aluminium air deflector is fitted that ensures an optimum flow to the distinct cooling fins on the aluminium transmission oil sump (BMW AG basis: plastic oil sump).

Particular attention has been given to the air flow around the rear axle QMVH differential (final drive unit).

The exhaust air ducting for the engine compartment and the transfer box have also been optimized.

Thermal protection

- The heat insulation for the rear silencer is a new part and identical for the F85 and F86.
- Additional heat insulation for the fuel tank and the universal joint on the drive shaft at the front.

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3. Body

3.2. Interior

3.2.1. Driving area and steering wheel

M driving area

F85/F86 M driving area

The upper instrument panel is leather-covered as standard. With the “Full leather” optional extra the lower instrument panel including all the flaps are also leather-covered. Merino fine graining leather with contrast stitching is used. The leather-covered center console in the F85/F86 has been adopted from the F16 including the knee pads.

M leather steering wheel

The M leather steering wheel with multifunction is built on a magnesium skeleton and is based on the steering wheel used with F10 M5. Above the thumb rests are the M gearshift paddles with M gearshift logic: downshift on left, upshift on right.

The steering wheel has increased in its outer diameter to 380 mm compared with the F15/F16. The steering wheel rim is reinforced and ergonomically optimized from a round to an oval cross-section, improving the driver's grip (similarly to F15/F16 with Sport package).

Gearshift paddles on the left **“-”** for downshift and right **“+”** for upshift for the M automatic transmission are similar to F1x M5/M6, F06/M6 and F80/F82/F83 with double-clutch transmissions.

The colored M stitching constitutes another difference from the production F15/F16 steering wheels. The M leather steering wheel in the double-spoke design with a stainless steel center trim and with M inscription is black leather.

The vibration element for lane departure warning and lane change warning is integrated for the first time in an X5 M and an X6 M in the steering wheel.

Two M Drive buttons are integrated in the left multifunction field. For more details please see the chapter "M Drive menu".

F85/F86 M leather steering wheel

3.2.2. M sports seat

M multifunction seat

The M multifunction seat is standard and offers:

- Foam parts and covers M-specifically new
- Lumbar adjustment
- Memory function for the driver's seat and front passenger seat
- No electric head restraint height adjustment since it is permanently integrated in the backrest
- Electrically reversing backrest upper section adjustment
- Embossed M logo in the head restraints
- Other seat functions as for the M sports seat.

Rear seats

F85: Full foam seat with backrest and seat cushion split with an upper body angle of 27°. The seat has a 40/20/40 split. The folding center armrest features a fixed head restraint and a cup holder. The outer head restraints are manually adjustable.

Optional equipment: Seat heating. The 3rd row seats option is not available.

F86: Full foam seat with backrest and seat cushion split with an upper body angle of 26°. The seat has a 40/20/40 split. The integrated head restraints and the individual seats with moulded side sections accentuate the sporty coupé character of the rear seats. The special design layout of the roofliner ensures optimum headroom without having to eliminate a folding center armrest and a ski bag (optional equipment).

Optional equipment: Rear seat heating.

3.2.3. Doors and strips

Doors

The door trim panels are M-specifically new with M-specific decorative strips.

M decorative strips

The following trims are offered in the F85/F86:

- Aluminium Trace decorative strip in brushed aluminium. The brushed aluminium Trace interior strips are available as standard exclusively for M vehicles.
- Standard 4MC: Carbon fiber black decorative strip. These interior strips in high-quality leather are optionally available exclusively for M vehicles.
- Option 4CV: Fineline Oak wood trim. The hand-picked raw materials of the highest quality are put together individually for each vehicle. The interior strips are located on the instrument panel of the center console, the rear console (F86) and on the door trim panels.

Sill trims, footrest and compact spare wheel

- Sill trims with M lettering
- M footrest
- Aluminium compact spare wheel is new due to its size of 19".
  The holders for the jack and the lug wrench are also located near the spare wheel.

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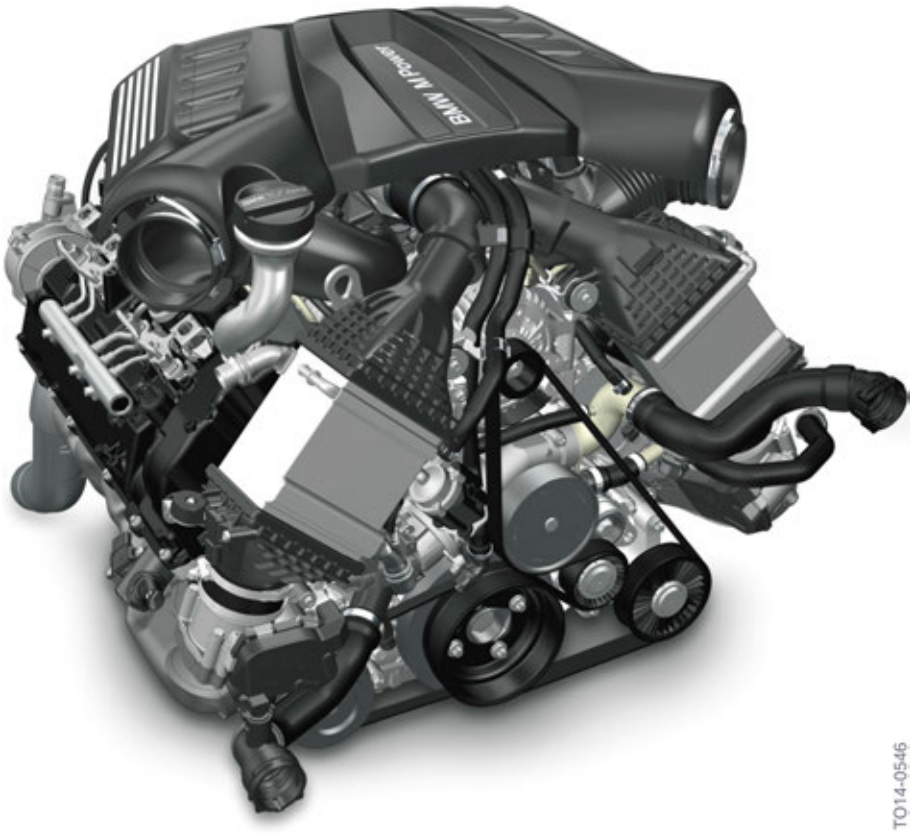
4. Engine/Powertrain

4.1. M TwinPower turbo engine S63B44T2



F85/F86 S63B44T2 engine

The S63B44T2 engine is the source of propulsion for the F85 and F86. It is a further development of the S63 Top engine (S63B44T0), which is familiar from the current BMW M5/M6, and is technically based on the N63TU engine (N63B44O1), which was launched in July 2012 with the LCI measures of the F01/F02. There is no engine with the designation S63B44T1 at M GmbH.

Only the differences from the S63 Top engine (S63B44T0) are described in this document.

Model designation	Engine designation	Start of Production
BMW X5 M	S63B44T2	12/2014
BMW X6 M	S63B44T2	12/2014

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4. Engine/Powertrain

4.1.1. S63B44T2 engine, comparison of S63B44O0 engine/S63B44T0 engine

	Unit	S63B44O0	S63B44T0	S63B44T2
Series		E70/E71	F1x/F06	F85/F86
Model designation		BMW X5 M BMW X6 M	BMW M5/M6	BMW X5 M BMW X6 M
Design		V8	V8	V8
Displacement	[cm³]	4395	4395	4395
Firing order			1-5-4-8-6-3-7-2	
Bore/stroke	[mm]	89/88.3	89/88.3	89/88.3
Power output at engine speed	[kW (HP)] [rpm]	408 (555) 6000	412 (560) 6000 - 7000	423 (567) 6000 - 6500
Cutoff speed	[rpm]	6800	7200	6800
Power output per liter	[kW/l]	92.8	93.7	96.2
Torque at engine speed	[Nm/lb-ft] [rpm]	680/500 1500 - 5650	680/500 1500 - 5750	750/553 2200 - 5000
Compression ratio	[ε]	9.3	10.0	10.0
Valves per cylinder		4	4	4
Fuel rating	[RON]	98	98	98
Fuel	[RON]	95 - 98	95 - 98	95 - 98
Fuel consumption complying with EU	[l/100 km]	13.9	9.9	11.1
CO_2 emissions	[grams per kilometer]	325	231	258
Digital Motor Electronics		MSD85.1	MEVD17.2.8	MEVD17.2.H
Exhaust emissions legislation		LEV II	LEV II	ULEV II
Maximum speed	[km/h / mph]	250 (156)	250 (156)	250 (156)
Acceleration 0–60 mph	[s]	4.5	4.2	4.0

4.1.2. Intake manifold

F85/F86 intake silencer

Air intake system

The air intake system is in principle comparable with that of the N63B44O1 engine. The most important change to the air intake system is the adaptation of the intake manifold air duct with regard to the installation space in the F85/F86 (see Section 3.1.1 Front).

The S63B44T2 engine is fitted on each cylinder bank with a hot film air mass meter, as has been in use since the N20 engine. The air temperature and intake pipe pressure sensors before and after the throttle valve are identical to those in the N63B44O1 engine.

Intake silencer

The housing of the intake silencer in the F85/F86 corresponds in its geometry to that of the F15/F16 with N63B44O1 engine. The only differences are in the lettering due to M-specific markings.

The air filter element differs in the quality of the filter mat from the N63B44O1 engine and the S63B44T0 engine. This modification to the filter mat design has resulted in a 14 % lower loss of pressure through the air filter element compared with the predecessor S63B44O0 engine. The air filter element for the S63B44T2 engine must therefore be identified by means of the Electronic Parts Catalogue (EPC) in order to avoid incorrect installation.

One air filter element is fitted per cylinder bank along similar lines to the N63B44O1 engine.

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4. Engine/Powertrain

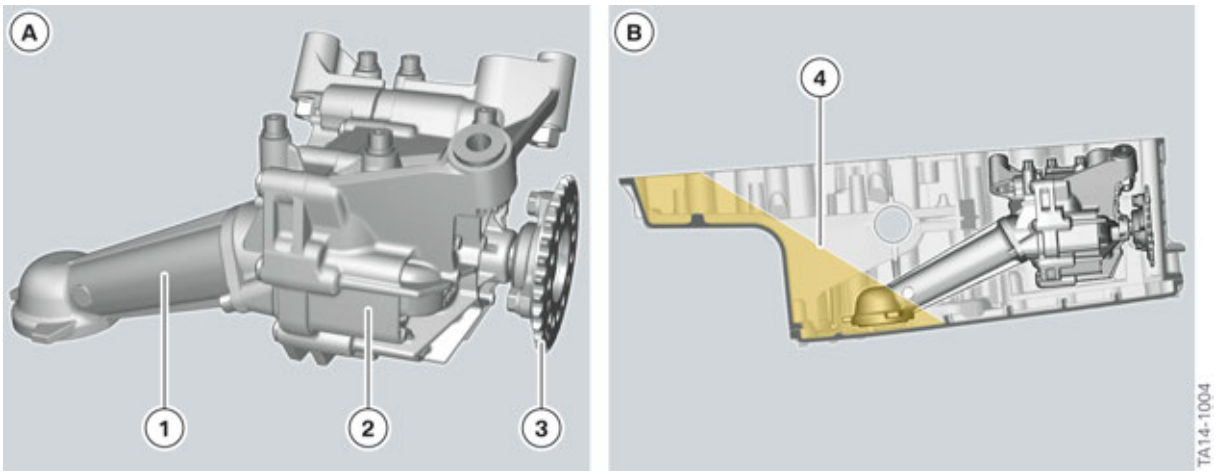
4.1.3. Oil supply

Differences in the oil supply between S63B44T0 engine and N63B44O1 engine and S63B44T2 engine:

- Oil sump adapted to use in xDrive vehicles as F15/F16 with xDrive.
- Oil supply adapted to use on racetracks.
- Oil-level check adopted from the N63B44O1 by oil-level sensor instead of oil condition sensor.
- Oil pump adopted from the N63B44O1.

Oil supply adaptations

The position and length of the oil pump intake snorkel has been adapted to the geometric shape of the oil pump. This was necessary in order to adapt the oil supply to racetrack use. This ensures a secure oil supply, even when the oil level is displaced during lateral and longitudinal accelerations, as can occur during racing applications.



F85/F86 oil pump with long intake snorkel

Index	Explanation
A	Oil pump
B	Oil level
1	Intake neck
2	Oil pump
3	Oil pump drive
4	Oil level in event of extreme negative longitudinal acceleration (braking)

With these changes the oil supply can be guaranteed up to a longitudinal acceleration of 1.2 g. Also with lateral acceleration, for example during cornering, this structure enables a secure oil supply up to constant 1.2 g.

4.1.4. Crankshaft drive

The crankshaft drive of the S63B44T2 engine has been adopted entirely from the S63B44T0 engine.

4.1.5. Crankcase, cylinder head and timing drive

The cylinder head of the S63B44T2 engine has been adopted entirely from the N63B44O1 engine.

4.1.6. Exhaust turbochargers

As already featured in the S63B44T0 engine, two twin-scroll technology exhaust turbochargers are used.

The exhaust turbochargers are supplied with exhaust gas as in the S63B44T0 engine via two cross-bank four-into-two exhaust manifolds, which is required for the special functioning of the twin-scroll exhaust turbochargers.

The wastegate valves have been modified when compared with the twin-scroll turbocharger unit in the S63B44T0 engine. The wastegate valves can now be opened further in terms of their opening angle. This was necessary in order to comply with the requirements of the ULEV II exhaust emission standards. The wastegate valves are opened fully in the warm-up phase. In this way, a large proportion of the hot exhaust gases is diverted past the turbocharger turbines and routed directly to the catalytic converter. Thanks to this further opening of the wastegate valves, even more hot exhaust gas can now be specifically diverted in the warm-up phase to the catalytic converters. This system reduces the necessary warm-up phase of the catalytic converters and complies with the even stricter emission requirements.

One-piece wastegate valves are used, increasing robustness.

4.1.7. Catalytic converter

The S63B44T2 engine has one catalytic converter per cylinder bank, each with two ceramic monoliths. The design of the catalytic converters corresponds to those in the N63B44O1 engine.

Oxygen sensors

The established Bosch oxygen sensors are used:

- Control sensor: LSU ADV
- Monitoring sensor: LSF 4.2

The control sensor is located ahead of the primary catalytic converter, as close as possible to the turbine outlet. Its position has been chosen so that all the cylinders can be recorded separately. The monitoring sensor is positioned between the first and second ceramic monoliths.

