

**Technical training.**  
**Product information.**

## **F97/F98 Complete Vehicle**



**BMW Service**

Edited for the U.S. market by:  
**BMW Group University**  
**Technical Training**

ST1907

5/1/2019

## 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: February 2019

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.

The information contained in the training course materials is solely intended for participants in this training course conducted by BMW Group Technical Training Centers, or BMW Group Contract Training Facilities.

This training manual or any attached publication is not intended to be a complete and all inclusive source for repair and maintenance data. It is only part of a training information system designed to assure that uniform procedures and information are presented to all participants.

For changes/additions to the technical data, repair procedures, please refer to the current information issued by BMW of North America, LLC, Technical Service Department.

This information is available by accessing TIS at [www.dealerspeed.net](http://www.dealerspeed.net).

### Additional sources of information

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

- Owner's Handbook
- Integrated Service Technical Application
- Aftersales Information Research (AIR)

**The information contained in this manual is not to be resold, bartered, copied, or transferred without the express written consent of BMW of North America, LLC (“BMW NA”).**

©2019BMW of North America, LLC

The BMW name and logo are registered trademarks. All rights reserved.

# F97/F98 Complete Vehicle

## Contents

<b>1.</b>	<b>Introduction</b> .....	<b>1</b>
1.1.	M history.....	1
1.2.	F97 vehicle profile.....	2
1.3.	F98 vehicle profile.....	3
1.4.	Vehicle profile for Competition model.....	5
<b>2.</b>	<b>Technical Data</b> .....	<b>6</b>
2.1.	Comparison of technical data.....	6
2.1.1.	BMW EfficientDynamics measures.....	7
<b>3.</b>	<b>Body</b> .....	<b>8</b>
3.1.	Rigidity.....	8
3.1.1.	Chassis and suspension components and rigidity concept.....	8
3.2.	Exterior.....	10
3.2.1.	Front.....	10
3.2.2.	Page.....	11
3.2.3.	Rear.....	13
3.2.4.	Underbody and thermal protection.....	15
3.3.	Interior.....	16
3.3.1.	Driving area and steering wheel.....	16
3.3.2.	Seats.....	18
3.3.3.	Doors and strips.....	19
<b>4.</b>	<b>Powertrain</b> .....	<b>20</b>
4.1.	Engine S58B30T0.....	20
4.2.	Transmission.....	20
4.2.1.	M automatic transmission.....	20
4.2.2.	Transmission oil cooling.....	21
4.2.3.	M gear selector lever/M GWS.....	22
4.2.4.	Launch Control.....	24
4.2.5.	Emergency gearbox release.....	25
4.2.6.	Service information.....	26
4.3.	M xDrive.....	26
4.3.1.	Four-wheel drive.....	28
4.3.2.	M VTG system wiring diagram.....	28
4.3.3.	Service information.....	29
4.3.4.	Lifetime oil filling.....	29
4.3.5.	Active M differential .....	30
4.3.6.	Structure/Function.....	31
4.3.7.	System information.....	35
4.3.8.	Service information.....	38

# F97/F98 Complete Vehicle

## Contents

4.4.	Differential.....	39
4.4.1.	Front axle differential.....	39
4.5.	Drive shafts and output shafts.....	39
4.5.1.	Front driveshaft .....	39
4.5.2.	Rear driveshaft .....	39
4.5.3.	Front output shafts.....	40
4.5.4.	Rear output shafts.....	40
<b>5.</b>	<b>Chassis and Suspension.....</b>	<b>41</b>
5.1.	Front axle.....	42
5.1.1.	Steering.....	44
5.1.2.	M Servotronic.....	46
5.1.3.	Steering angle sensor.....	47
5.1.4.	System wiring diagram, M Servotronic .....	48
5.2.	Rear axle.....	49
5.3.	Brakes and wheels/tires.....	51
5.3.1.	Brakes.....	51
5.3.2.	Wheels/tires.....	54
5.4.	Driving dynamics systems.....	55
5.4.1.	Vertical Dynamics Management.....	55
5.4.2.	M Dynamic Stability Control (M DSC).....	61
5.4.3.	Integrated actuation (longitudinal transverse dynamics).....	65
5.4.4.	M dynamic mode and M DSC OFF mode.....	70
<b>6.</b>	<b>General Vehicle Electronics.....</b>	<b>71</b>
6.1.	Bus overview.....	71
6.2.	On-board information.....	74
6.2.1.	M configuration menu.....	74
6.2.2.	M instrument cluster.....	79
6.2.3.	M Head-Up Display.....	80
6.2.4.	Active Sound Design .....	81
<b>7.</b>	<b>Brief Overview of Equipment.....</b>	<b>82</b>
7.1.	BMW X3 M/X4 M standard equipment.....	82
7.2.	BMW X3 M/X4 M optional equipment.....	83
7.2.1.	Paint colors.....	84
7.2.2.	"Merino" leather with additional features.....	84
7.2.3.	BMW Individual "Merino" leather with additional features.....	84
7.2.4.	Wheels/tires.....	85

# F97/F98 Complete Vehicle

## 1. Introduction

The BMW M family is being extended by the addition of another series in the BMW X family. The F97 and F98 will debut as BMW X3 M and BMW X4 M in the sports activity vehicle and sports activity coupé sectors. As is already the case with their bigger brothers, the F85 and F86, the F97 and F98 will be equipped with M TwinPower turbocharged engine, M Sport automatic transmission, xDrive, Vertical Dynamics Management (VDM) and M Servotronic.

The new BMW X3 M and BMW X4 M will be launched onto the market in the second quarter of 2019.

### 1.1. M history

In 1972 the then BMW Motorsport started out with the legendary M1. For over 45 years today's BMW M GmbH has been developing BMW M vehicles with a motor-sport 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 BMW M models with M TwinPower turbo engine, M Sport automatic transmission, xDrive, Dynamic Performance Control, Dynamic Drive and run-flat tires.



E70 M and E71 M

# F97/F98 Complete Vehicle

## 1. Introduction

### 1.2. F97 vehicle profile



F97, BMW X3 M Competition

- **Design and aerodynamics:** 5-door high-performance sports activity vehicle (SAV). M-specific characteristics in front, side and rear area. Clever aerodynamic design in front, side and rear area and vehicle underbody.
- **Engine/Transmission:** 3-liter six-cylinder TVDI engine. Even more powerful and even more spontaneous linear power development. Three selectable engine dynamics control programs. Even faster, more precise gear changes. M-specific gearshift characteristics with model-specific BMW M 8-speed automatic transmission variant (with Drivelogic program). M all-wheel drive fully variable between front and rear or between rear and front wheels. Electronically regulated M rear axle differential lock.
- **Engine sound:** Distinctively sports character in the lower and upper rev and power bands, a more emotive starting sound and an active sound design system. The engine sound can be influenced via the setting of the exhaust flaps with a sound button.
- **Steering:** Direct and precise variable M EPS with selectable Servotronic support (at 3 stages). M steering wheel including M shift paddles and two steering-wheel mounted driver-configurable M mode buttons.
- **Chassis and suspension/driving dynamics setup:** Adaptive suspension, selectable handling dynamics programs ranging from comfortable to sports in 3 stages. Optimal driving precision and adapted interplay of steering, suspension and damping action according to the selected program. M Dynamic Stability Control (M DSC) with 3 drive modes, configurable by

# F97/F98 Complete Vehicle

## 1. Introduction

the driver. Rear-biased setup of xDrive for a sporty driving style in MDM and DSC-OFF mode. Two additional modes in the M DSC OFF mode; the following are available: 4WD and 4WD Sport.

- **Seating comfort:** M sports seats in Vernasca leather as standard. Optional electric M sports seats with high-quality upholstery in BMW Individual Merino leather and illuminated M logo in the head restraint.
- **Ergonomics, interior equipment:** M instrument cluster, M Drive menu, optional M head-up display with M theme on start-up, M seat, M-specific decorative strips, M footrest and sill trims.
- **Vehicle electrical system:** LED light technology for headlights. HiFi speaker system for maximum listening pleasure. Active Sound Design (ASD) for M-specific engine sound in the vehicle interior.
- **Assistance systems:** Availability of the same range of driver assistance systems as on the G01.

### 1.3. F98 vehicle profile



F98, BMW X4 M Competition

TG18-2621

# F97/F98 Complete Vehicle

## 1. Introduction

- **Design and aerodynamics:** 5-door high-performance sports activity coupé (SAC). M-specific characteristics in front, side and rear area. Clever aerodynamic design in front, side and rear area and vehicle underbody.
- **Engine/Transmission:** 3-liter six-cylinder TVDI engine. Even more powerful and even more spontaneous linear power development. Three selectable engine dynamics control programs. Even faster, more precise gear changes. M-specific gearshift characteristics with model-specific BMW M 8-speed automatic transmission variant (with Drivelogic program). M all-wheel drive fully variable between front and rear or between rear and front wheels. Electronically regulated M rear axle differential lock.
- **Engine sound:** Distinctively sports character in the lower and upper rev and power bands, a more emotive starting sound and an active sound design system. The engine sound can be influenced via the setting of the exhaust flaps with a sound button.
- **Steering:** Direct and precise variable M EPS with selectable Servotronic support (at 3 stages). M steering wheel including M shift paddles and two steering-wheel mounted driver-configurable M mode buttons.
- **Chassis and suspension/driving dynamics setup:** Adaptive M suspension, selectable handling dynamics programs ranging from comfortable to sports in 3 stages. Optimal driving precision and adapted interplay of steering, suspension and damping action according to the selected program. M Dynamic Stability Control (M DSC) with 3 drive modes, configurable by the driver. Rear-biased setup of xDrive for a sporty driving style in MDM and DSC-OFF mode. Two additional modes in the M DSC OFF mode; the following are available: 4WD and 4WD Sport.
- **Seating comfort:** M sports seats in Vernasca leather as standard. Optional electric M sports seats with high-quality upholstery in BMW Individual Merino leather and illuminated M logo in the head restraint.
- **Ergonomics, interior equipment:** M instrument cluster, M Drive menu, optional M head-up display with M theme on start-up, M seat, M-specific decorative strips, M footrest and sill trims.
- **Vehicle electrical system:** LED light technology for headlights. HiFi speaker system for maximum listening pleasure. Active Sound Design (ASD) for M-specific engine sound in the vehicle interior.
- **Assistance systems:** Availability of the same range of driver assistance systems as on the G02.



# F97/F98 Complete Vehicle

## 1. Introduction

### 1.4. Vehicle profile for Competition model

- **Design and aerodynamics:** The surround of the BMW M grill, the typical M gills, the mirror hoods and the rear spoiler are finished in high-gloss black as standard. The additional model nameplate on the rear with the "Competition" insignia ultimately distinguishes the external appearance of the Competition model from the BMW X3 and BMW X4.
- **Engine:** The 3-liter six-cylinder TVDI engine with its power increased to 375 KW/503 hp and extended rev band offering a maximum available torque of 600 Nm makes the Competition model 0.1 seconds faster from 0-60 mph and raises the maximum vehicle speed to 285 km/h.
- **Engine sound:** M Sport exhaust system with even more sports-style sound both in the lower and upper rev and power bands, more emotive starting sound and an active sound design system. The engine sound can be influenced via the setting of the exhaust flaps with a sound button.
- **Chassis and suspension/driving dynamics setup:** Adaptive M suspension with even stiffer characteristics, selectable handling dynamics programs ranging from comfortable to sports in 3 stages. The 21" wheels with 265/40 R21 tires on the rear and 255/40 R21 tires on the front underline the external styling of the Competition model.
- **Seating comfort:** Electric M sports seats as standard with extended Merino leather trim and M seat belts with embroidered M colors.
- **Interior:** Sill trims and a badge on the center console with the "Competition" insignia add the finishing touches to the interior of the Competition model.