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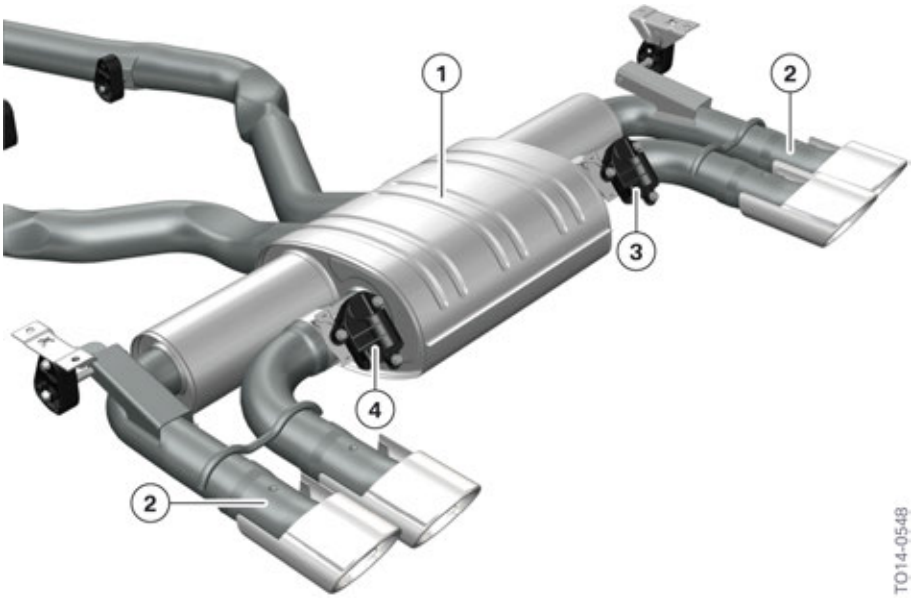
4. Engine/Powertrain

4.1.8. Exhaust system

Differences in the exhaust system between S63B44T0 engine and N63B44O1 engine and S63B44T2 engine:

- Pneumatic exhaust flaps replaced by electrical exhaust flaps.
- Exhaust gas routing system adapted to F85/F86.
- M-specific, startup sound on engine starting.
- Sporty exhaust sound to the vehicle occupants.



F85/F86 rear silencer with EAKS

Index	Explanation
1	Rear silencer
2	Twin tailpipe
3	Electrical exhaust flap actuator (EAKS), right
4	Electrical exhaust flap actuator (EAKS), left

The exhaust sound of the F85/F86 is geared towards the E7x M, but is much more pronounced. The exhaust flaps are closed when the vehicle is stationary, in the lower engine revs range through all the vehicle speed ranges and when engine dynamics control is set to **“Efficient”**.

In the upper engine revs range they open in response to the load requirement.

When engine dynamics control is set to **“Sport”** and **“Sport+”** the exhaust flaps are stationary and fully open in the lower gears.

In the upper gears the exhaust flaps are closed in the critical ranges, likewise in the upper engine revs ranges in response to the load requirement.

4.1.9. Vacuum supply

The vacuum system of the S63B44T2 engine exhibits some changes from the S63B44T0 engine. The vacuum reservoir has a new installation location and the vacuum lines are adapted accordingly. The vacuum reservoir is now situated above the second cylinder bank underneath the engine cover and serves to supply the pneumatic wastegate valve actuators.

4.1.10. Fuel preparation

The fuel preparation components of the S63B44T2 engine have been adopted, except for the solenoid valve injectors, entirely from the S63B44T0 and N63B44O1 engines.

A new component is the fuel low-pressure sensor, which measures and monitors the fuel pressure on the low-pressure side. The fuel low-pressure sensor is connected to and monitored by the DME 2.

For further information on the fuel preparation system of the S63B44T0 engine, please refer to the Technical Training Manual “S63 Top Engine” and “N63TU Engine”.

The high-pressure fuel injection valves have been adapted to the requirements of exhaust emission standards. Solenoid valve injectors that support the software function of so-called “Controlled Valve Operation” (CVO) are used.

For further information on “Controlled Valve Operation” (CVO), please refer to the Technical Training Manual “S55 Engine”.

Work on the fuel system is only permitted after the engine has cooled down. The coolant temperature must not exceed 40 °C / 104° F. This stipulation must be observed without fail, as otherwise there is a risk of fuel being sprayed back on account of the residual pressure in the high-pressure fuel system.

When working on the high-pressure fuel system, it is essential to adhere to conditions of absolute cleanliness and to observe the work sequences described in the repair instructions. Even the slightest contamination and damage to the screwed fittings of the high-pressure lines can cause leaks.

When working on the fuel system of the S63B44T2 engine, it is important to ensure that the ignition coils are not fouled with fuel. The resistance of the silicone material is greatly reduced by sustained contact with fuel. This may result in flashovers on the spark plug head and thus in misfires.

- Before making any modifications to the fuel system, remove the ignition coils and protect the spark plug shaft against ingress of fuel by covering with a cloth.
- Before reinstalling the solenoid valve injectors, remove the ignition coils and ensure that conditions of greatest possible cleanliness are maintained.
- Ignition coils heavily fouled by fuel must be replaced.

- The CVO function comprises the system components "Injector" and "Digital Engine Electronics" (DME). These components therefore have to be identified with the vehicle identification number in the EPC in the event of a replacement.
- For injectors and a DME which supports the CVO function, the injection quantity compensation during the replacement of one of the components is omitted.
- The information and repair instructions in the Integrated Service Technical Application (ISTA) must be observed.

4.1.11. Cooling (engine, engine oil, charge air, ARS (Dynamic Drive))

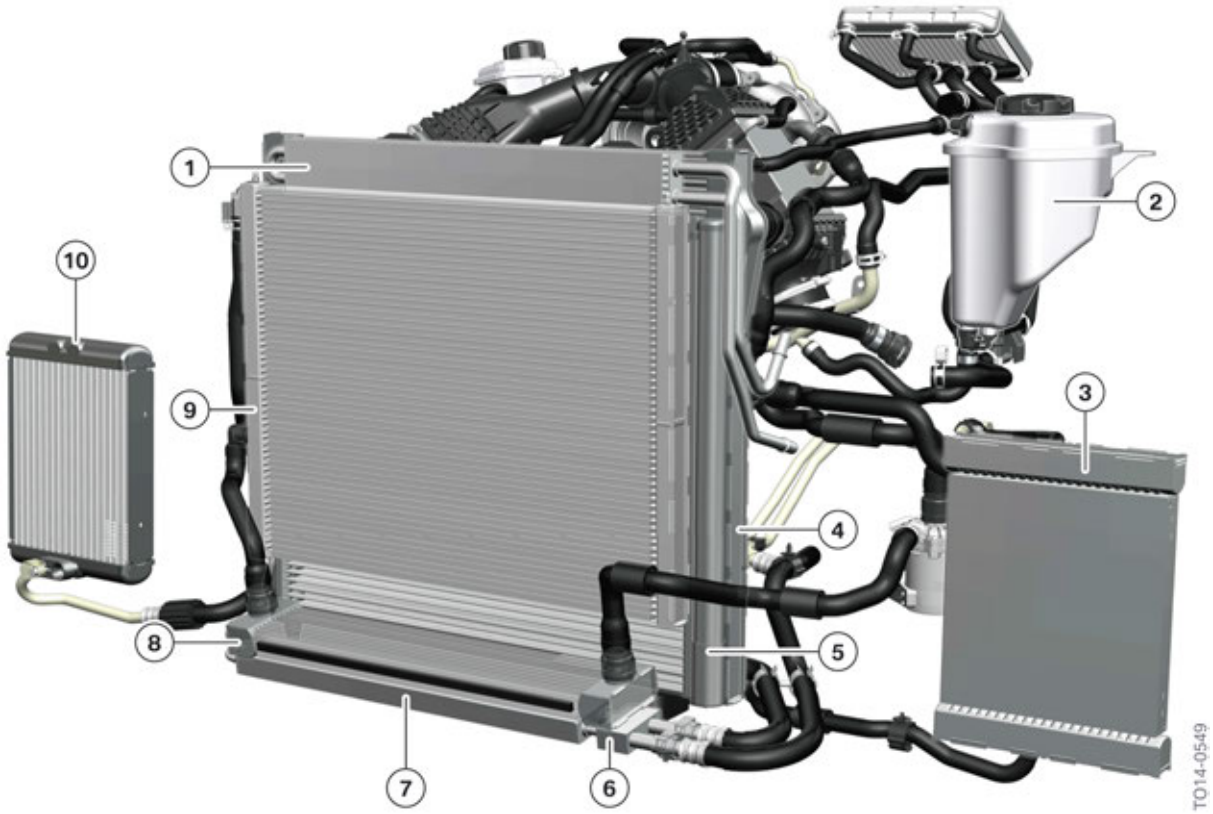
The cooling system also exhibits similarities to the S63B44T0 and N63B44O1 engines.
The engine and charge air cooling both have separate cooling circuits.

Differences in cooling between the S63B44T0 and S63B44T2 engines:

- Omission of cooling for the engine control units for bank 1 and bank 2.
- Adaptation of the installation position of the additional coolant cooler for charge air cooling to F85/F86.
- Electric coolant pumps for the charge air low-temperature circuit are independent for the S63B44T2 cylinder bank.
- Adaptation of the installation position of the engine oil cooler to F85/F86.
- Adaptation of the installation position for ARS transmission oil cooler to F85/F86.
- Adaptation of the installation position of the radiator to F85/F86.
- Engine coolant hoses optimized by larger cross-sections with regard to coolant flow.
- Charge air coolant hoses optimized by larger cross-sections with regard to coolant flow.
- Connections on the charge air cooler optimized with regard to coolant flow.

F85/F86 Complete Vehicle

4. Engine/Powertrain

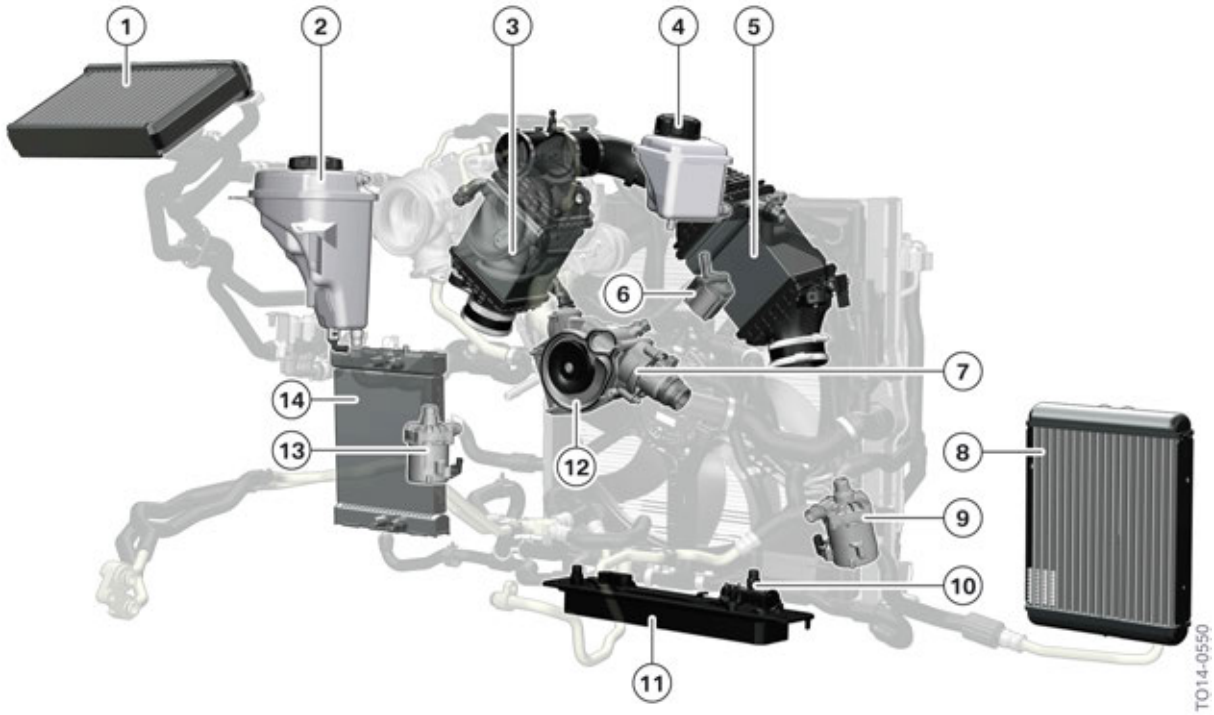


F85/F86 radiator assembly from front

Index	Explanation
1	ARS transmission oil cooler
2	Coolant expansion tank, engine
3	Auxiliary radiator, engine
4	Radiator, engine
5	Condenser, air conditioning
6	Thermostat, transmission oil cooler
7	Additional transmission oil cooler
8	Upstream low-temperature cooler, charge air
9	Low-temperature cooler, charge air
10	Engine oil cooler

F85/F86 Complete Vehicle

4. Engine/Powertrain



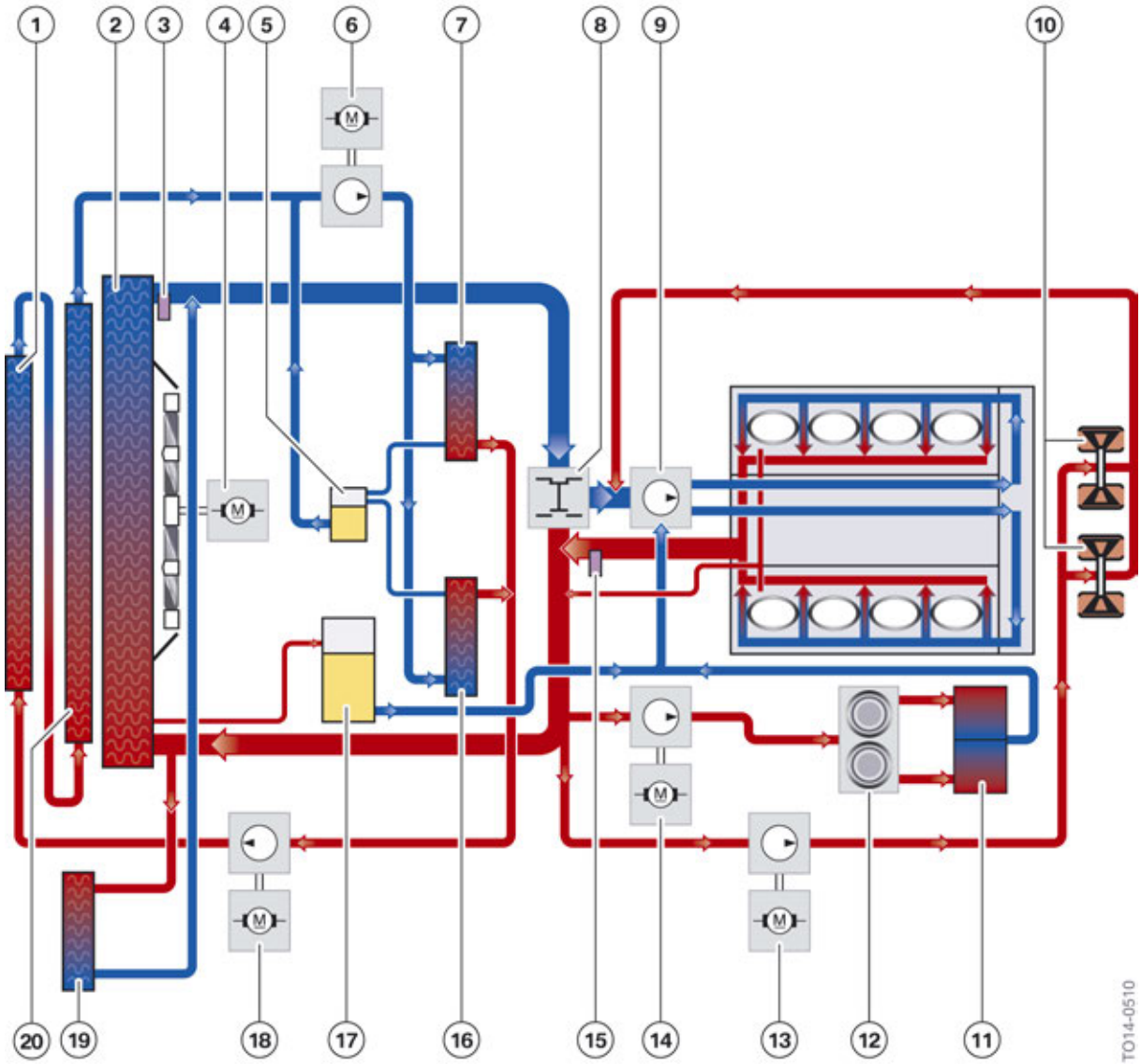
F85/F86 radiator assembly from rear

Index	Explanation
1	Heat exchanger for heating system
2	Coolant expansion tank, engine
3	Indirect charge air cooler, bank 2
4	Coolant expansion tank, low-temperature circuit, charge air
5	Indirect charge air cooler, bank 1
6	Electric coolant pump, exhaust turbocharger
7	Thermostat
8	Engine oil cooler
9	Electric coolant pump, low-temperature circuit, charge air
10	Thermostat, transmission oil-to-coolant heat exchanger
11	Transmission oil-to-coolant heat exchanger
12	Mechanical coolant pump
13	Electric coolant pump, low-temperature circuit, charge air
14	Auxiliary radiator, engine