# F97/F98 Complete Vehicle

## 2. Technical Data

### 2.1. Comparison of technical data

Designation	Unit	G01 M40i	F97 X3 M	G02 M40i	F98 X4 M
Engine series		B58B30M0	S58B30T0	B58B30M0	S58B30T0
Engine control		DME 8.6.0	DME 8.6.S	DME 8.6.0	DME 8.6.S
Transmission type designation		GA8HP50Z	M8HP76Z	GA8HP50Z	M8HP76Z
Length	[mm]	4716	4730	4761	4762
Width	[mm]	1897	1897	1938	1927
Height	[mm]	1676	1669	1621	1620
Number of seats		5	5	5	5
Luggage compartment volume	[l]	550	550	525	525
Maximum speed	[km/h]	250*	250*/280** /285****	250*	250*/280** /285****
Acceleration 0-100 km/h	[s]	4.8	4.2 4,1****	4.8	4.2 4,1****
Power at engine speed	[kW/hp] [rpm]	265/355 5500-6500	353/473 6250 375/503**** 6250****	265/355 5500-6500	353/473 6250 375/503**** 6250****
Torque at speed	[Nm / lb-ft] [rpm]	500/369 1550-4500	600/442 rpm 2600-5600 2600-5950****	500/369 1550-4500	600/442 rpm 2600-5600 2600-5950****
Aerodynamics					
Vehicle curb weight					
US	[lbs]	4277	4620	4323	4590
Payload	[lbs]	959	840	840 rpm	840
Maximum trailer load	[kg]	1520	1570	1520	1570
Fuel consumption	[l/100 km]	8.2	10.5	8.2	10.5
Approx. fuel tank capacity	[l]	65	65	65	65
CO <sub>2</sub> emissions	[g/km]	188	239	188	239
Exhaust emission standards US		ULEV 125	ULEV 125	ULEV 125	ULEV 125

\* Electronically limited.

\*\* Electronically limited in conjunction with option SA 7ME, M Driver's Package.

\*\*\* The specified figure includes the weight of fuel in the tank when 90% full, 68 kg for the driver and 7 kg of luggage.

# F97/F98 Complete Vehicle

## 2. Technical Data

\*\*\*\* In conjunction with option SA 7MN/7MA, Competition Package (technical data not final at time of editorial deadline).

Please compare figures with current sales documentation; not all up-to-date figures were available at time of editorial deadline.

### 2.1.1. BMW EfficientDynamics measures

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

# F97/F98 Complete Vehicle

## 3. Body

### 3.1. Rigidity

#### 3.1.1. Chassis and suspension components and rigidity concept

##### Front area of vehicle

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 brace
- Shock tower mountings
- Strut brace bridge
- Shock-tower-to-bulkhead brace



TG18-2622

F97/F98, stiffening measures in the forward area

# F97/F98 Complete Vehicle

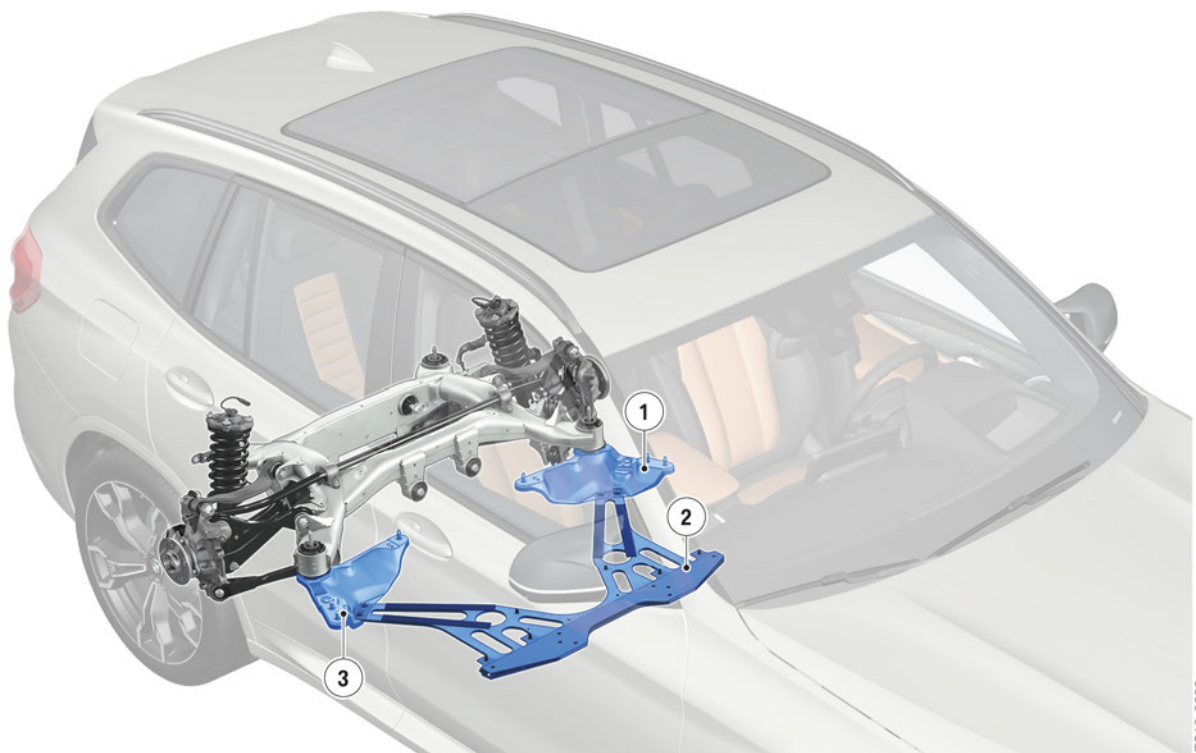
## 3. Body

Index	Explanation
1	Right shock tower mount
2	Shock-tower-to-bulkhead brace
3	Strut brace bridge
4	Left shock tower mount
5	Left front-end brace
6	Right front-end brace

### Rear area of the vehicle

The following measures for attaching the chassis and suspension components and increasing the vehicle rigidity have implemented in the rear end of the vehicle:

- Compression struts on the front of the rear suspension subframe
- Rear chassis brace



F97/F98, stiffening measures in the rear area

Index	Explanation
1	Left compression strut
2	Rear chassis brace
3	Right compression strut

# F97/F98 Complete Vehicle

## 3. Body

### 3.2. Exterior

#### 3.2.1. Front

##### Bumper, front

The one-piece M-specific bumper panel is identical in design on the F97 and F98 and has M-specific flaps for reducing front-wheel lift. It is - including the standard ultrasonic sensors for Park Distance Control (PDC) and the licence plate baseplate - painted to match the exterior body color. The grills have a black grained finish. The optional surround view camera and the ultrasonic/radar sensors for the PMA Parking Maneuver Assistant/driver assistance system are integrated in the front/sides of the vehicle as on the G01/G02 standard production models.

The ornamental grills at the bottom are black. An optional radar sensor for the driver assistance system can be fitted in the front bumper.



F97/F98, front view (Competition)

##### Radiator (kidney) grill

The surround of the BMW M grill is finished in chrome as standard. The double-rib grill bars of the BMW M grill are black as standard on the BMW X3 M and BMW X4 M with high-gloss struts and carry the BMW X3 M or BMW X4 M model nameplate.

##### Headlight

The headlights are carry-over parts from the G01/G02 equipment options. The Adaptive Full LED headlights are standard.

##### Fog light

No fog lights are offered for the F97/F98.

# F97/F98 Complete Vehicle

## 3. Body

### Cooling air routing

The air ducting is identical on the F97 and F98.

The air inlet areas for the required cooling air on the front bumper panel have been enlarged and optimized in such a way that there is more air inlet area available for cooling air compared with the G01/G02. There is an adapted air duct both for the center radiator assembly including low-temperature radiator and for the two discrete radiators in the wheel arches. This design feature has had a positive effect on the cooling capacity for charge air cooling, engine cooling and transmission cooling.

### 3.2.2. Page

#### Side panels

The front side panels have been carried over from the G01/G02. Distinctive design features include the so-called M gills and the X3 M/X4 M model inscriptions on the front left and right side panels. In addition, the air breathers in the left and right side panels, are used as design features integrated in the typical M gills. As on the standard production model, the side panels are made of aluminum.



F97/ F98 M gill element with integrated air breather (Competition)

#### Exterior rearview 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 F97 and F98 have the same design as the wheel arch trims on the G01/G02 with M Sport package.

The F97 and F98 light alloy wheels have the same styling and are a 20" cast design with a diamond polished finish.

# F97/F98 Complete Vehicle

## 3. Body

### Side sills

The M side sills on the F97 and F98 have the same design as the G01/G02 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 of the F97 and F98 are painted in body color.

### F97



TG18-2626

F97 side view (Competition)

### F98



TG18-2627

F98 side view (Competition)



# F97/F98 Complete Vehicle

## 3. Body

### 3.2.3. Rear

#### Exhaust tailpipes

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

#### F97 rear

The bumper panel has been carried over from the G01 with M Sport package and is a four-piece construction. The upper bumper trim panel with PDC mounts is painted in body color. The lower bumper panel with PDC mounts is painted in body color and has also been carried over from the G01 M Sport package. The lower diffuser has been adapted to suit the four M-specific tailpipes and is painted in body color. The ornamental grill in the center of the bumper panel has a black grained finish.



F97 rear view (Competition)

TG18-2628

The optional radar sensors for the driver assistance systems of the F97 are integrated in the sides/rear the same as on the G01 standard production model.

The F97 also features an M-specific rear spoiler on the tailgate which improves the aerodynamics and also accentuates the F97 vehicle's sports styling.

# F97/F98 Complete Vehicle

## 3. Body

### F98 rear

The bumper panel has been carried over from the G02 with M Sport package and is a four-piece construction. The upper bumper trim panel with PDC mounts is painted in body color. The lower bumper panel with PDC mounts is painted in body color and has also been carried over from the G02 M Sport package. The lower diffuser has been adapted to suit the four M-specific tailpipes and is painted in body color. The ornamental grill in the center of the bumper panel has a black grained finish.



TG18-2629

F98, rear view (Competition)

The optional radar sensors for the driver assistance systems of the F98 are integrated in the sides/rear the same as on the G02 standard production model.

The F98 also features an M-specific Gurney flap on the tailgate which improves the aerodynamics and also accentuates the F98 vehicle's sports styling.

# F97/F98 Complete Vehicle

## 3. Body

### 3.2.4. Underbody and thermal protection

#### Underbody

The stiffening plate has been carried over from the G01/G02. The engine underguard is a new part with an integrated air outlet for the additional, horizontal, forward-mounted engine oil cooler. The air ducting for the brake system has been adapted on the F97/F98, featuring new air ducts between the bumper panel and the inner wheel arch liner.

In order to achieve an additional optimization in terms of reducing the lift on the F97/F98, M-specific air guides in front of the front wheels that differ geometrically from the G01/G02 have been developed in a wind tunnel.

The center underbody trim panel has been adapted specifically for the M model to achieve optimum airflow over the protruding cooling fins of the aluminum transmission sump (BMW AG base model: plastic oil sump).

#### Thermal protection

- Additional heat insulation on the right engine subframe (turbocharger)
- Exhaust system heat insulation as a new part to the right of the automatic transmission
- Additional exhaust system heat insulation for fuel tank and the front prop shaft universal joint
- Additional exhaust system heat insulation above the rear silencer.

# F97/F98 Complete Vehicle

## 3. Body

### 3.3. Interior

#### 3.3.1. Driving area and steering wheel

##### M driving area



F97/F98, M dashboard

The instrument panel on the F97 and F98 is finished in Sensatec. The common center console including the knee pads in the F97/F98 has been carried over from the G02.

##### M leather steering wheel

The M leather multifunction steering wheel on an magnesium armature is based on the M modular steering wheel. Above the thumb rests are the M shift paddles with M gearshift logic: downshift on the left, upshift on the right.

The steering wheel has an external diameter of 380 mm. The steering wheel rim is reinforced and ergonomically optimized from a round to an oval cross-section, improving the driver's grip.

Left shift paddle "-" shifts down, right shift paddle "+" shifts up as with the M automatic transmission in the F85/F86 and F90 with M automatic transmission.

The colored M stitching constitutes another difference from the production G01/G02 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 vibrator element for lane departure warning and lane change warning is integrated in the steering wheel.

# F97/F98 Complete Vehicle

## 3. Body

There are 2 red M buttons mounted on top of the multifunction pad because the multifunction button clusters for the driver assistance systems remain on the steering wheel as on the G01/G02. For more details, please see the chapter "M configuration menu".



F97/F98, M leather steering wheel

TG18-2630

# F97/F98 Complete Vehicle

## 3. Body

### 3.3.2. Seats

#### **M sports seats**

The M sports seats are standard equipment. The starting basis is the sports seat from the G01/G02.

These are fully electric sports seat with integrated side airbag and a seat belt buckle pretensioner. The seats are operated by means of a control switch on each seat. The 3 memory functions for the driver's seat can be retrieved via the 3 buttons in the door trim panel. The control unit is installed at the bottom of the seat. To increase safety, the crash-active head restraints are installed as standard.

M seat features (driver and front passenger):

- Vernasca leather
- Heated seats
- Electrically adjustable seat length, height, tilt and backrest angle
- Manual head restraint depth and seat depth adjustment
- Memory function for the driver's seat
- Pneumatic backrest width adjustment
- Impressed M logo in the backrest upper section
- Lumbar support

#### **Fully electric M sports seat**

The fully electric sports seats are available as optional equipment (SA 712) on the X3 M and X4 M .

Standard fully electric sports seats on the X3 M Competition and X4 M Competition models.

This fully electric sports seat also offers:

- Merino leather
- Backrest upper section adjustment
- Manual seat depth adjustment
- Memory function for the driver's seat
- M-specific moulded bulges in the seat area for increased side support
- M-specific moulded backrest for increased support in the shoulder and bulge area
- Lumbar support with pneumatic height and depth adjustment
- Pneumatic backrest width adjustment
- Illuminated M logo in the head restraints
- Other seat functions as for the M sports seat

The seats are operated by means of a control switch on each seat. The 3 memory functions for the driver's seat can be retrieved via the 2 buttons in the door trim panel. The control unit is installed at the bottom of the seat.

# F97/F98 Complete Vehicle

## 3. Body

### Optional equipment for the fully electric M sports seat

- Active seat ventilation (SA 4FH)

### Rear seats

Three passenger design with split backrest and an upper body angle 26°. The split ratio is 40/20/40. The center head restraint in the split 20 section is a folding design.

### Optional equipment for rear seats:

- Seat heating (SA 4HA)

### 3.3.3. Doors and strips

#### M decorative strips

The following trims are offered in the F97/F98:

- Aluminum carbon-effect interior trim finishers with pearl-effect chrome accentuation trim
- Fineline cove matte finish wood trim (SA 4LH)
- Grey poplar wood trim (SA 4LQ)
- Carbon fiber interior trim (SA 4MC)

#### Sill trims, footrest and compact spare wheel

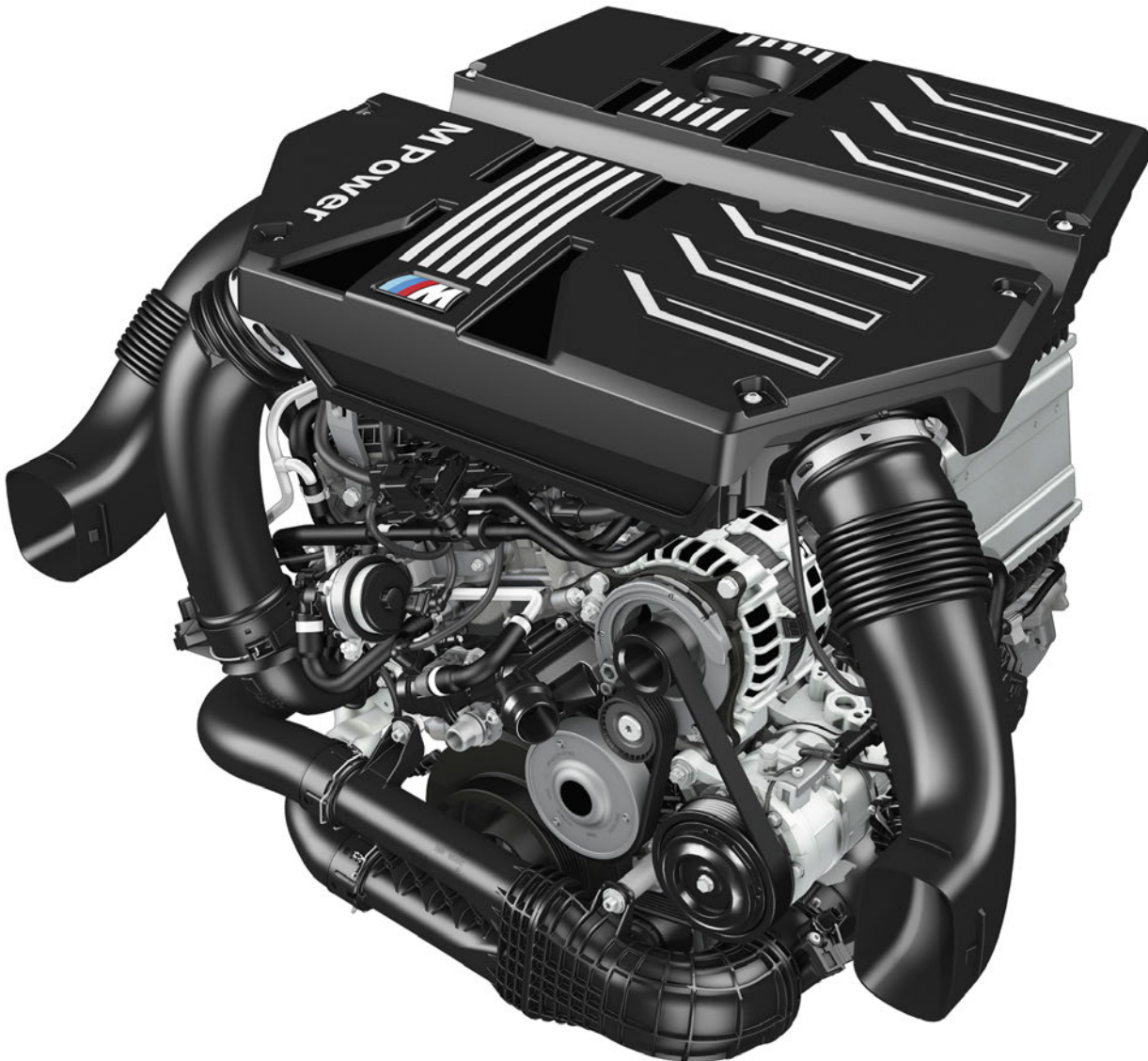
- Sill trims with M lettering
- Door sill strips with M Competition on Competition model
- Footrest
- A compact spare wheel is offered as optional equipment (SA 300). A Mobility Set is included with the vehicle as standard.

# F97/F98 Complete Vehicle

## 4. Powertrain

### 4.1. Engine S58B30T0

The S58B30T0 engine is described in a separate Product Information ST1926 S58 Engine.



TO18-1635

F97/F98, S58B30T0 engine

### 4.2. Transmission

#### 4.2.1. M automatic transmission

As already used on the F85/F86 and F90, the F97/F98 features an M automatic transmission with Drivelogic designated the GM8HP76Z. This is referred to as M8HP76 in the following sections.



# F97/F98 Complete Vehicle

## 4. Powertrain

With the M8HP76 M Sport Steptronic transmission, which is based on the BMW AG 8HPTU2 gearbox, customers benefit from significantly improved gear shift responsiveness and even further optimized control of the converter lock-up 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. As a result, the operating ranges in which the converter lock-up clutch has to be controlled are reduced even further because the converter lock-up clutch is fully engaged in the vast majority of driving situations. This provides for an even more direct connection of the M8HP76 transmission to the complete drivetrain, resulting in an even sportier driving experience and reduced fuel consumption.

The power transmission capacity of the torque converter has been adapted to the S58B30T0 engine.

In the F97/F98 the “**Idle coasting**” function known from the BMW AG vehicles is not implemented. However, the M8HP76 supports, as known from the BMW AG vehicles, the “**ConnectedShift**” function.

### Transmission ratios – F97/F98

	F97/F98
Transmission designation	M8HP76 (ZF)
Transmission ratio spread	7.8
Maximum engine speed [rpm]	7200
Torque [Nm]	650
Ratio [:1] 1st gear	5.000
Ratio [:1] 2nd gear	3.200
Ratio [:1] 3rd gear	2.143
Ratio [:1] 4th gear	1.720
Ratio [:1] 5th gear	1.313
Ratio [:1] 6th gear	1.000
Ratio [:1] 7th gear	0.823
Ratio [:1] 8th gear	0.640
Ratio [:1] reverse gear	3.478

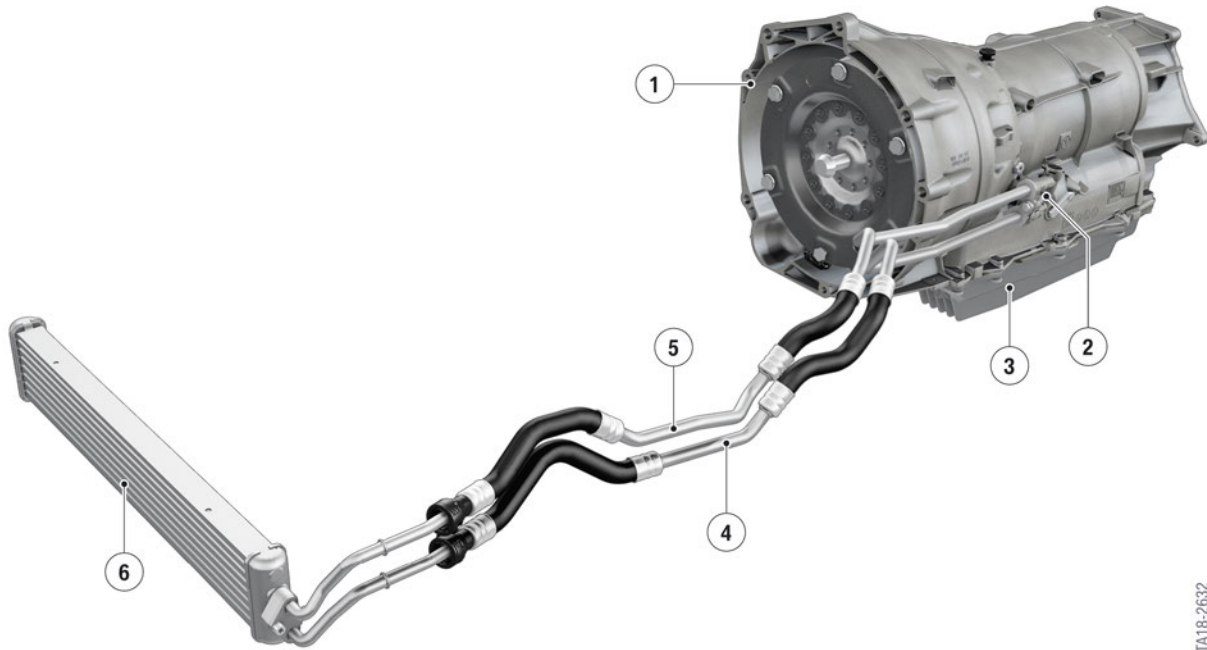
### 4.2.2. Transmission oil cooling

The plastic transmission sump has been replaced by an aluminum version with larger cooling fins and the opening point of the transmission oil thermostat lowered, thereby improving the cooling of the M8HP76 transmission.

A transmission oil cooler with a thermostat is used to cool the M8HP76 on the F97/F98. 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 vertically in front of the radiator assembly.

# F97/F98 Complete Vehicle

## 4. Powertrain



F97/F98, transmission oil cooling

Index	Explanation
1	M automatic transmission
2	Thermostat
3	Aluminum transmission sump
4	Transmission oil return
5	Transmission oil feed
6	Transmission oil cooler (oil-to-air heat exchanger principle)

Some of the external pipes and hoses carrying transmission oil to the supplementary transmission oil cooler have had their cross-sectional area 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 starts opening at 76 °C (169 °F) and is fully open at 96 °C (205 °F).

### 4.2.3. M gear selector lever/M GWS

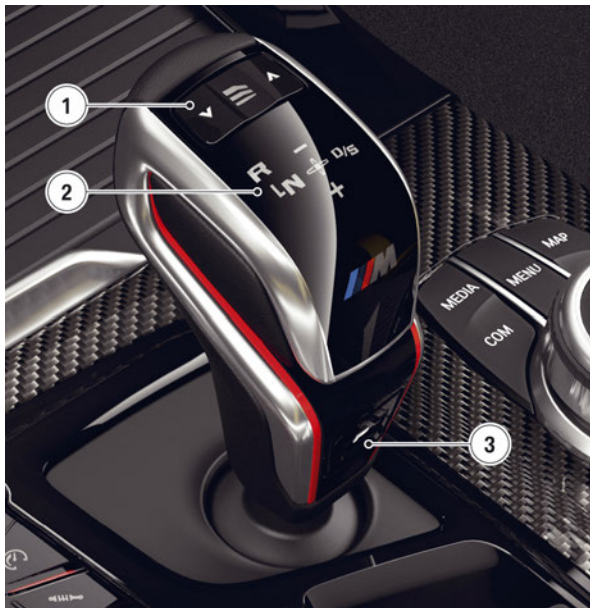
The M automatic transmission is operated using the M gear selector lever (M GWS) or the shift paddles on the steering wheel.