F85/F86 Complete Vehicle

4. Engine/Powertrain

System overview



F85/F86 complete cooling system without engine oil cooling, schematic

Index	Explanation
1	Upstream low-temperature cooler, charge air
2	Radiator, engine
3	Coolant temperature sensor at radiator outlet
4	Electric fan
5	Coolant expansion tank, low-temperature circuit, charge air
6	Electric coolant pump, low-temperature circuit, charge air
7	Indirect charge air cooler, bank 1

F85/F86 Complete Vehicle

4. Engine/Powertrain

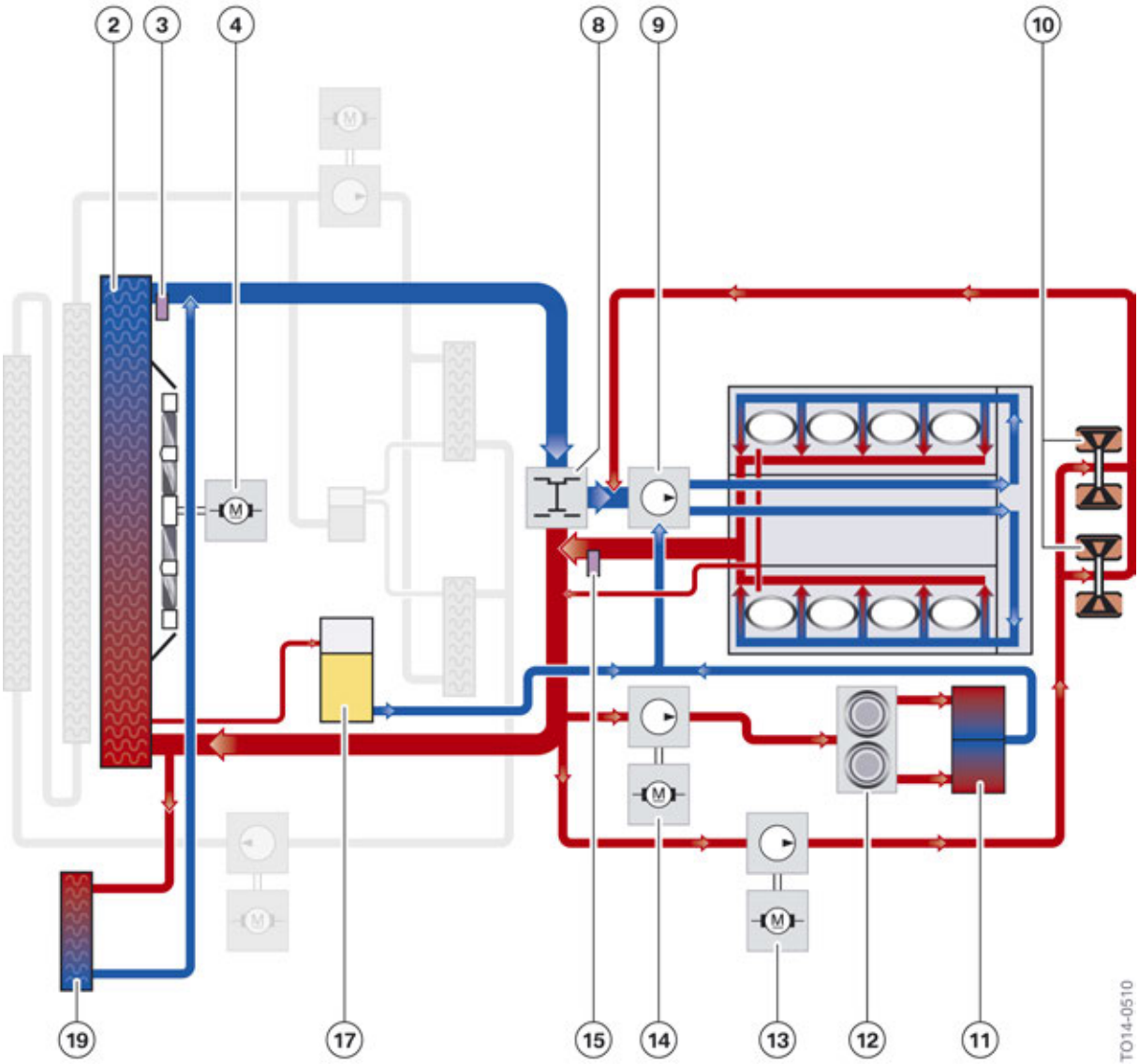
Index	Explanation
8	Thermostat
9	Mechanical coolant pump
10	Exhaust turbocharger
11	Heat exchanger
12	Heating system heat exchanger control valve
13	Electric coolant pump, exhaust turbocharger
14	Electric coolant pump, heating, vehicle interior
15	Coolant temperature sensor
16	Indirect charge air cooler, bank 2
17	Coolant expansion tank, engine
18	Electric coolant pump, low-temperature circuit, charge air
19	Auxiliary radiator, engine
20	Low-temperature cooler, charge air

F85/F86 Complete Vehicle

4. Engine/Powertrain

Engine cooling with exhaust turbocharger

The engine cooling system is an independent coolant circuit, the so-called “**high-temperature circuit**”. It comprises the conventional engine cooling and cooling of the turbochargers. Even the vehicle interior heating is supplied by the coolant circuit of the engine cooling system.



F85/F86 engine cooling with turbocharger, schematic

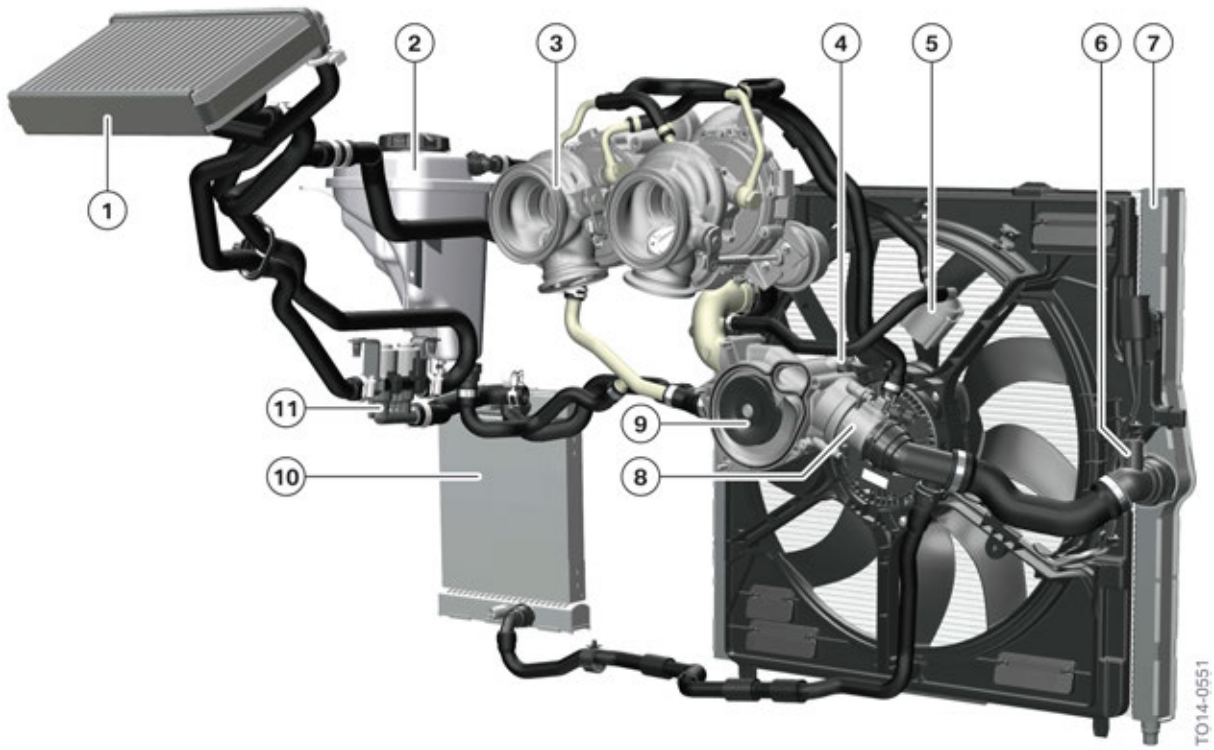
Index	Explanation
2	Radiator, engine
3	Coolant temperature sensor at radiator outlet
4	Electric fan
8	Thermostat
9	Mechanical coolant pump

Index	Explanation
10	Exhaust turbocharger
11	Heat exchanger
12	Heating system heat exchanger control valve
13	Electric coolant pump, exhaust turbocharger
14	Electric coolant pump, heating, vehicle interior
15	Coolant temperature sensor
17	Coolant expansion tank, engine
19	Auxiliary radiator, engine

The conventional coolant pump is driven via a belt and cannot be used for cooling the exhaust turbocharger after the engine has shut down. For this reason there is an electric coolant pump, which works at a power of 20 W, for this separate coolant circuit. But also during engine operation the electric coolant pump is switched on taking into account the following factors:

- Coolant temperature at the engine outlet
- Engine oil temperature
- Injected fuel quantity

Using these values the heat input into the engine is calculated. The after-run of the electric coolant pump can last up to 30 minutes. To improve the cooling effect, the electric fan is activated and can run down for up to a max. of 11 minutes.



F85/F86 engine cooling with turbocharger, components

F85/F86 Complete Vehicle

4. Engine/Powertrain

Index	Explanation
1	Heat exchanger
2	Coolant expansion tank, engine
3	Exhaust turbocharger
4	Coolant temperature sensor
5	Electric coolant pump, exhaust turbocharger
6	Coolant temperature sensor at radiator outlet
7	Radiator, engine
8	Thermostat
9	Mechanical coolant pump
10	Auxiliary radiator, engine
11	Heating system heat exchanger control valve

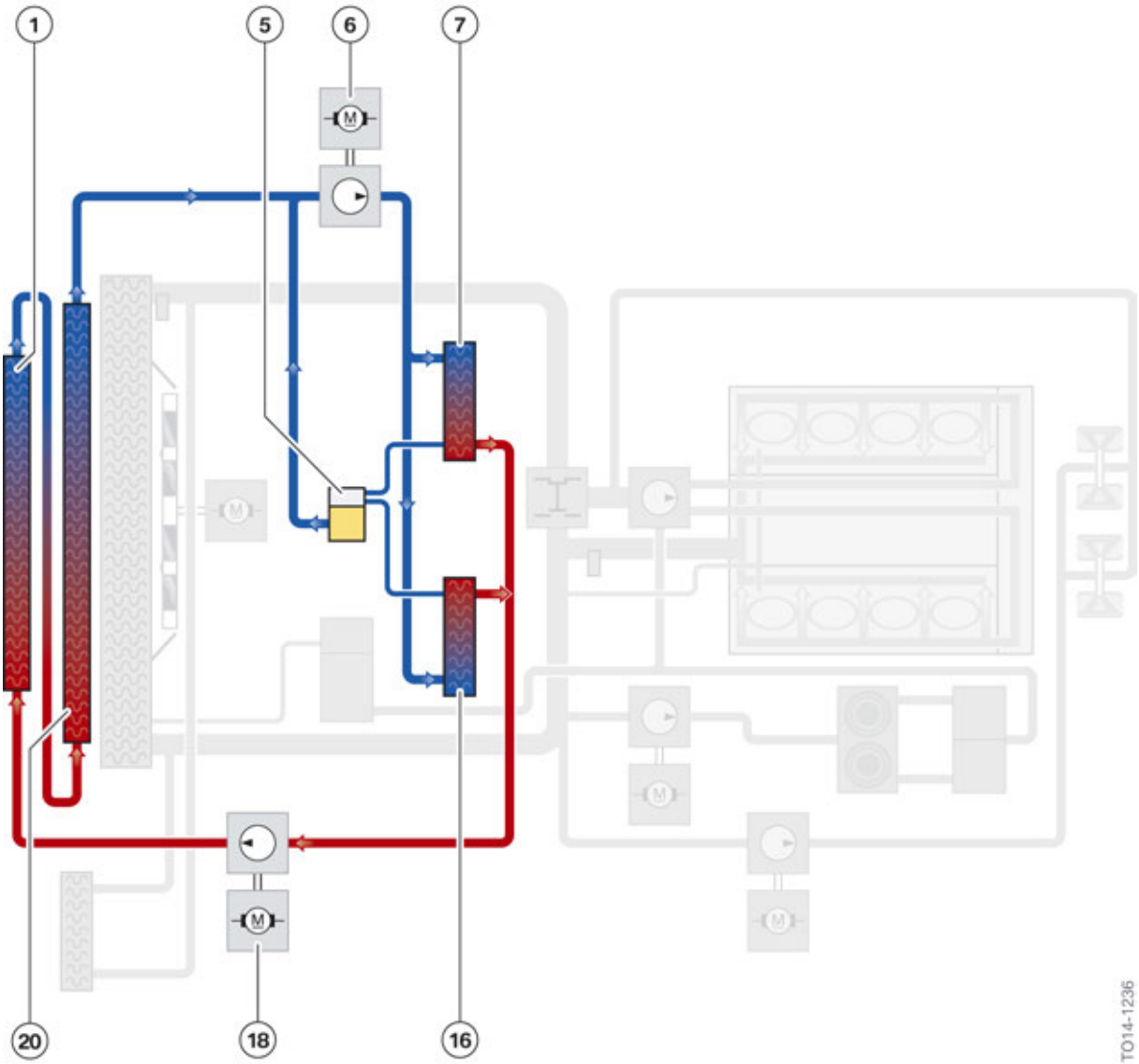
F85/F86 Complete Vehicle

4. Engine/Powertrain

Charge air cooling

The system again makes use of so-called "**indirect**" charge air cooling, which is cooled by a separate coolant circuit, the so-called "**low-temperature circuit**".

To guarantee sufficient cooling of the charge air, in the S63B44T2 engine the low-temperature coolant-to-air heat exchangers are adapted when compared with the S63B44T0 engine. Because a larger surface area is available to the F85/F86 for the radiators at the front of the vehicle, two low temperature charge air coolers are used. One low-temperature charge air cooler is located directly after the front of the vehicle as the first component of the radiator assembly. A second low-temperature charge air cooler is located upstream of the radiator assembly. These are supplied with coolant via an independent cooling system with two electric coolant pumps.

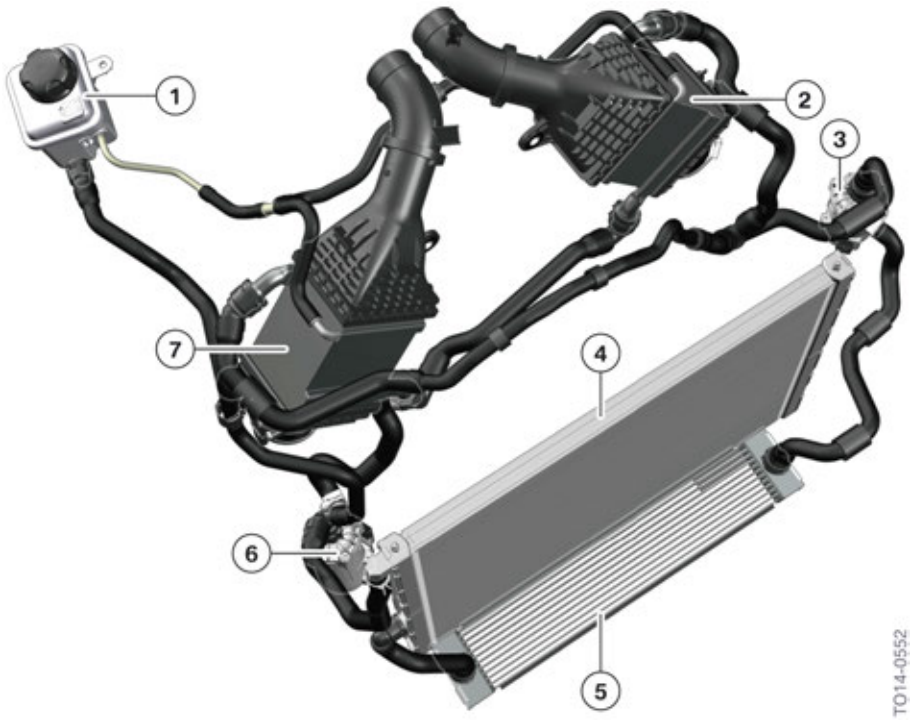


F85/F86 charge air cooling, schematic

F85/F86 Complete Vehicle

4. Engine/Powertrain

Index	Explanation
1	Upstream low-temperature cooler, charge air
5	Coolant expansion tank, low-temperature circuit, charge air
6	Electric coolant pump, low-temperature circuit, charge air
7	Indirect charge air cooler, bank 1
16	Indirect charge air cooler, bank 2
18	Electric coolant pump, low-temperature circuit, charge air
20	Low-temperature cooler, charge air



F85/F85 charge air cooling, components

Index	Explanation
1	Coolant expansion tank, charge air
2	Indirect charge air cooler, bank 2
3	Electric coolant pump, low-temperature circuit, charge air
4	Low-temperature coolant radiator, charge air
5	Upstream low-temperature coolant radiator, charge air
6	Electric coolant pump, low-temperature circuit, charge air
7	Indirect charge air cooler, bank 1

F85/F86 Complete Vehicle

4. Engine/Powertrain

The S63B44T2 engine again uses two electric auxiliary coolant pumps, as on the S63B44T0 engine, for the charge air cooling low-temperature circuit. But unlike on the S63B44T0 engine, which had for each cylinder bank an additional auxiliary low-temperature charge air coolant radiator and thus also an additional electric coolant pump for the charge air low-temperature circuit in each case, the S63B44T2 engine utilizes a pump for the feed and a pump for the return. The indirect charge air coolers are connected in series to the respective circuit.

Both 50 W pumps have self-diagnosis and dry-running protection, which can lead to fault code entries in the DME. If the engine speed is increased by 15 minutes over a period, the auxiliary water pumps are switched off and a fault code is stored in the DME. The expansion tank does not have a coolant level switch and does not automatically detect when the fluid level is too low.

If the electric coolant pump is removed and then to be reused, it is important to ensure that it is set down still filled with coolant. Drying out may cause the bearings to stick. The upshot of this is that the electric coolant pump may possibly not start, which in turn may result in engine damage.

Before installing, turn the pump impeller manually to ensure that it moves freely.

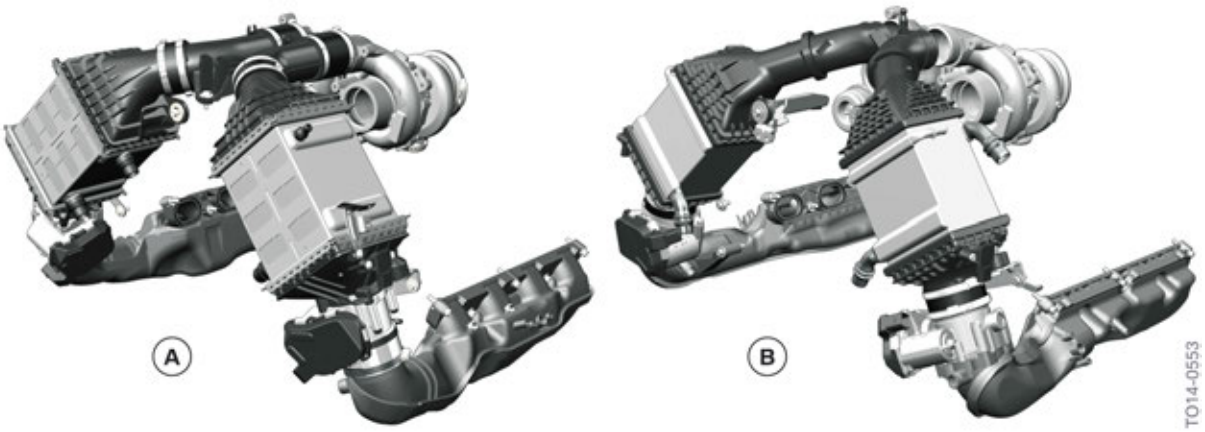
F85/F86 Complete Vehicle
4. Engine/Powertrain

Charge air cooler

The charge air coolers have, in contrast to the S63B44T0 engine, been adapted to the installation space of the F85/F86. The charge air coolers have been reduced in size (dimensions), but still deliver the same performance data as those of the S63B44T0 engine.

- Charge air cooler temperature input: approx. 160° C / 320° F
- Charge air cooler temperature output: approx. < 50° C / 122° F
- Charging pressure: 2.5 bar
- Pressure loss through charge air cooler: < 50 mbar

This has been made possible with optimized charge air and coolant routing, which positively influences the pressure loss and the charge air cooling in the charge air cooler. The charge air coolers have been altered in terms of their geometry in such a way that they can be directly connected at the top to the turbocharger compressor wheel. The connections have been optimized downwards in such a way as to facilitate a direct connection to the electronic throttle valves via a connection hose. This has made it possible to adopt the intake neck with the electronic throttle valves from the N63B44O1 engine. The system supplier of the new charge air coolers is Delphi.



F85/F86 charge air coolers, comparison

Index	Explanation
A	Charge air cooler S63B44T0
B	Charge air cooler S63B44T2

Cooling power limits

If under extreme conditions such as for example in countries with high outside temperatures and the cooling power reaches its limits on the racetrack under race conditions, the cooling power of the vehicle air conditioning is reduced as the very first measure. Reducing the cooling power for the air conditioning ensures that there is sufficient cooling power available for the engine cooling and charge air cooling. The driver is alerted by a Check Control message if the cooling power of the engine cooling or charge air cooling reaches its limits. In the event of a customer complaint relating to the cooling power of the vehicle's air conditioning system, it is essential first to take these boundary conditions into consideration before starting troubleshooting on the cooling system and on the air conditioning.

4.1.12. Engine electrical system

The MEVD 17.2.H from Bosch is used as the engine control unit in the S63B44T2 engine. The MEVD 17.2.H is closely related to the MEVD 17.2.8 as used in the N63B44O1. However the MEVD 17.2.H supports the software function “Controlled Valve Operation” (CVO) and also facilitates the use of the electrical exhaust flap actuator (EAKS).

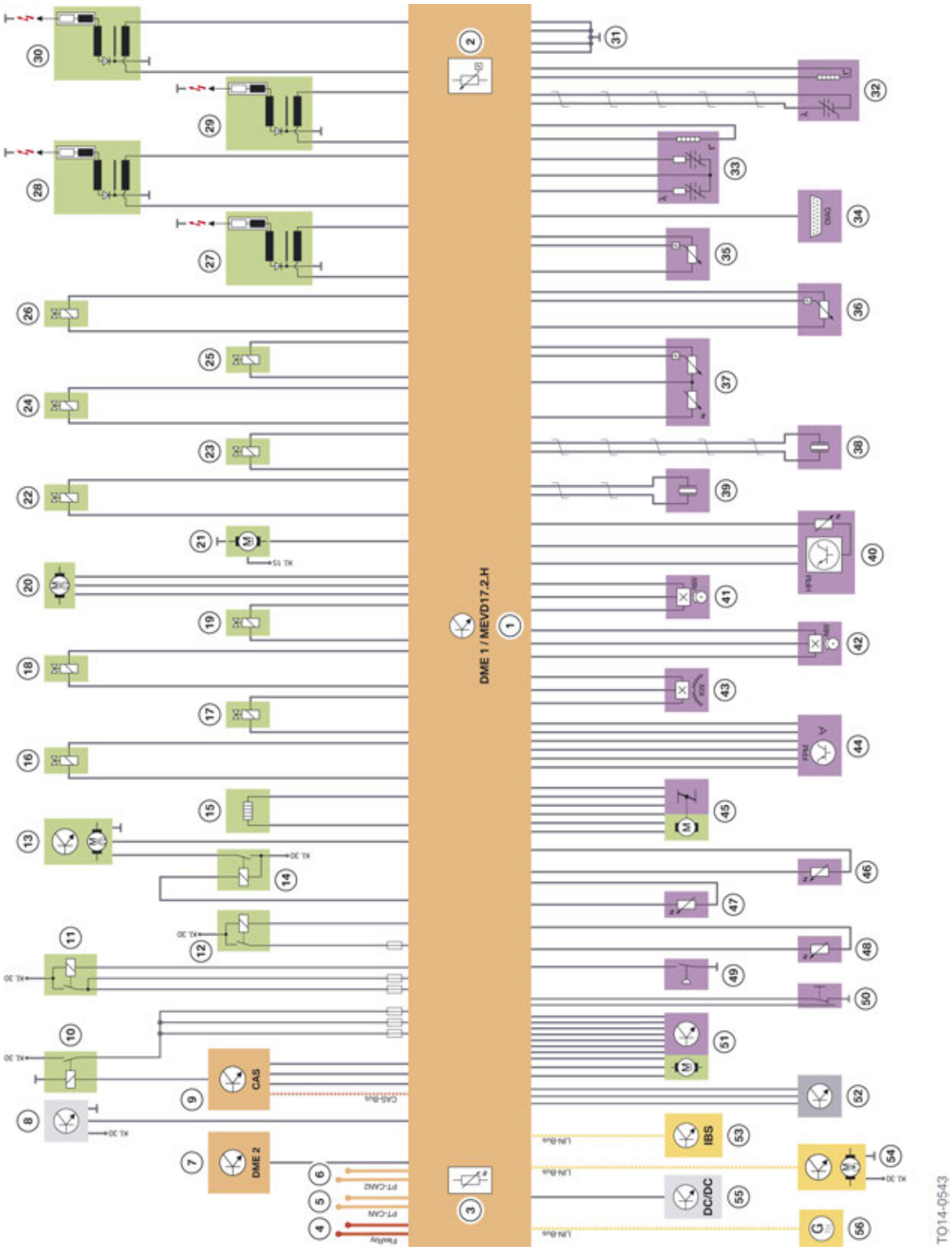
The F85/F86 use a MEVD 17.2.H engine control unit for each cylinder bank.

The two engine control units are identically housed in the F85/F86 in terms of installation position, but are not water-cooled as in the F15/F16 with the MEVD 17.2.8.