The gear selector switch used on the F97/F98 is a combined M gear selector switch with integrated Drivelogic switch and parking lock button as familiar from the BMW M5.

The M-specific shift pattern, as used for the M double-clutch transmissions, was retained for the M gear selector switch.

# F97/F98 Complete Vehicle

## 4. Powertrain



F97/F98, M gear selector switch

Index	Explanation
1	Drivelogic button
2	Gear indicator display (with M-specific shift pattern)
3	Parking lock button

### Drivelogic

A rocker switch is used on the F97/F98 for changing the transmission mode up or down.

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

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

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

It is possible to choose and change between an automatic **“D mode”** and a sequential **“Manual mode”**. In each mode there are 3 driving programs, which can be selected and activated using the **“Drivelogic switch”**.

### D mode/Drive mode

Three driving programs are available for selection:

- 1: Efficient driving, comfort shifting time
- 2: Fast driving, sport shifting times
- 3: Sports mode/Sports shift point

# F97/F98 Complete Vehicle

## 4. Powertrain

### Manual mode/sequential mode

The gears can be shifted manually at the appropriate road speed and engine revs by means of "+" and "-" gearshift paddles on the steering wheel or by moving the gear selector lever **"forward"** or **"back"**. 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 manual mode is selected for the first time after a change of terminal status (engine restart), the last Drivelogic level 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 engine loads and speeds
- 3: Maximum sporty shift speed and gearshifts are the requirement for the activation of Launch Control.

Using the highest program, i.e. 3, does not require the M DSC to be deactivated.

### 4.2.4. Launch Control



---

During the first 5000 km (3100 miles) run-in distance, the Launch Control must not be used.

The Launch Control is released at the factory. Release of the Launch Control is no longer restricted to the 2000 km (1200 miles) running-in check.

Premature wear occurs as a result of the high load on the vehicle components when using Launch Control.

---

### Launch Control

Function: Launch Control enables optimal acceleration when driving off on a non-skid roadway.

---

Sequence	Precondition/Action
1.	The vehicle must be stationary, the engine running and at operating temperature (approx. 10 km (6 mph) warm-up journey).
2.	The M Dynamic Stability Control (M DSC) is deactivated. (4WD)
3.	The manual 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.

---

# F97/F98 Complete Vehicle

## 4. Powertrain

### 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.

---

### 4.2.5. Emergency gearbox release



---

A mechanical emergency transmission release is available and can be accessed through the vehicle underbody. In addition, an electronic emergency gearbox release is implemented as it is in automatic transmissions of the BMW AG vehicles. If the vehicle needs to be towed, the guidance in the owner's manual for the vehicle must be followed.

---

Release is possible if the starter motor can crank the engine. Before the parking lock is released, the parking brake must be applied in order to prevent the vehicle rolling away.

---

Sequence	Precondition/Action
1.	Engage selector lever position N.
2.	Press and hold the brake.
3.	Press the start/stop button (the starter motor must start up audibly).
4.	Keep the start/stop button pressed.

---

# F97/F98 Complete Vehicle

## 4. Powertrain

Sequence	Precondition/Action
5.	With your free hand, press the selector lever into selector lever position N and keep it there until selector lever position N appears in the instrument cluster.
6.	A CC message is displayed in the KOMBI and in the CID.
7.	Release the start/stop button and the selector lever.
8.	Release the brake as soon as the starter motor stops.

Maneuver the vehicle out of the danger area and then secure to prevent it from rolling away. Observe the additional information in the owner's manual for the vehicle.

### 4.2.6. Service information

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 owing to a repair, there must be maximum cleanliness. They include:

- 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 work bay in which an automatic transmission is opened up must be absolutely clean and protected from dirt contamination, including during work interruptions, e.g. by means of an adequate, clean and lint-free cover.

### Lifetime oil filling

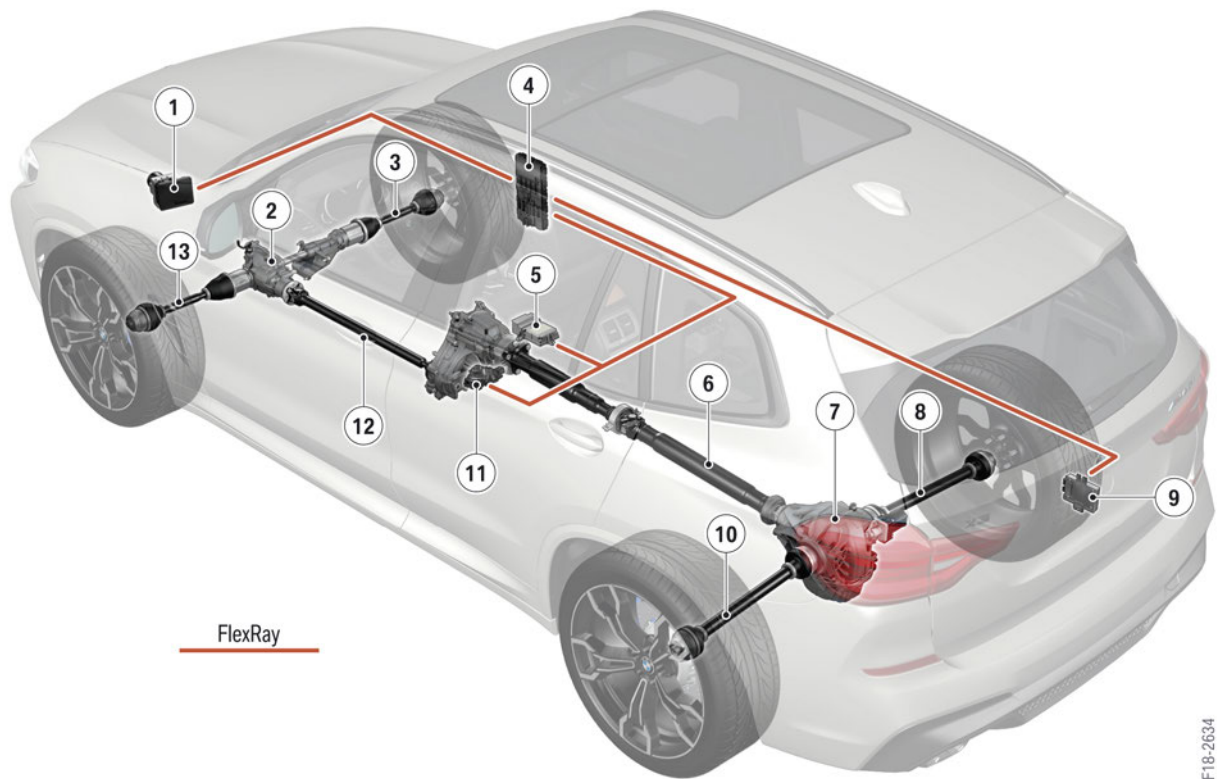
At present, as is the case with the F85/F86 and F90 with automatic transmission, a transmission oil change at 2000 km (1200 mile running-in check) and at every 3rd engine oil change is **not** required for the F96/F97 with M automatic transmission.

### 4.3. M xDrive

"High-performance dynamic handling on the one hand and the everyday usability of an SUV/SAV on the other" is how we could summarize the typical M concept approach in which the individual drivetrain components are perfectly matched with the M xDrive system. That enables the new BMW X3 M and BMW X4 M to have the same familiar precise sports handling whether being driven on the race track or the public road. In addition, they are also a delight to drive even in unpleasant weather conditions such as rain and snow or off road thanks to noticeable extra traction and controllability right up to the limits of handling stability. The agile rear-oriented design is achieved by allowing the M xDrive to bring the front axle to bear only when the rear wheels have reached their limits and additional traction force is required. Even when adopting a very vigorous driving style using a lot of power, the new BMW X3 M and BMW X4 M with M xDrive show themselves to be predictable and effortless to control for the driver, so that the outstanding performance of the vehicles can be experienced even more intensely.

# F97/F98 Complete Vehicle

## 4. Powertrain



F97, system overview, M xDrive

TF18-2634

Index	Explanation
1	M Dynamic Stability Control (M DSC)
2	Front axle differential
3	Front output shafts, right
4	Body Domain Controller (BDC)
5	Advanced Crash Safety Module (ACSM)
6	Prop shaft
7	M rear axle differential lock
8	Rear output shafts, right
9	Control unit, regulated M rear axle differential lock (M GHAS)
10	Rear output shafts, left
11	M transfer box (M VTG)
12	Front propeller shaft
13	Front output shafts, left
FlexRay	FlexRay bus

# F97/F98 Complete Vehicle

## 4. Powertrain

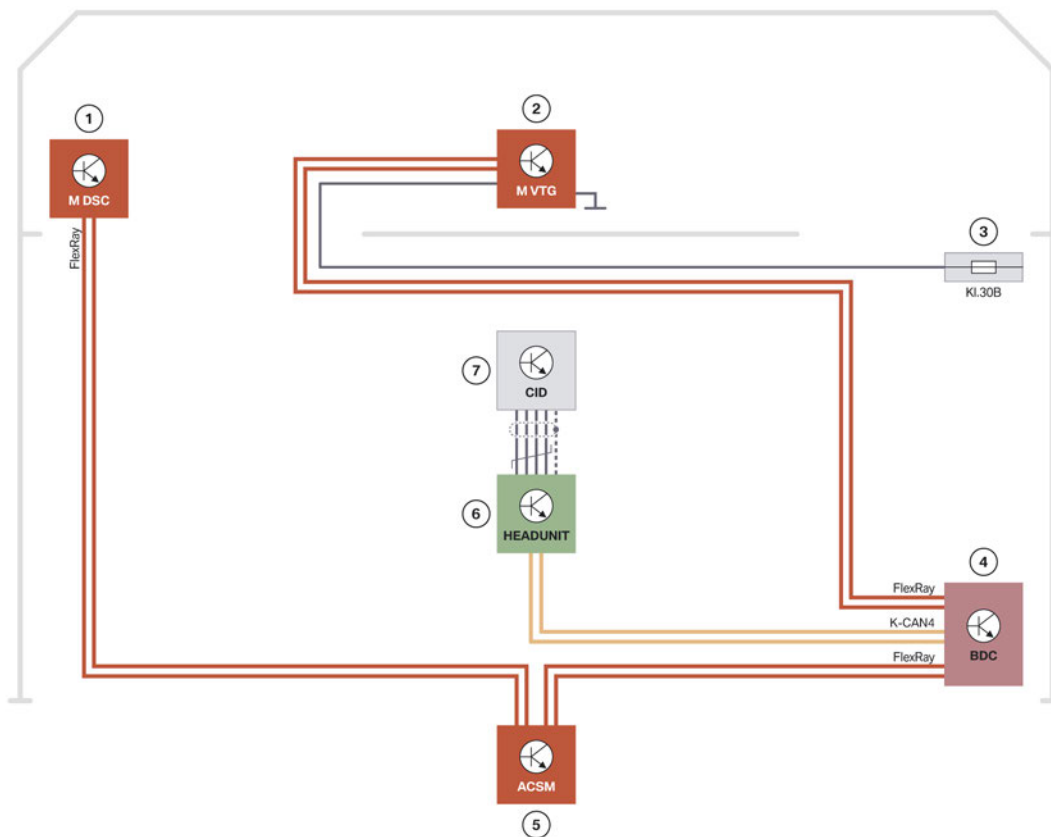
### 4.3.1. Four-wheel drive

The M xDrive system used on the F97/F98 is based on the all-wheel drive system of the G12 with the ATC13 transfer box and has been carried over from the F90.