F85/F86 Complete Vehicle

4. Engine/Powertrain

DME 1 Main



F85/F86 MEVD 17.2.H Main

F85/F86 Complete Vehicle

4. Engine/Powertrain

Index	Explanation
1	Engine electronics Valvetronic direct fuel injection MEVD 17.2.H DME 1
2	Ambient pressure sensor
3	Temperature sensor
4	FlexRay
5	PT-CAN
6	PT-CAN2
7	Secondary DME 2
8	Tank leak diagnosis, Natural Vacuum Leak Detection NVLD (only US version)
9	Car Access System (CAS)
10	Relay, terminal 15N
11	Relay, terminal 30
12	Relay, terminal 30
13	Electric fan
14	Relay for electric fan
15	Data-map thermostat
16	Electropneumatic pressure converter (EPDW) wastegate 1
17	Tank vent valve 1
18	VANOS solenoid valve, intake camshaft, bank 1
19	VANOS solenoid valve, exhaust camshaft, bank 1
20	Electric coolant pump, exhaust turbocharger
21	Electrical exhaust flap actuator 1
22	Quantity control valve, bank 1
23–26	Injectors 1–4
27–30	Ignition coils 1–4
31	Ground
32	Oxygen sensor LSF 4.2, bank 1
33	Oxygen sensor LSU ADV, bank 1
34	Diagnostic connector
35	Charging pressure sensor before throttle valve, bank 1
36	Rail pressure sensor, bank 1
37	Charge air temperature and intake pipe pressure sensor after throttle valve, bank 1
38	Knock sensor 1–2
39	Knock sensor 3–4
40	Hot film air mass meter HFM 7, bank 1

F85/F86 Complete Vehicle
4. Engine/Powertrain

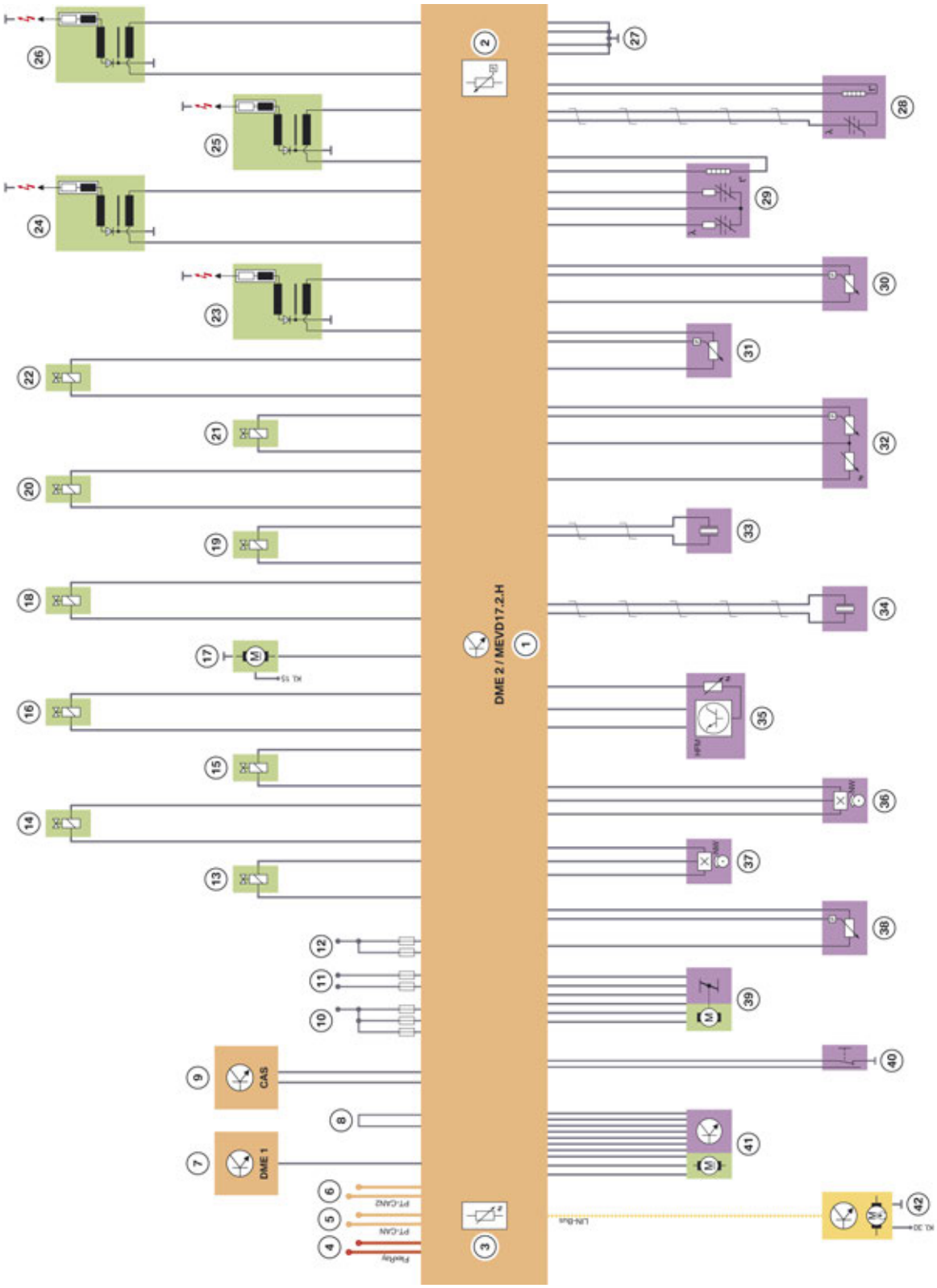
Index	Explanation
41	Camshaft sensor, intake camshaft, bank 1
42	Camshaft sensor, exhaust camshaft, bank 1
43	Crankshaft sensor, signal is looped through to DME slave
44	Accelerator pedal module
45	Throttle valve, bank 1
46	Engine temperature (sensor at housing of coolant pump)
47	Coolant temperature at radiator outlet
48	Oil temperature sensor
49	Oil pressure switch
50	Engine dynamics button
51	Valvetronic servomotor, bank 1
52	Oil level sensor
53	Intelligent battery sensor IBS
54	Electric coolant pump, charge air cooler 1
55	DC/DC converter (for automatic engine start-stop function)
56	Alternator

Engine dynamics control can be configured by the driver via the M Drive menu in the iDrive or the keypad in the center console.

F85/F86 Complete Vehicle

4. Engine/Powertrain

DME 2 Secondary



F85/F86 MEVD 17.2.H Secondary

F85/F86 Complete Vehicle
4. Engine/Powertrain

Index	Explanation
1	Engine electronics Valvetronic direct fuel injection MEVD 17.2.H DME 2
2	Ambient pressure sensor
3	Temperature sensor
4	FlexRay
5	PT-CAN
6	PT-CAN2
7	Primary DME 1
8	DME1/ DME2 encoding
9	Car Access System (CAS)
10	Terminal 15N
11	Terminal 30B
12	Supply with DME 1
13	Tank vent valve 2
14	VANOS solenoid valve, intake camshaft, bank 2
15	VANOS solenoid valve, exhaust camshaft, bank 2
16	Electropneumatic pressure converter (EPDW) wastegate 2
17	Electrical exhaust flap actuator 2
18	Quantity control valve, bank 2
19–22	Injectors 5–8
23–26	Ignition coils 5–8
27	Ground
28	Oxygen sensor LSF 4.2, bank 2
29	Oxygen sensor LSU ADV, bank 2
30	Charging pressure sensor before throttle valve, bank 2
31	Rail pressure sensor, bank 2
32	Charge air temperature and intake pipe pressure sensor after throttle valve, bank 2
33	Knock sensor 5–6
34	Knock sensor 7–8
35	Hot film air mass meter HFM 7, bank 2
36	Camshaft sensor, intake camshaft, bank 2
37	Camshaft sensor, exhaust camshaft, bank 2
38	Fuel low-pressure sensor

Index	Explanation
39	Throttle valve, bank 2
40	M Servotronic button
41	Valvetronic servomotor, bank 2
42	Electric coolant pump, charge air cooler 2

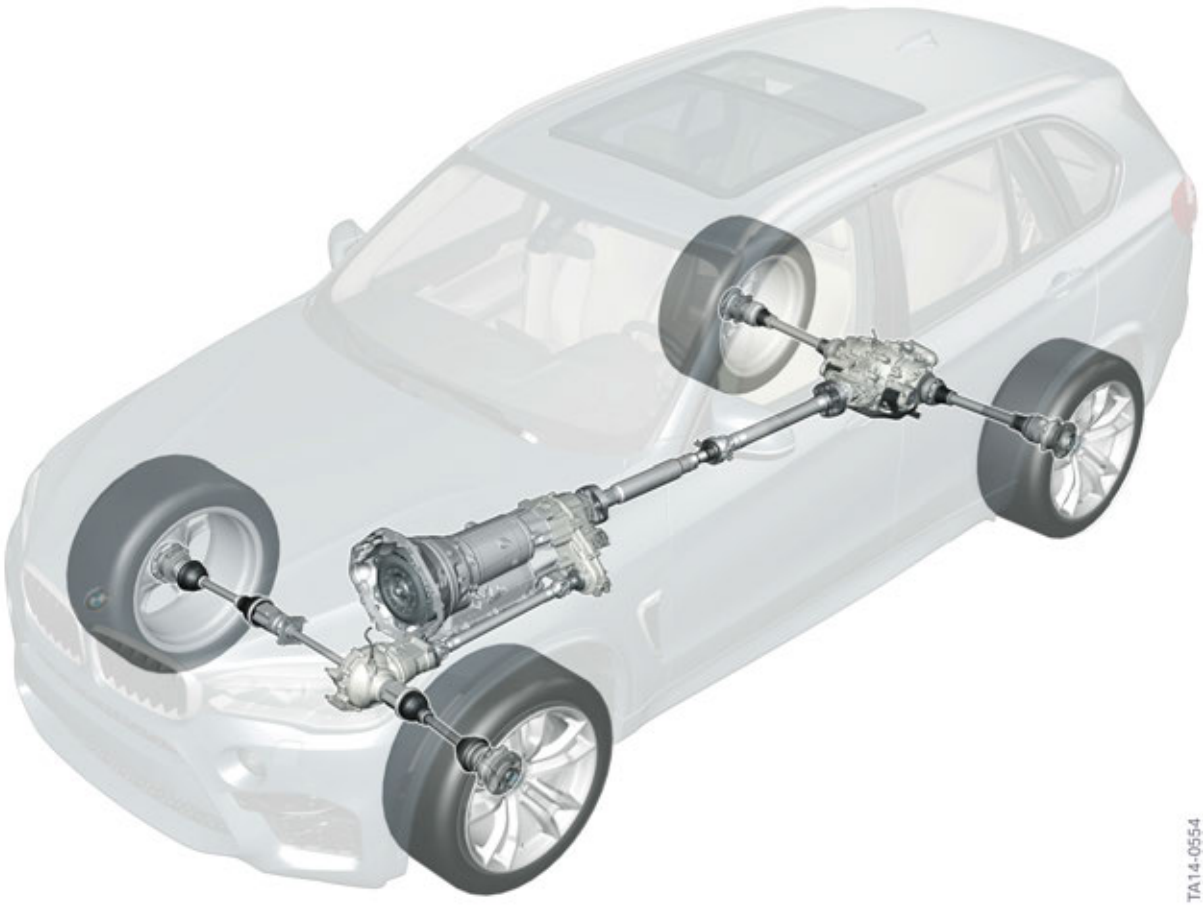
M Servotronic can be configured by the driver via the M Drive menu in the iDrive or the keypad in the center console.

4.1.13. 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 (pre-delivery check) on the F85/F86 with the S63B44T2 engine.

4.2. Power transmission



F85/F86 powertrain

F85/F86 Complete Vehicle
4. Engine/Powertrain

4.2.1. M automatic transmission

The F85/F86 uses a M automatic transmission with Drivelogic with the designation GM8HP75Z. It is called M8HP75 in the following.

With the M Sport automatic transmission M8HP75, which is based on the 8HPTU of BMW AG, the customer is able to enjoy significantly more spontaneous gearshifts and further optimized control of the converter lockup clutch.

This has been made possible by the further development of converter technology to effectively damp rotational irregularities in the drivetrain with a turbine torsional vibration damper. In this way it has been possible to reduce even further the operating ranges in which the converter lockup clutch has to be controlled with the result that the converter lockup clutch is closed in the vast majority of driving situations. This provides for an even more direct connection of the M8HP75 transmission to the complete drivetrain, resulting in an even sportier driving experience and reduced fuel consumption.

The power transmission capability of the torque converter has been adapted to the increased torque of the S63B44T2 engine.

In the F85/F86 the **“Idle coasting”** feature known from the non Motorsport vehicles is not used. However, the M8HP75 supports, the **“ConnectedShift”** function which is used in the BMW AG vehicles.

Transmission ratios, comparison E70 M/E71 M-F85/F86

	E70 M / E71 M	F85/F86
Transmission designation	6HP26S	M8HP75
Spread	6.0	7.8
Maximum engine speed [rpm]	6800	7200
Torque [Nm]	680	760
Ratio [:1] 1st gear	4.171	5.000
Ratio [:1] 2nd gear	2.340	3.200
Ratio [:1] 3rd gear	1.521	2.143
Ratio [:1] 4th gear	1.143	1.720
Ratio [:1] 5th gear	0.867	1.313
Ratio [:1] 6th gear	0.691	1.000
Ratio [:1] 7th gear		0.823
Ratio [:1] 8th gear		0.640
Ratio [:1] reverse gear	3.403	3.478

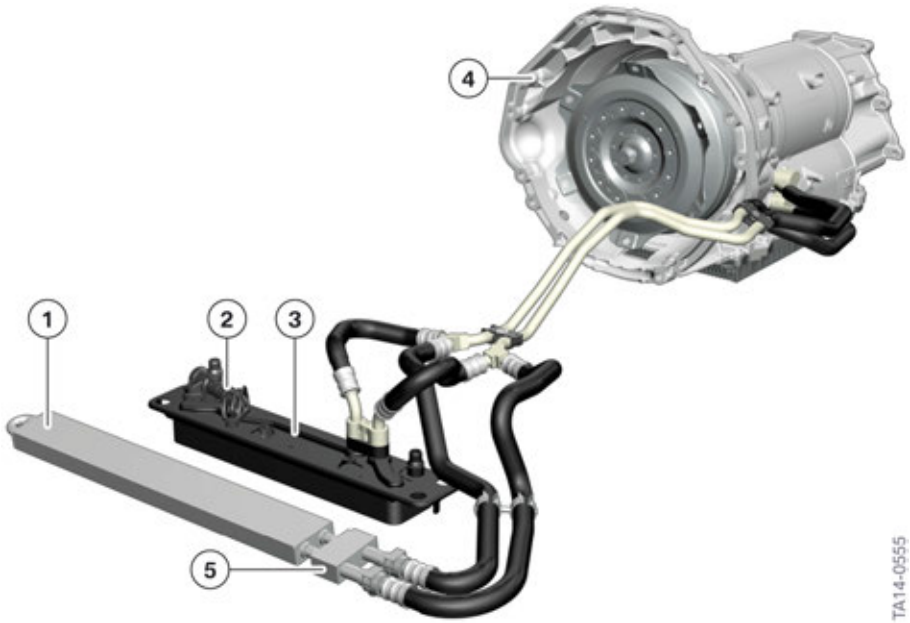
F85/F86 Complete Vehicle

4. Engine/Powertrain

Transmission oil cooling

The plastic transmission oil sump has been replaced by an aluminium version with larger cooling fins and the opening point of the transmission oil thermostats has been lowered, improving the cooling of the M8HP75 transmission.

An additional transmission oil cooler with thermostat is used as well as the standard oil-to-water heat exchanger with thermostat to cool the M8HP75 in F85/F86. This additional transmission oil cooler, which is designed as a plate heat exchanger, operates according to the oil-to-air heat exchanger principle and is installed horizontally in front of the radiator assembly.



F85/F86 transmission oil cooling

Index	Explanation
1	Additional transmission oil cooler (oil-to-air heat exchanger principle)
2	Thermostat
3	Transmission oil cooler (oil-to-water heat exchanger)
4	M automatic transmission
5	Thermostat

The cross-sections of the outer lines and hoses carrying transmission oil to the additional transmission oil cooler (oil-to-air heat exchanger principle) and transmission oil cooler have been optimized. This results in a greater oil flow rate, translating into more efficient cooling of the M automatic transmission.