The torque generated by the engine is stepped up in the automatic transmission and is supplied via the transmission output shaft to the transfer box. The transfer box forming the next stage in the drivetrain has the task of varying the torque distribution between the front and rear wheels across the full range from 0:100% to 100:0% as demanded by the driving situation. Since a rigid connection of the rear axle with the front axle is not possible due to possible differences in the wheel speeds, there is a multidisc clutch inside the transfer box. The multidisc clutch performs the task of variable torque distribution between the two drive axles.

General information on BMW xDrive can be found in the product information publication "ST1501 G12 Drivetrain".

### 4.3.2. M VTG system wiring diagram



TA17-0455

F97/F98, M transfer box system wiring diagram



# F97/F98 Complete Vehicle

## 4. Powertrain

Index	Explanation
1	M Dynamic Stability Control (M DSC)
2	M transfer box (M VTG)
3	Power distribution box, front right
4	Body Domain Controller (BDC)
5	Advanced Crash Safety Module (ACSM)
6	Head Unit HU (M-specific)
7	Central Information Display (CID)

### 4.3.3. Service information

- The vehicle must **not** be driven when the front propeller shaft has been removed.
- When carrying out work on a brake test stand, it is not necessary to take into account any all-wheel drive-specific points.  
(roller mode for testing the brake system is detected automatically.)
- The vehicle must **not** be towed if only one axle is raised.
- The oil filling of the transfer box is designed for the entire unit service life.  
However, a fault memory entry with an oil change recommendation for the transfer box oil is stored when a usage of 150,000 km / 9300 miles is exceeded.  
When refilling the transfer box oil, it is necessary to move the oil partition to the open position using the BMW ISTA diagnosis system.
- Various test plans are available in the BMW diagnosis system ISTA for Service.



The tire tread depth as well as the tire manufacturer should be the same on the front and rear axles if possible in order to ensure proper functioning of the xDrive. It is also advisable to only use tires that have been approved or recommended by BMW M.

### 4.3.4. Lifetime oil filling

The oil filling of the transfer box is designed for the entire unit service life. This corresponds to a usage of approximately 150,000 km / 9300 miles. A fault code entry with an oil change recommendation for the transfer box is stored when this mileage is exceeded.

The transfer box does not have an oil drain plug. The oil filling to be renewed must be removed using an extractor unit.

The new transfer box oil can be filled using an oil filler plug.

In order to ensure that the entire oil filling has been exchanged, the oil bulkhead must remain open for the duration of extraction and filling.

# F97/F98 Complete Vehicle

## 4. Powertrain



---

The Service employee can move the oil bulkhead to the open position by means of the “Service function > Transfer box VTG > Oil change” in the BMW ISTA diagnosis system.

---



---

Current transfer box oil recommendations and capacities can be found in the current documentation of the BMW workshop information systems.

---

### 4.3.5. Active M differential

The active M differential on the rear axle is an integral part of the M xDrive.

This electronically/electromechanically controlled M rear differential lock was developed specifically for the F10 M5 and is also used on the F06/F12/F13 M6, F80/F82/F83/F87, F90 and now on the new F97/F98.

The active M differential has been reworked for the F97/F98, which specifically involved adapting the rear differential housing to the rear suspension subframe of the F97/F98.

The M rear axle differential, size HAG 225 (crown wheel Ø 225 mm), is used with a M rear axle differential lock. The system designation is "M regulated rear differential lock" and accordingly the control unit designation is M GHAS.

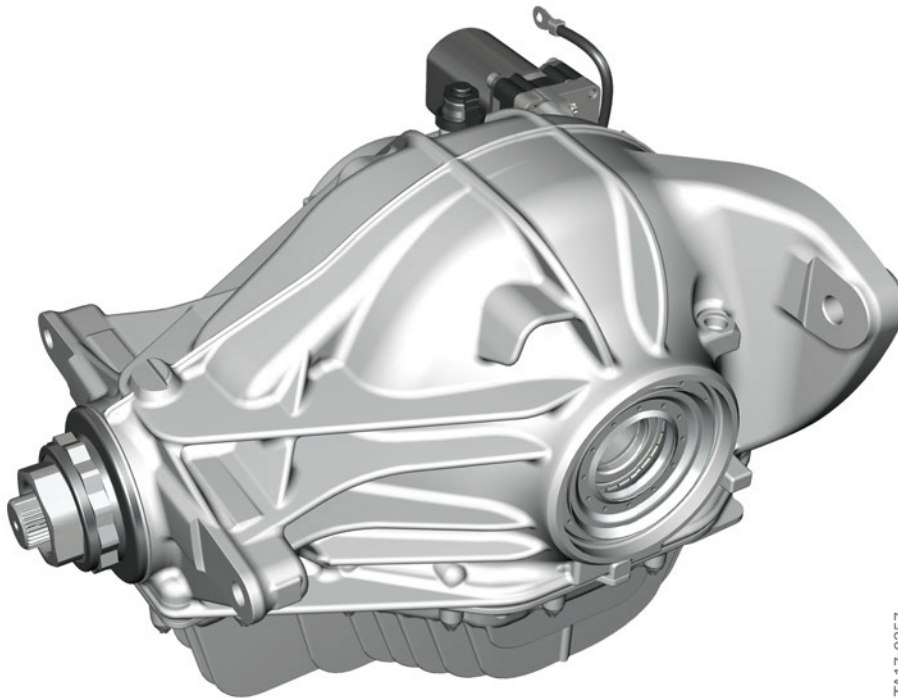
The gear ratio of the rear axle differential HAG 225 is 3.154:1.

This M rear axle differential can be recognized by an aluminum oil sump assembled from below and an electric motor which is visible from the outside.

The HAG 225 weighs 43 kg.

# F97/F98 Complete Vehicle

## 4. Powertrain



F97/F98, M GHAS external view

TA17-0357

### **Demand-controlled lock**

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

- Pullaway
- Differential speed at the rear axle for straight-ahead driving under tension due to various coefficients of friction, left/right
- M dynamic cornering tensioned
- Power oversteer (slight steering drift in MDM mode)
- 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.

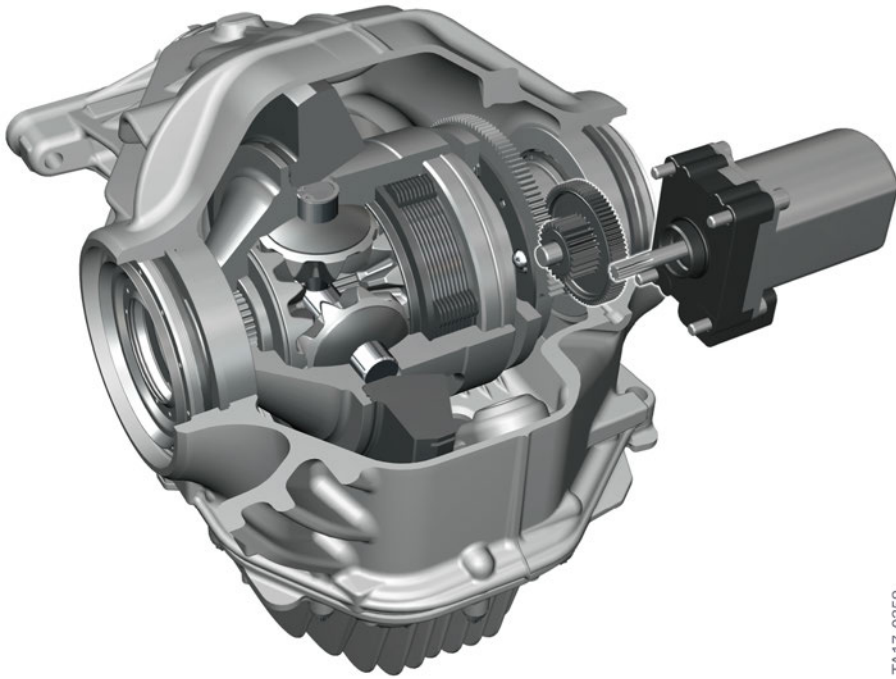
The regulated M rear axle differential lock works with a position-controlled electric motor and a ball ramp.

### **4.3.6. Structure/Function**

The lock-up torque is generated by a multidisc clutch. The necessary axial pressure is applied to the multidisc clutch by the position-controlled direct current motor by means of gears and a ball ramp mechanism. The clutch package operates between the expansion tank housing (steel outer discs) and the right output (steel inner discs with carbon friction lining).

# F97/F98 Complete Vehicle

## 4. Powertrain



TA17-0358

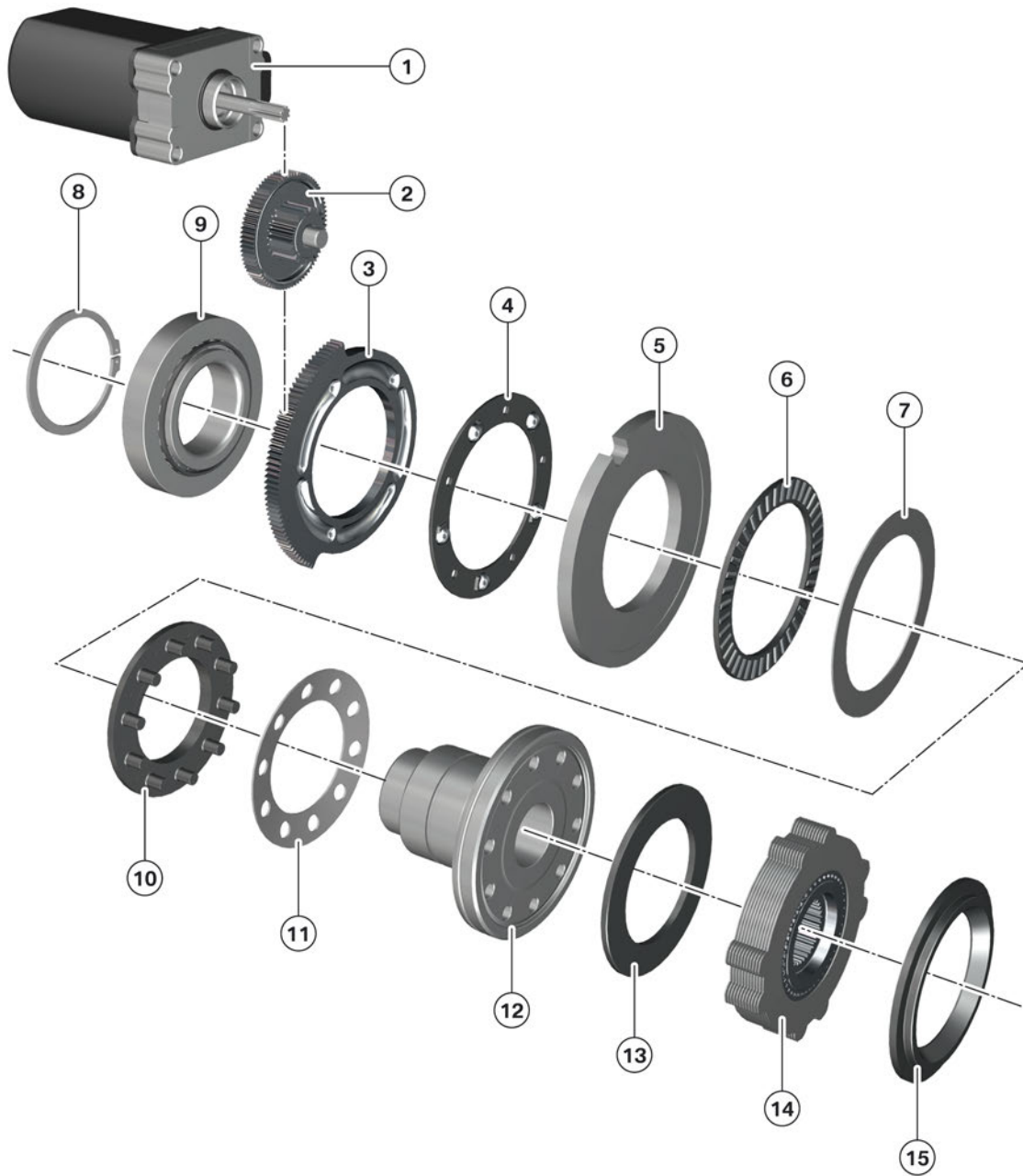
F97/F98, sectional view of rear differential

### System components:

- Wiring harness
- Regulated differential lock control unit M GHAS
- Electric motor and transmission gearing
- Lock