The thermostat of the transmission oil cooler (oil-to-water heat exchanger) opens at 86° C /186° F and that of the additional transmission oil cooler (oil-to-air heat exchanger principle) at 92° C / 197° F. Both transmission oil coolers are fully open at 104° C / 219° F.

F85/F86 Complete Vehicle

4. Engine/Powertrain

Gear selector lever

The M automatic transmission is operated using the M gear selector lever (M GWS) or the gearshift paddles on the steering wheel.

The BMW X5 M and BMW X6 M does not use a gear selector lever as seen in a BMW automatic transmission; instead, it uses the gear selector lever of the M double-clutch transmission as seen in BMW M vehicles. This means that the M gear selector levers have a uniform appearance, regardless of whether the BMW M vehicle in question is equipped with an M double-clutch transmission or an M automatic transmission.

M GWS/M gear selector lever

A button for engaging the parking lock as featured on the gear selector lever of the automatic transmission is omitted. The parking lock is automatically engaged as in the M double-clutch transmission. The transmission stage “Park P” is selected as in the logic familiar from M double-clutch transmissions.

It is possible to choose and change between an automatic **“D mode”** and a sequential **“S mode”**. In each mode there are three driving programs, which can be selected and activated with the **“Drivelogic switch”**.

F85/F86 Complete Vehicle
4. Engine/Powertrain

Drivelogic

The number of driving programs is the same as in F1x M, F80, F82, F83 and F06 M6 vehicles.
The haptics of the Drivelogic switch have been altered, as already seen in the F80, F82, F83. A rocker was installed for the E9x M3 and for F1x M vehicles, while in the new F85/F86 a normal pressure switch is used for clicking through.

After each change between Sequential mode and Drive mode the last selected driving program is active.

After each engine start driving program 1 is active in Drive mode.

D mode/Drive mode

Automated mode, all the forward gears are automatically shifted. Kickdown is triggered by depressing the accelerator pedal beyond the pressure point.

Three driving programs are available for selection:

1: Efficient drive

2: Relaxed drive

3: Sporty drive

S mode/Sequential mode

The gears can be manually shifted by means of gearshift paddles on the steering wheel **"+** or **–"** or the gear selector lever **"forward** and **back"** at the matching driving speed and engine revs. The selected gear is maintained even when the engine speed limitation is reached, but an automatic downshift is performed when the vehicle drops below the gear-specific minimum driving speed.

When the S mode is selected for the first time after terminal change (engine restart), the last Drivelogic stage used is active.

Three driving programs are also available here for selection:

1: Comfortable, smooth gearshifts in all driving conditions.

2: Sporty, fast gearshifts, light gearshift jolts permitted at higher load and engine revs.

3: Maximum sporty shift speed and gearshifts are the requirement for the activation of Launch Control.

To use the highest, i.e. the third driving program, the DSC does not have to be activated.

M automatic transmission behavior when creeping

The **"Creep on request"** function familiar from M double-clutch transmissions is effected for the first time in conjunction with a torque converter transmission.

- When the service brake or parking brake is released with a drive position selected, there is no **"Creeping"** in the M automatic transmission (rolling possible).
- **"Creep on request"** can be triggered by briefly depressing the accelerator pedal. This request is cancelled again only after the vehicle has come to a standstill again.
- The Automatic Hold functions are maintained as on the F15/F16.

Launch Control

Function: Launch Control enables optimal acceleration when driving off on a dry roadway.

Sequence	Precondition/Action
1.	The vehicle must be stationary, the engine running and at operating temperature (approx. 10 km / 6 mile warm-up journey).
2.	Dynamic Stability Control is deactivated or M Dynamic Mode is activated.
3.	The Sequential mode and the third Drivelogic driving program are selected.
4.	The brake pedal is gently pressed with the left foot and held.
5.	The accelerator pedal is depressed fully and held in this position.
6.	In the M instrument cluster a flag symbol must appear (if not, check notes and steps 1-5).
7.	An optimum engine speed for pulling away is adjusted.
8.	The left foot is taken off the brake within 5 seconds.

F85/F86 Launch Control active

Effect

- Launch Control automatically shifts up using the shortest possible gearshift times and performance-optimized shift points as long as the driver keeps the accelerator pedal fully depressed.
- The start flag in the instrument cluster remains active.

A renewed Launch Control start is possible as long as the transmission oil temperature satisfies the preconditions for this.

Automatic deactivation

- The driver leaves (even if only briefly) the accelerator pedal full-load range during acceleration.

A manual intervention in the automatic upshift, for example via the gearshift paddles on the steering wheel or the gear selector lever, does not interrupt the Launch Control process.

If one of these preheating/precooling conditions is breached, 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.

Premature wear occurs as a result of the high load of the vehicle with use of the launch control.

A mechanical emergency transmission release is available and can only be accessed under the vehicle. An electronic emergency transmission release is also implemented as in automatic transmissions of non Motorsport vehicles. For towing instructions, please observe the information in the Owner's Handbook of the vehicle.

4.2.2. Axle drive and transfer box

Front axle differential

The front axle differential VAG178AL known from the F15/F16 is used.

For further information on the front axle differential, please refer to the Technical Training Manual “F15 Complete Vehicle”.

Transfer box

The ATC45L as known from the F15/F16 is used as the transfer box. Design measures for increasing rigidity and strength have been incorporated into the ATC45L in order to satisfy the higher torque requirement in the F85/F86. The output flange on the transfer box has been adapted to the altered flange dimensions of the drive shaft.

For further information on the transfer box, please refer to the Technical Training Manual on the F15 Complete Vehicle and F25 LCI/F26 Complete Vehicle.

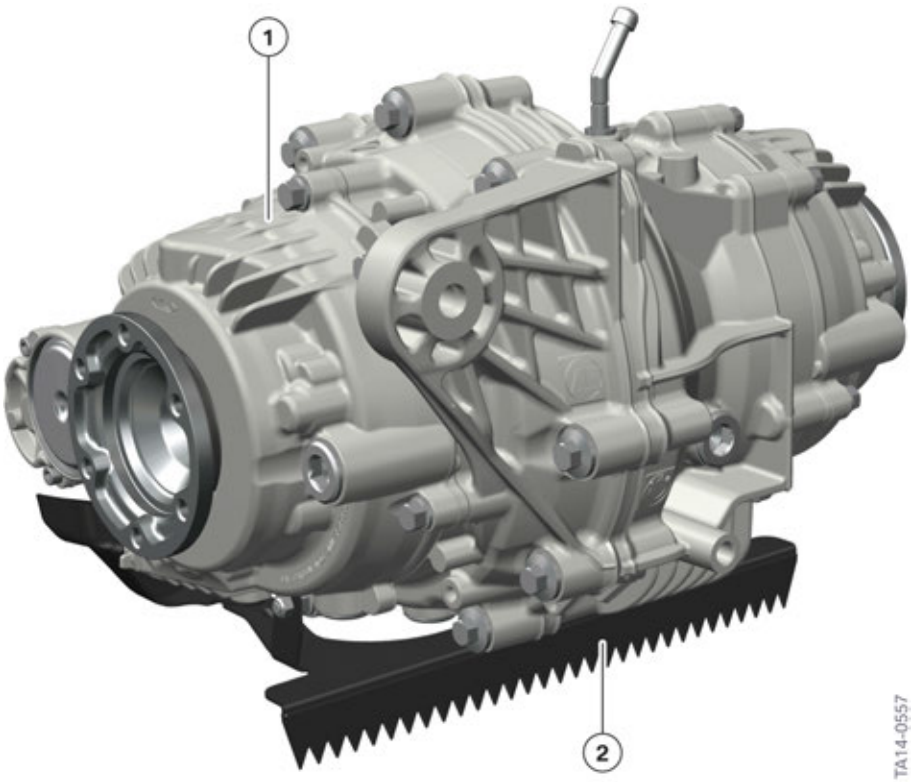
F85/F86 Complete Vehicle

4. Engine/Powertrain

Rear axle differential (final drive unit)

The HAG 225 QMV rear axle differential in conjunction with Dynamic Performance Control, also used as optional equipment in the F15/F16, are used in the F85/F86.

The gear ratio of the HAG 225 QMVH is 3.15.



F85/F86 Dynamic Performance Control (QMVH)

Index	Explanation
1	Dynamic Performance Control, rear axle differential (QMVH)
2	Air guide

An air guide for increasing cooling power is mounted on the QMVH rear axle housing.

The output flanges of the rear axle differential have been adapted to the dimensions of the output shaft flexible joints.

For further information on the rear axle differential, please refer to the Technical Training Manual “F15 Complete Vehicle”.

4.2.3. Flexible disc, Drive shaft and output shafts

Flexible disc

The flexible disc has been adapted to the increased power level for the F85/F86. The flexible disc is, in contrast to the F15/F16, 14 mm wider and now measures 44 mm in width. The flexible disc in the F85/F86 has increased in diameter to 110 mm, likewise corresponding to 14 mm in comparison with the F15/F16.

Drive shaft

The drive shaft of the F85/F86 is a steel shaft, the heaviest and most stable drive shaft that has ever been used on a BMW or BMW M vehicle. The drive shaft, the center mount, the flange on the flexible disc to the transfer box and the flange on the rear axle differential have been adapted in terms of design and strength to the enormous power of the F85/F86. The flexible disc to the transfer box and to the rear axle differential is a common part in terms of design.

The bolt connections of the drive shaft to the transfer box through the flexible disc have been adapted in terms of their larger-diameter to accommodate the larger-dimensioned flexible disc.

Drive shaft, front

The drive shaft (front) is a common part for the F15/F16 and therefore corresponds in its dimensions and design to the drive shaft (front) known from the F15 and F16.

Output shafts, rear

The flexible joints of the output shafts have been adapted in terms of design and strength to the higher power in the F85/F86.

Drive flanges, rear

The drive flanges (rear) have been adapted to the F85/F86 and have additional retaining pins for accommodating the M compound brake discs.

Output shaft, front

The output shafts (front) are a common part of the output shafts known from the F15 and F16.

Wheel bearings, front

The wheel bearings (front) have been adapted to the F85/F86 and have additional retaining pins for accommodating the M compound brake discs.

4.2.4. Service information

Transmission oil circuit

For work required on the oil circuit of the automatic transmission, for example after an accident, or if the oil circuit has to be opened due to a repair, there must be maximum cleanliness. This includes:

- Optimal cleaning of the outer oil circuit areas before disassembly of the components or opening the oil circuit.
- Immediate closure of openings and lines after disassembly without delay and using clean original plugs. Do not use unsealed components or replacement parts of the oil circuit without checking for cleanliness and where possible competent repair.
- The workbay in which an automatic transmission is opened must be extremely clean and secured against dirt contamination, also during work interruptions. For example by sufficiently clean and lint-free cover.

Lifetime oil filling

Currently, as with the E7x M with automatic transmission, for the F85/F86 with M automatic transmission a transmission oil change is **not** required at 2000 km / 1200 miles (pre-delivery check) or with every third engine oil change.

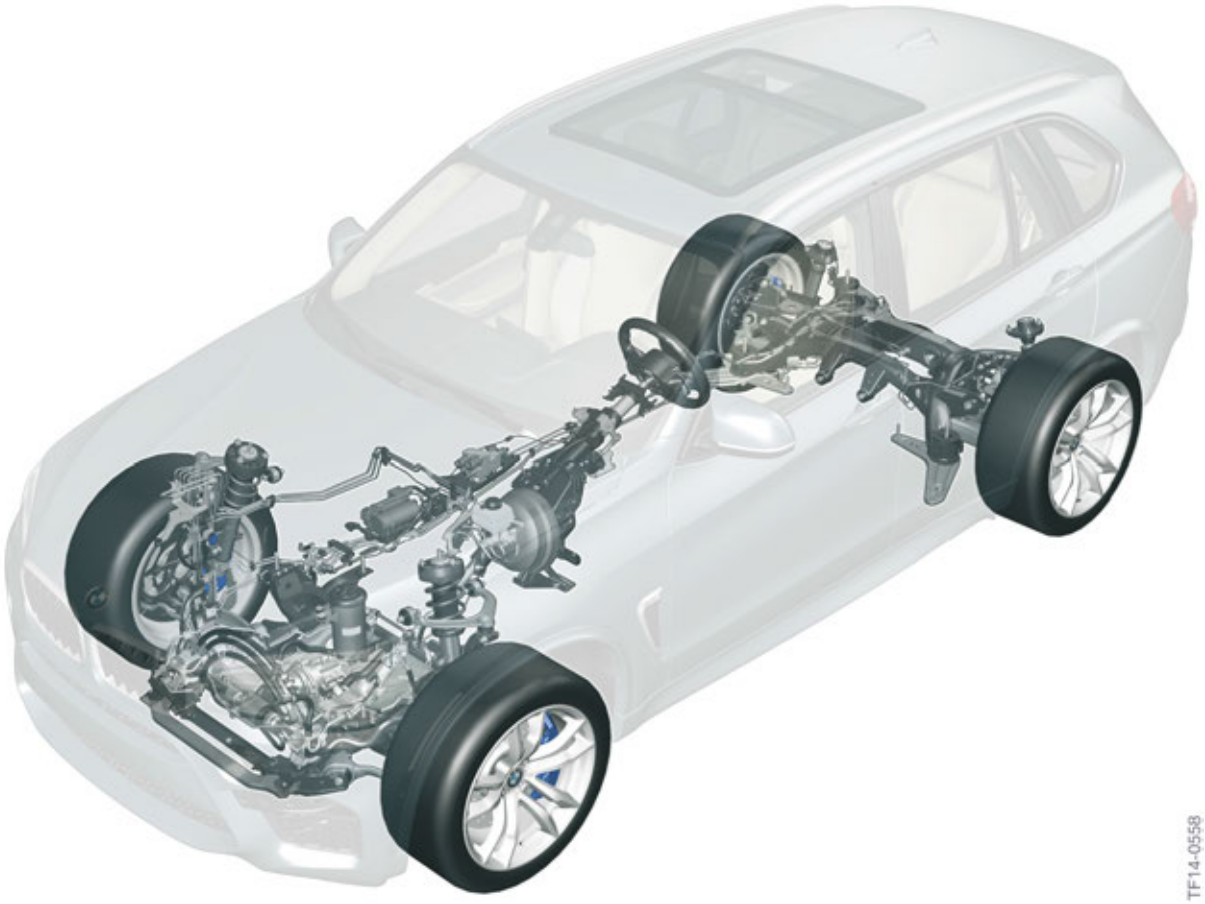
Rear axle differential (final drive unit)

Both F85/F86 vehicles are equipped with Dynamic Performance Control as standard equipment. A rear axle differential oil change **is** required at 2000 km / 1200 miles (running in check) and at every fifth engine oil change (at approximately each 50,000 miles). **Note:** There are three drain plugs on the rear differential. However only the oil in the center section of the QMVH needs to be changed as the two outer sections of the differential are filled with long-term rated oil.

During the oil change, after allowing the oil to fully drip out of the center section, fill with SAF-XO oil (ETK # 33 11 7 695 240) and pour 0.95 liters (exactly 1.0 qt). DO NOT FILL TO THE LOWER EDGE OF THE FILLING HOLE!

F85/F86 Complete Vehicle

5. Chassis/Driving Dynamics Systems



F85/F86 chassis and suspension

5.1. Axles

5.1.1. Front axle

The double-wishbone front axle known from the F15/F16 is used as the front axle. The front axle has been lowered by 10 mm in comparison with the standard suspension on the F85/F86. The upper A-arm has been adapted by a repair wishbone from the F15/F16 spare parts range in order to achieve the M-specific greater camber values for a sportier suspension setting. The rubber mounts for connecting to the front axle support of the lower wishbone and the tension strut have been matched for the F85/F86. The spring strut has been adapted by a separate damper variant together with the coil spring to the F85/F86 and bolted at the top by a newly dimensioned support bearing in the dome; in addition, the auxiliary damper, installed between the shock absorber and the support bearing on the piston rod, has been adapted. For further information on the double-wishbone front axle, please refer to the Technical Training Manual “F15 Complete Vehicle”.

5.1.2. Steering

Within the framework of the EfficientDynamics measures for the F85/F86, the steering used is a rack-and-pinion steering with electrical steering wheel support “M Servotronic based on an EPS”.

F85/F86 Complete Vehicle

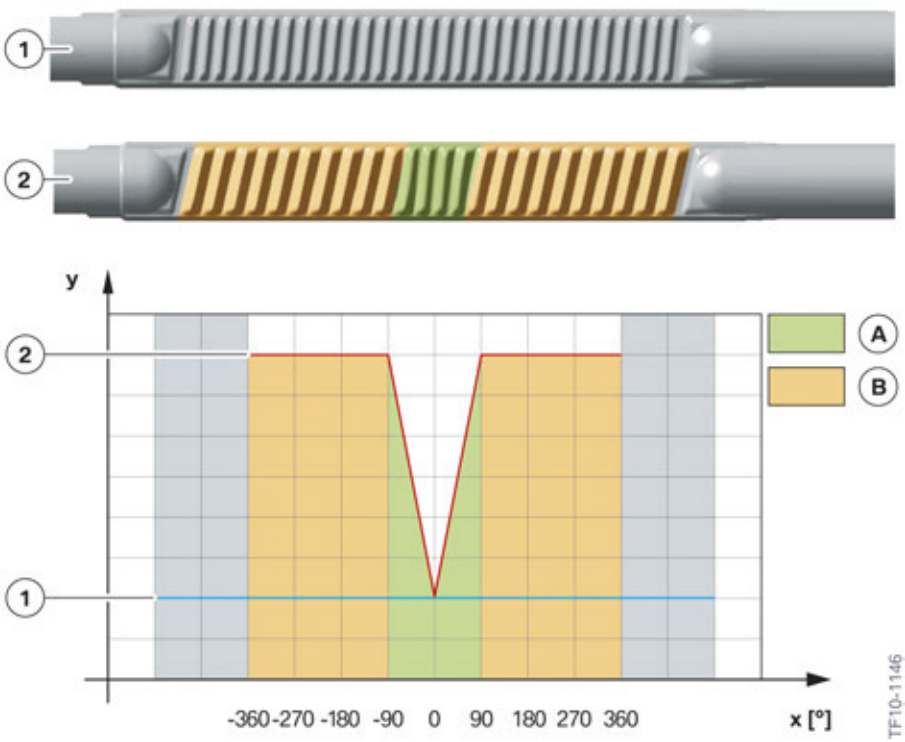
5. Chassis/Driving Dynamics Systems

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

As components of M Servotronic (EPS) the ratio of the rack has been specifically adapted for the F85/F86. 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

The ratio of M Servotronic (EPS) has been adapted to the F85/F86; of particular note is the fact after an eighth of a turn of the steering wheel the rack ratio increases by 8 %.



F85/F86 Comparison of steering gear ratio, M Servotronic (EPS) steering

Index	Explanation
1	Rack, basic version F15/F16 (constant gear geometry)
2	Rack, variable sport steering F85/F86 (variable gear geometry)
A	More indirect steering gear ratio (variable sport steering)
B	More direct steering gear ratio (variable sport steering)
X	Steering wheel angle
y	Rack travel

With the use of the M Servotronic (EPS) in the new F85/F86 the parking assistance system “Parking Manoeuvring Assistant” (option SA 5DP) is now also offered.

The system supplier of M Servotronic (EPS) is ThyssenKrupp.

M Servotronic (EPS) can be configured by the driver via the M Drive menu in the iDrive or the keypad in the center console.

For further information on EPS, please refer to the Technical Training Manual “F15 Complete Vehicle”.

5.1.3. Rear axle

The Integral IV rear axle known from the F15/F16 is used as the rear axle. The rear axle has been lowered by 10 mm in comparison with the standard suspension on the F85/F86. The rear axle support of the F85/F86 is however supported by the incorporation of Cellasto discs at the top and bottom of the bolting points of the rear axle bearings. The incorporation of Cellasto discs prevents the rear axle support from tilting at the rear axle support bearings in the event of a marked load reversal. The rear axle support bearings have been adapted in terms of a harder design to the F85/F86. The shock absorbers have been adapted by a separate damper variant to the F85/F86 and are bolted at the top with a newly dimensioned support bearing; in addition, the auxiliary damper, installed between the shock absorber and the support bearing on the piston rod, has been adapted. The U-type bellows on the rear axle have been adapted by modified roll pistons to the F85/F86. For further information on the Integral IV rear axle, please refer to the Technical Training Manual “F15 Complete Vehicle”.

5.2. Brakes, wheels and tires

5.2.1. Brakes

M compound brake

Designation	Unit	E7x M	F85/F86
Front brake		4 pistons, fixed caliper	6 pistons, fixed caliper
Brake disc, front	[mm]	395 x 36	395 x 36
Design, brake disc, front		Internally ventilated cast brake disc, unperforated	Internally ventilated M compound brake disc, perforated
Rear brakes		1 piston, floating caliper	1 piston, floating caliper
Brake disc, rear	[mm]	385 x 24	385 x 24
Design, brake disc, rear		Internally ventilated cast brake disc, unperforated	Internally ventilated M compound brake disc, perforated
Parking brake		electro-mechanical	electro-mechanical

The front brake is completely F85/F86-specific. It is a large perforated and ventilated M compound brake disc combined with a four-piston fixed caliper. The use of the six-piston brake caliper has increased the friction surface of the individual brake pads by 30 % compared with the E7x M. This measure has positively influenced the braking power and reduce the fading properties compared with the E7x M.

Compared with the E7x M, the brake disc has the same dimensions, but the friction ring thicknesses and cooling ducts of the brake discs have been M-specifically optimized.

All front brake calipers are blue with a colored M logo.

F85/F86 front brake

The rear perforated and ventilated M compound brake disc has the same dimensions as the E7x M. The rear brake caliper is a single-piston fixed caliper and has been adopted from the production F15/F16.

The rear brake calipers are blue.

M carbon ceramic brakes

M carbon ceramics brakes are not offered.

F85/F86 Complete Vehicle

5. Chassis/Driving Dynamics Systems

5.2.2. Wheels/tires

Summer equipment

F85/F86 summer wheels

Index	Explanation
A	20" 611M no charge wheel option
B	21" 612M standard equipment wheel

The following wheel/tire combinations are offered:

Standard equipment

Designation	E7x M	F85/F86
LM EH2 wheel rim standard wheel front	10J x 20 IS40 299M/300M	10J x 21 IS40 Styling 612M
LM EH2 wheel rim standard wheel rear	11J x 20 IS35 299M/300M	11.5J x 21 IS38 Styling 612M
Standard tire front	275/40 R20	285/35 R21
Standard tire rear	315/35 R20	325/30 R21

No charge optional equipment

Designation	F85/F86
LM EH2 wheel rim, front (forged) styling 611M	10J x 20 IS40
LM EH2 wheel rim, rear (forged) styling 611M	11.5J x 20 IS38
Tires, front	285/40 R20
Tires, rear	325/35 R20

Winter equipment

Designation	E7x M	F85/F86
EH2 Wheel rim front/rear axle (cast) front/ rear	9J x 19 IS37/9J x 19 IS18 Styling 298M	10J x 20 IS40/10J x 20 IS32 Styling 611M
Tire	255/50 R19	285/40 R20 M+S

Tires: Non-Runflat

Tires without run-flat technology are used on the F85/F86. So-called UHP tires (Ultra-High-Performance tires) without run-flat properties are used. Tires without run-flat properties are softer in the sidewall area and afford the handling and comfort benefits that are wanted in a BMW M vehicle.

The components of the above-listed wheel/tire combinations have been developed specially for the F85/F86. This can be recognized by the star on the outer side of the tire, among other things.

Other combinations may have a negative effect on the performance and the driveability of the F85/ F86.

5.3. Driving dynamics systems

The F85/F86 is equipped as standard with Vertical Dynamics Management (VDM and Dynamic Drive) and Integrated Chassis Management (Dynamic Performance Control and M Servotronic).

Active steering is not offered in the F85/F86. Both vehicles have a M Servotronic system based on electromechanical power steering (EPS) with a more direct, variable steering gear ratio.

All Vertical Dynamics Management system have been M-specifically coordinated.

The M-specific coordination of the driving dynamics (longitudinal, transverse and vertical) was effected on the Nürburgring Nordschleife. The main criteria were handling and the lap times.

5.3.1. Vertical Dynamics Management

Dynamic Drive

Active Roll Stabilization (ARS - Dynamic Drive), as known from the F15/F16 basic vehicles, is used on the F85/F86.

The anti-roll bars and the front and rear axles are separated and can be connected together using a hydraulic swivel motor. Dynamic Drive can very quickly generate a torque at the anti-roll bars in order to stabilize the vehicle. For straight-ahead driving the two halves of the anti-roll bars are disconnected.

The settings of Active Roll Stabilization (ARS) are coupled to VDM-EDC:

- VDM **Comfort** = ARS **Comfort**
- VDM **Sport** = ARS **Comfort**
- VDM **Sport+** = ARS **Sport**

F85/F86 Complete Vehicle
5. Chassis/Driving Dynamics Systems

For further information on Dynamic Drive, please refer to the Technical Training Manual “F15 Complete Vehicle”.

VDM

Vertical Dynamics Management (VDM), as known from the F15/F16 basic vehicle, is used on the F85/F86.

VDM is an electronic damper control system (EDC) for controlling vertical dynamics. The VDM control unit calculates individual control commands for the electromagnetic valves in the shock absorber, based on the information input about:

- the body and wheel acceleration
- current lateral and longitudinal acceleration
- driving speed
- and the steering wheel position.

Based on this measured data, the VDM control unit calculates the control commands to be sent to the electromagnetic valves in the shock absorbers for each individual wheel according to the road profile and driving situation. This means that the damping forces will always be applied according to requirements.

VDM can be configured by the driver via the M Drive menu in the iDrive or the keypad in the center console.

For further information on VDM, please refer to the Technical Training Manual “F15 Complete Vehicle”.

Electronic ride height control (EHC)

Electronic ride height control (EHC), as featured in the F15/F16 basic vehicles, is used in the F85/F86.

In order to be able to maintain the ride comfort, the ground clearance and the spring travel independent of the vehicle load or trailer load, a self-levelling suspension can be used on the rear axle.

For further information on EHC, please refer to the Technical Training Manual “F15 Complete Vehicle”.

5.3.2. Transverse dynamics management

Integrated Chassis Management ICM

Integrated Chassis Management (ICM) is the transverse dynamics system network. This control unit coordinates the interaction between M Servotronic (EPS), DSC, VDM, engine control and Dynamic Performance Control.

Dynamic Performance Control (QMVH)

Dynamic Performance Control is the further development of the intelligent four-wheel drive xDrive. To date, the drive torque could only be distributed between front and rear axle. Dynamic Performance Control now also allows a distribution of the drive torque at the rear axle. The familiar rear axle differential is extended with two variable ratio transmissions, each comprising a double planetary gear and an electric multiple disc brake. The system is already known from the E71.

The settings of Dynamic Performance Control are coupled to longitudinal dynamics management:

- DSC **On** = QMVH **Comfort**
- DSC **MDM** = QMVH **Sport**
- DSC **Off** = QMVH **Sport**

For further information on Dynamic Performance Control, please refer to the Technical Training Manual “F15 Complete Vehicle” and “E71 Complete Vehicle”.

5.3.3. Longitudinal dynamics management

Longitudinal dynamics management is performed by DSC.

DSC 9+ from Bosch, as featured in the F15/F16 production vehicles, is used in the F85/F86.

DSC 9+ has been M-specifically coordinated to match the M compound brake system. Furthermore, DSC 9+ has been integrated into the M Dynamic Mode (MDM). Further adaptations have been made to coordinate DSC 9+ with Dynamic Performance Control and the M8HP automatic transmission.

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 driveability.

The “DSC” driving dynamics button or the configuration in the M Drive menu is used to switch between DSC ON, MDM and DSC OFF. The button obtains ground from ICM and sends back a ground signal on actuation to ICM. ICM forwards this information on the FlexRay data bus to DSC.