# F97/F98 Complete Vehicle

## 4. Powertrain



TA17-0454

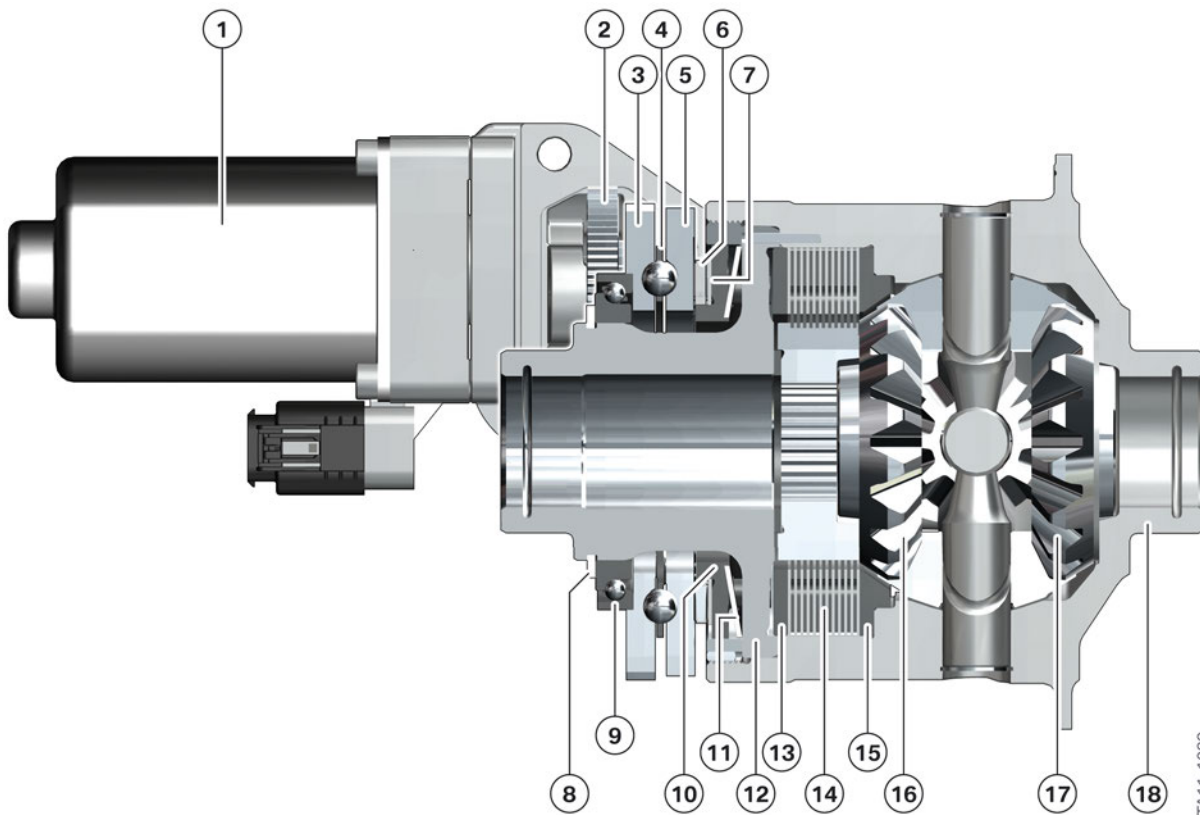
F97/F98, components of internal differential lock: Exploded diagram

Index	Explanation
1	Electric motor
2	Transfer box
3	Ball ramp consisting of geared mobile adjusting disc and first half of ball ramp
4	Balls/Spherical washer
5	Static/fixed pressure plate with 2nd half of ball ramp
6	Axial needle bearing

# F97/F98 Complete Vehicle

## 4. Powertrain

Index	Explanation
7	Axial bearing thrust washer
8	Circlip (ball bearing fixing)
9	Ball bearing between inner output hub and differential housing
10	Disc spring pressure ring
11	Disc spring
12	Differential lid (connected to differential housing, cannot rotate)
13	Pressure plate
14	Disc set
15	Counter pressure plate



TA11-1022

F97/F98, sectional view of parking lock differential

Index	Explanation
1	Electric motor
2	Transfer box
3	Ball ramp consisting of geared mobile adjusting disc and first half of ball ramp
4	Balls/Spherical washer
5	Fixed pressure disc with second half of ball ramp

# F97/F98 Complete Vehicle

## 4. Powertrain

Index	Explanation
6	Axial needle bearing
7	Axial bearing thrust washer
8	Circlip (ball bearing fixing)
9	Ball bearing between inner output hub and differential housing
10	Disc spring pressure ring
11	Disc spring
12	Differential lid (connected to differential housing, cannot rotate)
13	Pressure plate
14	Disc set
15	Counter pressure plate
16	Output bevel gear
17	Output bevel gear
18	Differential housing (connected to outer discs)

The electric motor (1) is bolted onto the housing and the pressure plate fixed to the 2nd half of the ball ramp (5) in the housing. The mobile components of the ball ramp (2, 3 and 4) generate the necessary axial displacement of the pressure disc (5). These components are not subject to the differential transmission rotation and are disconnected from the rotating components by an axial needle bearing (6).

The components with the index 6 to 18 belong to the differential and rotate proportional to the rear axle gear speeds.

The lock is effected between the right output (16) and the differential housing (18) and counteracts a difference in speed between the output bevel gears (16 and 17). The disc spring (11) opens the lock when the engine is not supplied with current.

### 4.3.7. System information

The M DSC control unit evaluates the dynamic handling characteristics parameters made available by other control units via the FlexRay data bus and determines the lock-up torque to be applied. The M DSC control unit can also request separate and higher-level locking interventions to stabilize the vehicle both when the M DSC is activated and deactivated.

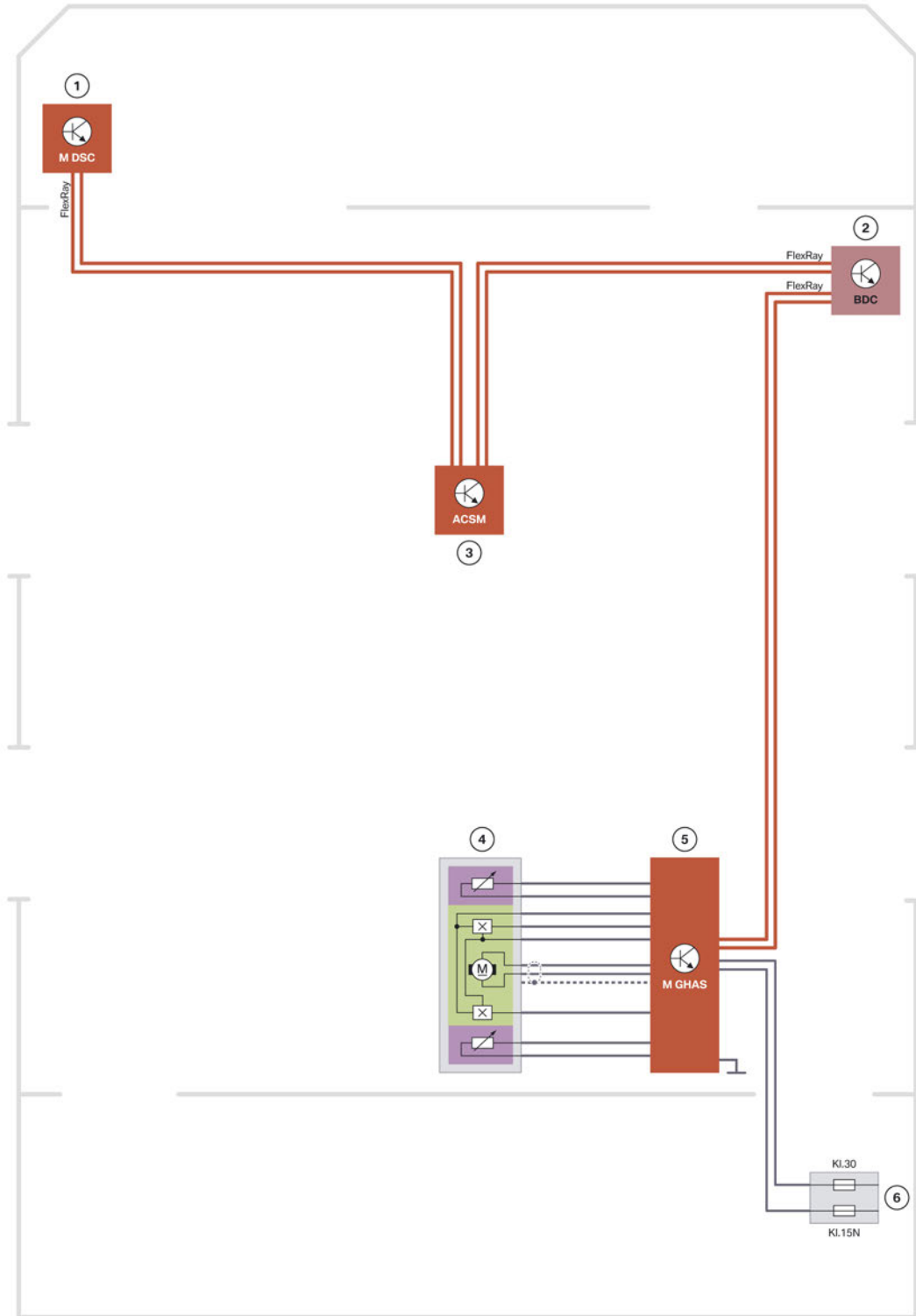
The position-controlled direct current motor is activated directly by the power electronics of the M GHAS control unit with vehicle voltage via a pulse-width-modulated signal. The frequency is approximately 4 kHz and the maximum current level is 30 A.

To determine the position and the direction of rotation of the electric motor it is equipped with 2 hall effect sensors.

# F97/F98 Complete Vehicle

## 4. Powertrain

### System wiring diagram



TA17-0356

F97/F98, M GHAS system wiring diagram



# F97/F98 Complete Vehicle

## 4. Powertrain

Index	Explanation
1	M Dynamic Stability Control (M DSC)
2	Body Domain Controller (BDC)
3	Advanced Crash Safety Module (ACSM)
4	Components of the regulated M rear axle differential lock
5	Regulated M rear axle differential lock (M GHAS)
6	Power distribution box, rear

### Interfaces

The M GHAS control unit works with the following control units and includes the following information:

Control unit	Bus system	Information
BDC	FlexRay	<ul style="list-style-type: none"><li>- Terminal status</li><li>- Vehicle identification number (for encoding)</li><li>- Vehicle condition (power management and fault memory block, e.g. in the event of voltage drop by engine start)</li></ul>
DME	FlexRay	<ul style="list-style-type: none"><li>- "Engine running" signal</li></ul>
M DSC	FlexRay	<ul style="list-style-type: none"><li>- Wheel speed</li><li>- Setpoint axial torque distribution</li><li>- Stabilization status</li><li>- Brake value</li><li>- Tolerance adjustment of wheel (adjustment of different wheel circumferences)</li><li>- Driving speed</li></ul>
ACSM	FlexRay	<ul style="list-style-type: none"><li>- Lateral acceleration</li><li>- Yaw rate</li><li>- Road longitudinal tilt</li><li>- Steering angle</li></ul>

### Electric motor location determination

To determine the position of the electric motor, 2 hall effect sensors in the engine are evaluated.

To calculate the characteristic curve for lock-up torque over motor position, recalibration is performed at regular intervals to compensate for wear in the clutch.

To be able to assign a certain position of the servomotor a certain coupling lock-up torque and to take the wear influences into account while doing so, a reference run is performed after the vehicle engine is switched off. During this reference run the engine is subjected to a defined current level. The lock-up torque of 0 Nm is assigned to the resulting position.

# F97/F98 Complete Vehicle

## 4. Powertrain

### Temperature monitoring

A total of 3 temperature sensors are installed. The temperature of the control unit (driver output stage), the temperature of the electric motor and the transmission oil temperature are monitored. The temperature thresholds are:

- Control unit 85 °C (185 °F)
- Electric motor 160 °C (320 °F)
- Oil temperature 190 °C (374 °F)

### 4.3.8. Service information

- If the M GHAS control unit is replaced, coding (activation of a vehicle-related characteristic curve) and then initial calibration are necessary, after which the fault memory must be erased.
- After the replacement of the entire M rear axle differential a calibration must be performed and then the fault memory must be deleted.
- If the electric motor, the electric motor and intermediate gearing or the oil temperature sensor is replaced, erasing the fault memory is all that is required.