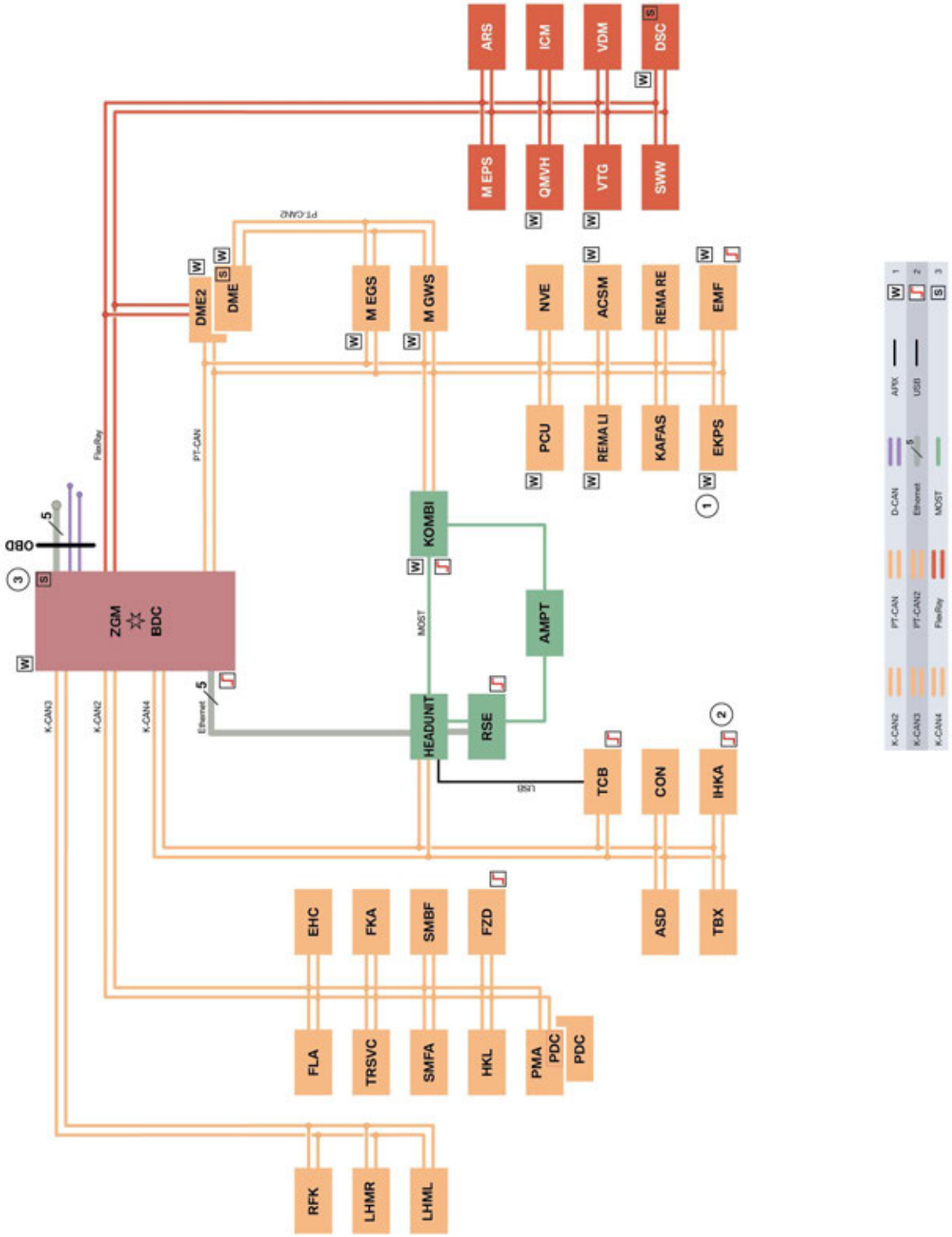
Longitudinal dynamics can be configured by the driver via the M Drive menu in the iDrive or the keypad in the center console.

For further information on longitudinal dynamics management, please refer to the Technical Training Manual “F15 Complete Vehicle”.

F85/F86 Complete Vehicle

6. Vehicle Electr. Syst/On-board Info

6.1. F85/F86 vehicle electrical system



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F85/F86 bus overview

F85/F86 Complete Vehicle

6. Vehicle Electr. Syst/On-board Info

Index	Explanation
1	Control unit with wake-up line
2	Control unit authorised to perform wake-up function
3	Start-up node control units for starting and synchronizing the FlexRay bus system
ACSM	Advanced Crash Safety Module (ACSM)
AHM	Trailer module
AMPT	Top HiFi amplifier
ASD	Active Sound Design
CID	Central Information Display
CON	Controller
D-CAN	Diagnosis-on-Controller Area Network
DME	Digital Motor Electronics
DME 2	Digital Engine Electronics 2
DSC	Dynamic Stability Control
EHC	Electronic ride height control
EKPS	Electronic fuel pump control
EMF	Electromechanical parking brake
Ethernet	Cable-based data network technology for local data networks
FLA	High-beam assistant
FKA	Automatic rear air-conditioning system
FlexRay	Fast, preset and fault-tolerant bus system for use in automotive sector
FZD	Roof function center
GZAR	Right-hand targeted illumination (not US)
GZAL	Left-hand targeted illumination (not US)
HEADUNIT	Headunit High
HKL	Automatic operation of tailgate
HUD	Head-Up Display
ICM	Integrated Chassis Management
IHKA	Integrated automatic heating / air conditioning
K-CAN2	Body controller area network 2
K-CAN3	Body Controller Area Network 3
K-CAN4	Body controller area network 4
KAFAS	Camera-based driver support systems
KOMBI	Instrument cluster (Media Oriented System Transport connection not in basic equipment)
LHMR	LED main light module on the right

F85/F86 Complete Vehicle
6. Vehicle Electr. Syst/On-board Info

Index	Explanation
LHML	LED main light module on the left
M EGS	M electronic transmission control
M EPS	M Servotronic (EPS)
M GWS	M gear selector lever
MOST	Media Oriented System Transport bus
NVE	Night Vision Electronics
OBD	On-board diagnosis
PCU	Power Control Unit
PDC	Park Distance Control (with option SA 5DP, Parking Manoeuvring Assistant: integrated in the Parking Manoeuvring Assistant control unit, otherwise integrated in the Rear Electronic Module [REM] control unit)
PMA	Parking manoeuvring assistant
PT-CAN	Powertrain controller area network
PT-CAN 2CAN2	Powertrain controller area network 2
QMVH	Rear axle lateral torque distribution
REMAFA	Reversible electric-driven reel, left
REMABF	Reversible electric-driven reel, right
RFK	Reversing camera
RSE	Rear Seat Entertainment system
SMFA	Seat module, driver
SMBF	Seat module, passenger
SWW	Lane change warning
TBX	Touchbox
TCB	Telematic Communication Box
TRSVC	Top rear side view camera
VM	Video Module (not US)
VTG	Transfer box
VDM	Vertical Dynamics Management

The following deviations exist in comparison with the standard F15/F16:

PT-CAN
The S63B44T2 engine exclusively has the DME variant MEVD17.2.H in a master-slave connection. In place of the electronic transmission control (EGS) the M automatic transmission with Drivelogic (M EGS) is used and instead of the gear selector lever (GWS) the M gear selector lever (M GWS) with Drivelogic button is used. The SCR control unit is omitted.

FlexRay
The electromechanical power steering (EPS) is omitted, with M Servotronic (EPS) being used instead.

F85/F86 Complete Vehicle
6. Vehicle Electr. Syst/On-board Info

K-CAN
There is no difference from the current F15/F16 vehicle electrical system.

MOST
There is no difference from the current F15/F16 vehicle electrical system.

6.2. On-board information

6.2.1. M instrument cluster

The M instrument cluster of the F85/F86 is based on the instrument cluster from the F1x M5/M6. The respective scales of the instrument cluster are market- and vehicle-specific.

The following M-specific changes exist in comparison with the F15/F16:

Round instruments:

- Speed and engine speed display correspond to the drive concept (330 km/h / 200 mph, 8000 rpm)
- Typical M red needle, lighting of the dial in white (also during the day without driving light), M inscription.

F85/F86 Complete Vehicle
6. Vehicle Electr. Syst/On-board Info

M-specific displays:

- MDM M dynamic mode symbol in place of the DTC
- M1 = M Drive1
- M2 = M Drive2
- Display of gear
- Display of Drivelogic (bar symbol such as a button)
- Display of system status: engine dynamics, damper control and M Servotronic.

In the instrument cluster the current configuration of the engine dynamics, damper control and M Servotronic systems is shown in the bottom part of the rev counter field. This function can be activated under “Settings” in the Configuration menu display.

F85/F85 M Drive menu

The confirmation of the M Drive settings for DSC and transmission is also effected centrally in the instrument cluster.

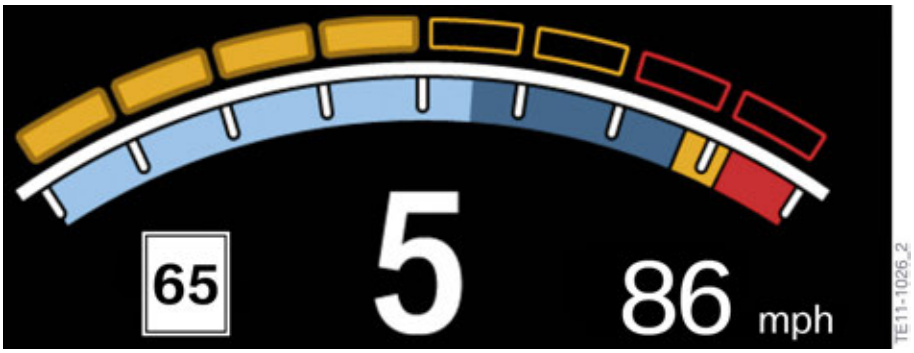
For setting/adjustment work in the engine dynamics, EDC and M Servotronic systems the response of the button activation is also effected as a list in the instrument cluster.

6.2.2. M Head-Up display (option SA 610)

The optional color head-up display, depending on the national-market version, can switch to the M-specific display.

The following information/parameters can be shown:

- Shift point indicator by Shift light function
- Engine speed over rev counter range
- Transmission shift level
- Vehicle speed
- Speed limit info (option SA 8TH)
- No-overtaking indicator (not US)



The M-specific display for corresponding configuration in the M Drive menu is activated via the M buttons on the steering wheel or by selecting it from the Head-up display configuration menu.

6.2.3. M Drive menu

The M Drive menu can be found in the Settings menu. There are two individually selectable M Drive configurations, M Drive1 and M Drive2.

The settings made there are called up by pressing the appropriate buttons on the multifunction steering wheel.

F85/F86 M Drive button

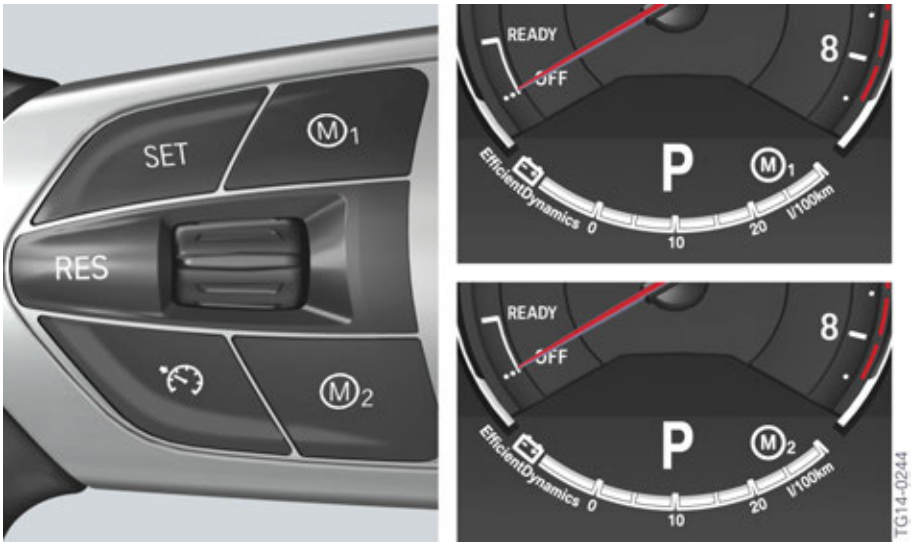
Index	Explanation
1	M1 Button
2	M2 Button

Two M buttons are available on the steering wheel.

The activation of an M Drive configuration is displayed by a M1 or M2 symbol in the instrument cluster. The corresponding symbol flashes if for example ABS or DSC adjust upon activation of request.
A renewed activation is only possible if the control is completed.

F85/F86 Complete Vehicle

6. Vehicle Electr. Syst/On-board Info



F85/F86 M Drive combination display

During the journey a requested configuration can be temporarily changed at any time until “Ignition OFF”. The corresponding driving dynamics button must be operated for this purpose. The M1 or M2 symbol in the instrument cluster goes out.

An efficient/comfortable configuration is set by default in the factory for the M1 button and a sporty configuration for the M2 button. This setting can be adapted in the M Drive menu to the customer's needs and also reset again to the factory setting. Each M button is individually configured and the overall configuration is also assigned to the vehicle remote control being used.

The following functions and configurations can be selected and set:

Dynamic Stability Control (DSC)

- **“ON”** Maximum possible driving stability.
- **“MDM”** Reduced stabilizing interventions. Allows driving with greater longitudinal and lateral acceleration on a dry roadway.
- **“OFF”** Stability control switched off. ABS control remains active.

Engine dynamics control incl. ASD (Active Sound Design)

- **Sport +** Response spontaneous and direct, with maximum dynamics.
- **Sport** Dynamic, sporty response.
- **Efficient** Comfortable response (city traffic, snow), minimized consumption.

Electronic Damper Control

- **Sport +** Consistently sporty
- **Sport** Balanced
- **Comfort** Comfort-optimized tuning

M Servotronic (EPS)

- **Sport +** High steering force, significant feedback
- **Sport** Medium steering force, noticeable feedback
- **Comfort** Low steering force

Head-up display

- M view
- Unchanged

Drivelogic

- Drivelogic program "S" switch position (bar) 1-3
- Drivelogic program "D" switch position (bar) 1-3

Configuration quick save

The modified setting or a new setting performed using the driving dynamics button can also be assigned permanently to one of the two M buttons on the steering wheel. The corresponding M button on the steering wheel must be held down for a longer period. The current configuration is assumed and overwrites the previously saved setting. This enables a quick adaptation or saving without calling up the M Drive menu.

If the driver is not aware that holding down an M button overwrites the current configuration/setting, this may lead to an unjustified customer complaint.

Active configuration

During the journey the desired ideal coordination of the individual driving stability controls is determined using the buttons and then before "Ignition OFF" one of the two M buttons on the steering wheel is pressed for a long period.

6.3. Active Sound Design (ASD)

The Active Sound Design (ASD) is described in a separate Training Reference Manual within the framework of the F10 M5.

The ASD settings are coupled to the engine dynamics control settings:

- Engine dynamics **Efficient** = ASD **Comfort**
- Engine dynamics **Sport** = ASD **Sport**
- Engine dynamics **Sport+** = ASD **Sport+**

F85/F86 Complete Vehicle

7. Equipment Overview

7.1. Standard equipment from the BMW X5 and X6 optional equipment range

- Sport automatic transmission
- Adaptive suspension
- Alarm system
- Automatic trunk release
- Automatically dipping interior/exterior mirror
- Electrical seat adjustment with memory
- Lumbar support for driver and front passenger
- Storage compartment package
- Seat heating for driver and front passenger
- BMW Individual instrument panel finished in leather
- Headlight washers
- Park Distance Control
- Automatic air-conditioning
- Light package
- Additional 12 V power socket
- HiFi loudspeaker system
- BMW Individual high-gloss Shadow Line
- BMW Individual roofliner Anthracite

7.2. M exclusive standard equipment

- Merino leather
- 21" M BMW light-alloy wheels, double spoke 612 M with mixed tires
- LED fog light
- Adaptive Xenon Headlights
- Aluminium Trace interior strips.
- M multifunction seat for driver and front passenger

7.3. M exclusive optional equipment

- 20" M BMW light-alloy wheels, double spoke 611 M with mixed tires
- Merino full leather
- M Driver's Package
- Navigation with touch pad

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Qualifizierung und Training
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