The rear differential fluid is currently replaced at 2000 km (1200 mile running-in check) and every 3rd engine oil change.



---

Because of the change of clutch plate material to one with carbon content on the F90 and F97/F98, a new differential fluid is used. The initial filling is with Fuchs Titan 5037B.

---



---

Current rear axle differential box oil recommendations and capacities can be found in the current documentation of the BMW workshop information systems.

---



---

If, due to a fault, the M GHAS lock function is switched off or fails, a blocked differential is automatically reopened as the lock function is not self-locking. The driver is warned/informed and the following effects can be expected:

1. Deterioration of traction with dynamic driving style and low coefficients of friction, particularly with different coefficients of friction, left/right.
  2. Possible deterioration of stability in dynamic driving situations.
-

# F97/F98 Complete Vehicle

## 4. Powertrain

### 4.4. Differential

#### 4.4.1. Front axle differential

The VAG168AL front differential familiar from the G05 is used.

##### Technical data

Technical data	Front axle differential 168AL
Oil volume	0.45 l
Oil grade ex-works	Fuchs Titan EG3846
Oil grade in BMW Service	Castrol SAF-XO
Maximum input torque	1300 Nm
Possible ratios	3:154
Weight including oil filling	11.74 kg



Current front axle differential oil recommendations and capacities can be found in the current documentation of the BMW workshop information system.

### 4.5. Drive shafts and output shafts

#### 4.5.1. Front driveshaft

The front propeller shaft has been carried over from the G01/G02.

#### 4.5.2. Rear driveshaft

This is a steel prop shaft carried over from the F90 and adapted to the F97/F98. The dimensioning and strength of the prop shaft, the center bearing, the flange connecting to the flexible disc on the transfer box and the flange connecting to the rear differential have been adapted to the higher torque of the F97/F98.



The maximum permissible deflection angle of the propeller shaft must not be exceeded when working on the propeller shaft center bearing. The instructions in the current repair instructions in ISTA absolutely must be followed.

It is important to follow the procedures in the current repair instructions in ISTA regarding inserted and screwed propeller shafts on the rear axle differential.

# F97/F98 Complete Vehicle

## 4. Powertrain

### 4.5.3. Front output shafts

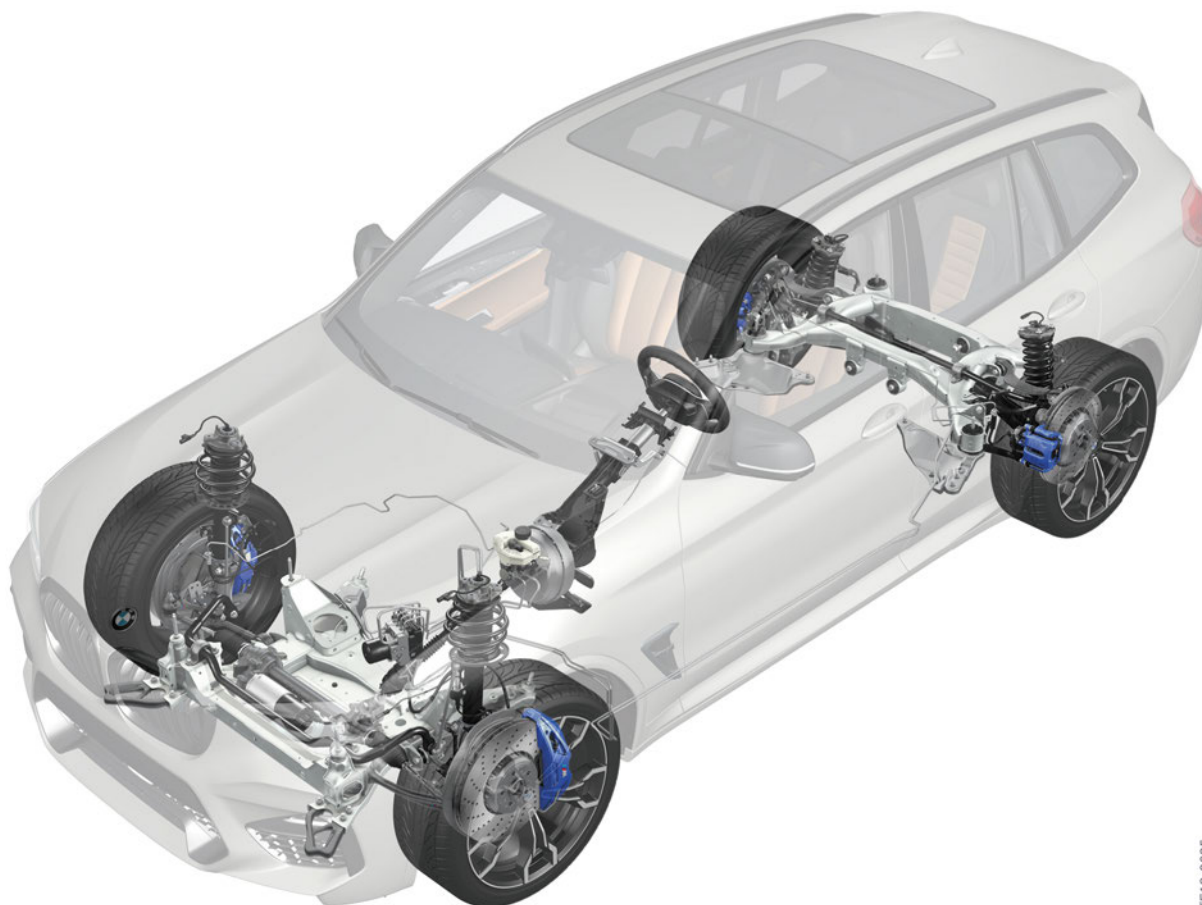
The front output shafts have been carried over from the G01/ G02 with the VAG170AL.

### 4.5.4. Rear output shafts

The rear output shafts have been carried over from the F90 and adapted to the F97/F98. The dimensioning and strength of the shaft and the joints with the rear differential and wheel bearing have been adapted to the higher torque of the F97/F98.

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension



TF18-2635

F97/F98, complete chassis and suspension

The chassis and suspension is based on the technology of the G01/G02, though once again with many new M-specific or adapted components.

Designation	Unit	F97/F98
Wheelbase/ Turning circle	[mm]	2864
Front track width	[mm]	1623
Rear track width	[mm]	1602
Front axle		Twin-arm McPherson strut front suspension
Steering		Electronic Power Steering (EPS)
Steering-gear ratio		12,9
Rear axle		HA5 Rear axle
Final drive ratio		3,15

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

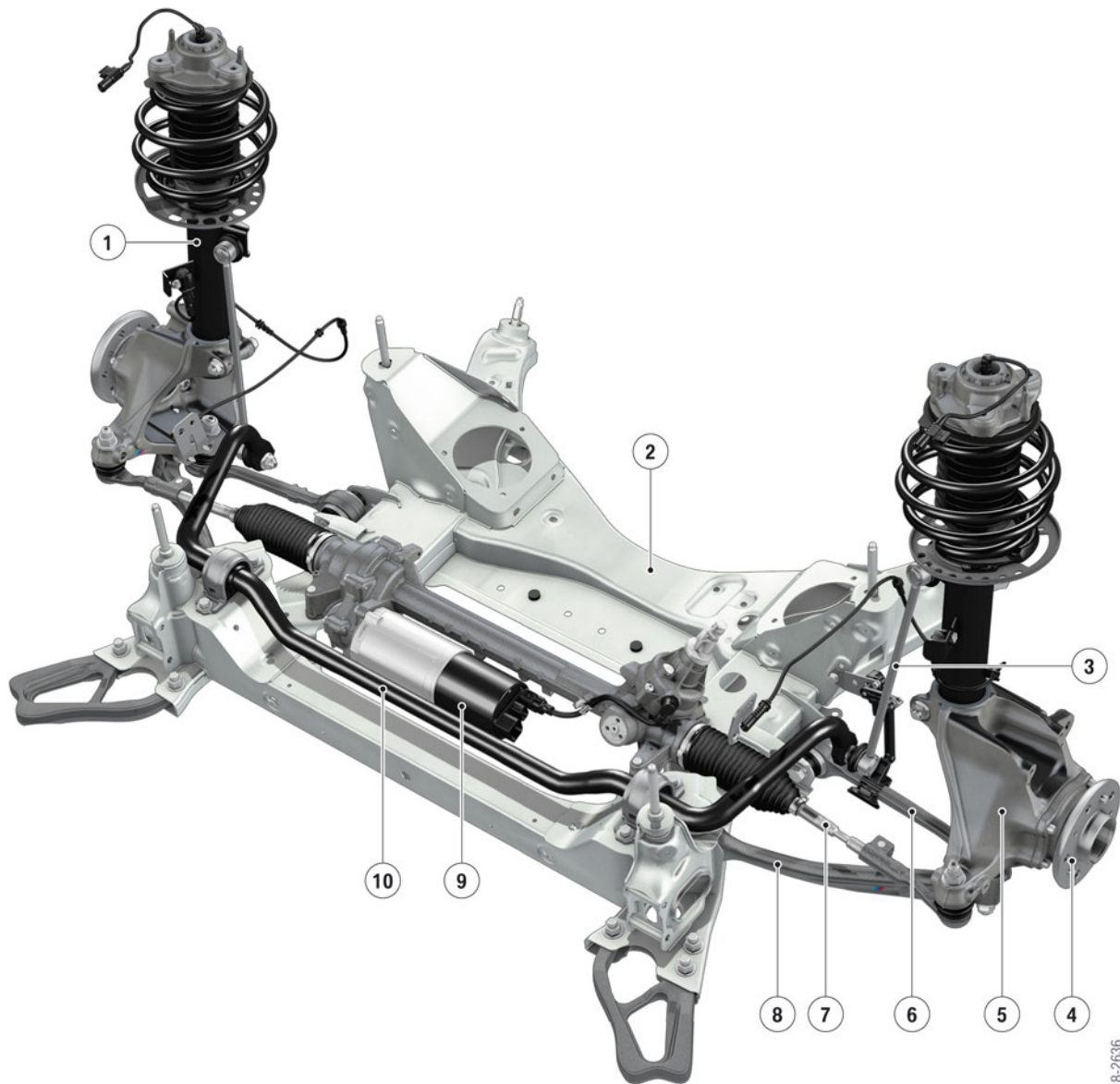
### 5.1. Front axle

The front suspension is based on the twin-arm spring-strut front suspension used on the G01/G02. The following components and mounts are new M-specific or adapted versions:

- Front axle support
- Steering
- Wishbone
- Trailing link with hydro mount
- Ball joint (F25)
- Swivel bearing
- Wheel hub
- Spring strut
- Support bearing
- Anti-roll bar

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension



TF18-2636

F97/F98, twin-arm spring-strut front suspension

Index	Explanation
1	M spring strut with support bearing
2	Front axle support
3	Anti-roll bar link
4	M wheel hub
5	M swivel bearing
6	M wishbone

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

Index	Explanation
7	Track rod
8	M trailing link with hydro mount
9	M Servotronic (M EPS)
10	M anti-roll bar

### 5.1.1. Steering

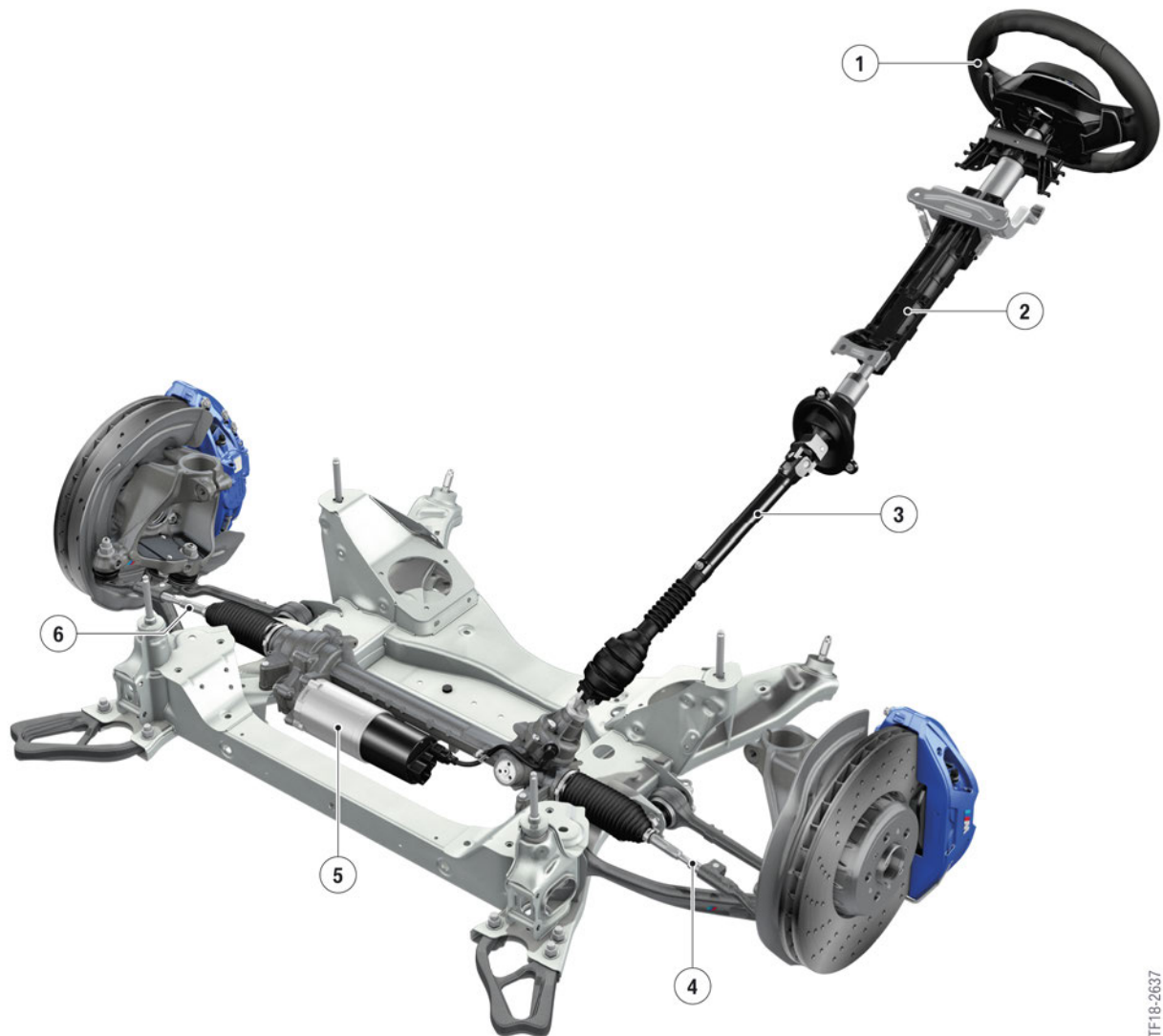
Within the framework of the EfficientDynamics measures for the F97/F98, the steering used is a rack-and-pinion steering with electrical steering wheel support “M Servotronic based on an EPS”.

For power assistance during steering an electric motor is mounted parallel to the rack on the steering gear housing with the power transmitted via a ball screw.



# F97/F98 Complete Vehicle

## 5. Chassis and Suspension



TF18-2637

F97/F98, steering

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

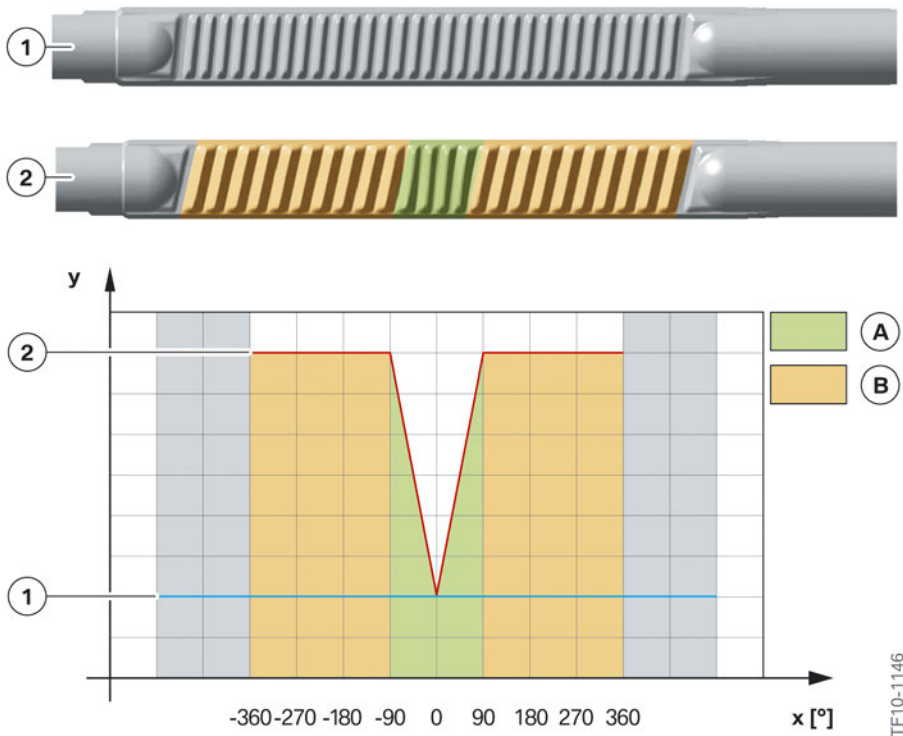
The M Servotronic (M EPS) has been developed independently for the F97/F98. All components of the M Servotronic (M EPS) have been developed specifically for the F97/F98. With this measure the development of the steering was able to be coordinated to the typical M properties. Special attention was paid here to the typical M features:

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

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

The ratio of M Servotronic (M EPS) has been adapted to the F97/F98; of particular note is the fact after an eighth of a turn of the steering wheel the rack ratio increases by 8%.



F97/F98, comparison of M Servotronic (M EPS) steering gear ratios

Index	Explanation
1	Rack, basic version G01/G02 (constant gear geometry)
2	Rack, variable sport steering F97/F98 (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

The system supplier for the M Servotronic (M EPS) is Thyssen Krupp.

### 5.1.2. M Servotronic

The Servotronic function familiar from conventional hydraulic power-steering systems is also used on the M Servotronic (M EPS) and is available as standard on the F97/F98. It is a M Servotronic, which functions according to the same operating principle as in production vehicles. The difference in the

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

M Servotronic is that 3 stages can be selected in comparison to 2 stages in the production vehicles, and it has a separate button in the M driving dynamics button panel in the center console. Using the button or via the M1/M2 buttons, the driver can switch between "Comfort", "Sport" and "Sport+". Here the corresponding characteristic curve is activated and in Sport direction the power steering support is also noticeably withdrawn. The program selection can also be preconfigured in the head unit HU and selected using the M1/M2 buttons on the steering wheel.

### **M drive dynamic control switch, program description, M Servotronic:**

- "COMFORT": Focus on light and comfortable steering torques with perfect feedback from the road surface at the same time.
- "SPORT": Greater rise in the steering force and perceptibly more feedback for sporty M dynamic driving, both for every day use and at the dynamic driving limit.
- "SPORT+": Even greater rise in the steering force and high steering force level for the greatest possible feedback and clear sporty steering sensation.

### **5.1.3. Steering angle sensor**

The information on the steering angle in the F97/F98 is not recorded by the Electronic Power Steering (EPS) and not via a separate sensor on the steering wheel and instead is computed based on the motor position angle of the EPS motor in relation to the steering wheel.

The EPS delivers the position of the rack via FlexRay to the M Dynamic Stability Control (M DSC). 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).

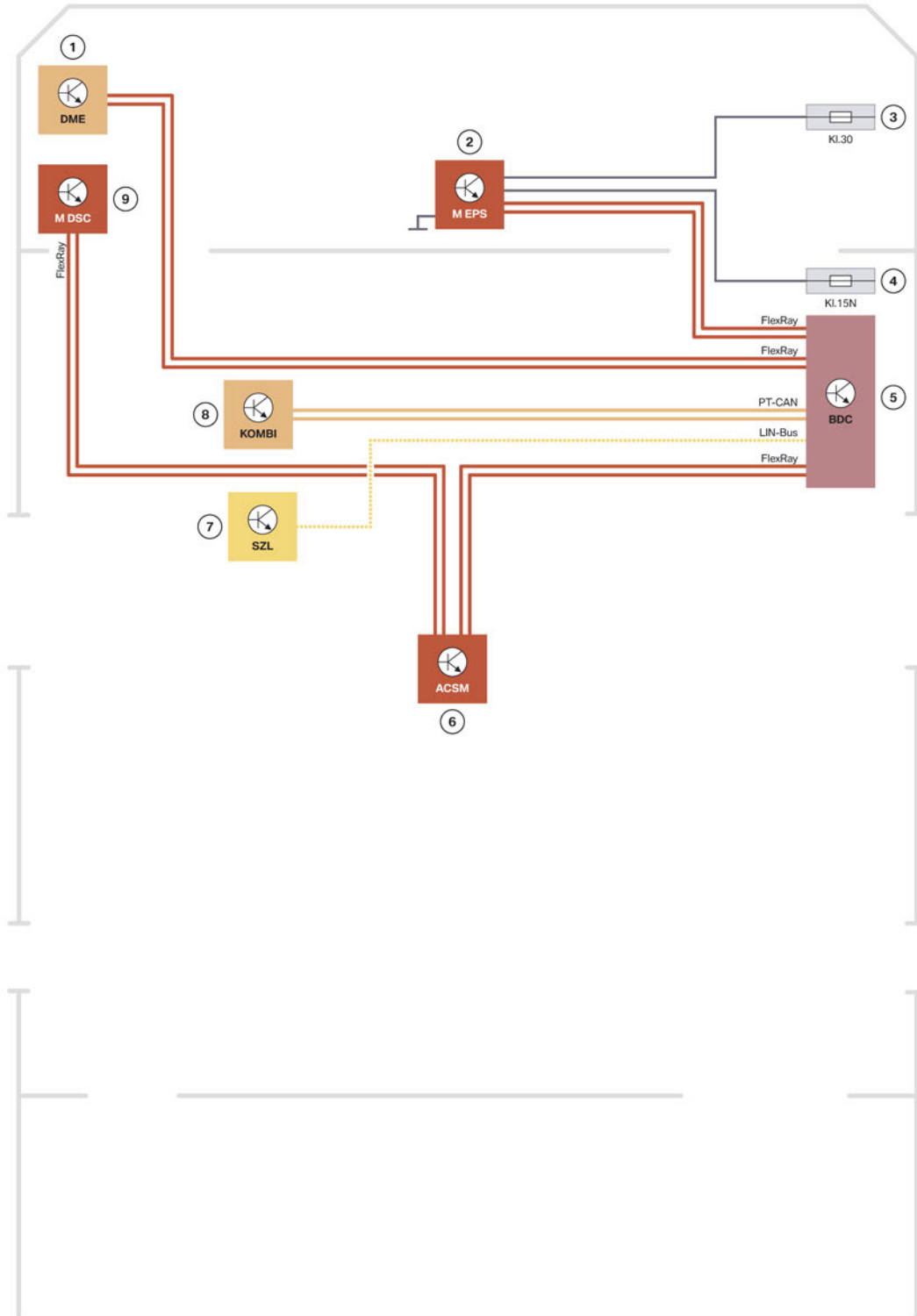
Taking this position as the starting point, the M Dynamic Stability Control (M DSC) determines the wheel-specific steering angle among other things using the stored ratio parameters (rack to wheel-specific steering angle) and transmits this via FlexRay. This wheel-specific steering angle is used by the M Dynamic Stability Control (M 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, flash process), the absolute value is determined through interaction between the M Dynamic Stability Control (M DSC) and EPS using an adaption function in which the steering wheel is turned from end stop to end stop (e.g. straight-ahead position -> left -> right -> straight-ahead position).

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

### 5.1.4. System wiring diagram, M Servotronic



F97/F98, M Servotronic (M EPS) system wiring diagram

TF17-0376

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

Index	Explanation
1	Digital Motor Electronics (DME)
2	M Servotronic (M EPS)
3	Power distribution box, engine compartment
4	Power distribution box, front
5	Body Domain Controller (BDC)
6	Advanced Crash Safety Module (ACSM)
7	Steering column switch cluster (SZL)
8	Instrument cluster (KOMBI)
9	M Dynamic Stability Control (M DSC)

### 5.2. Rear axle

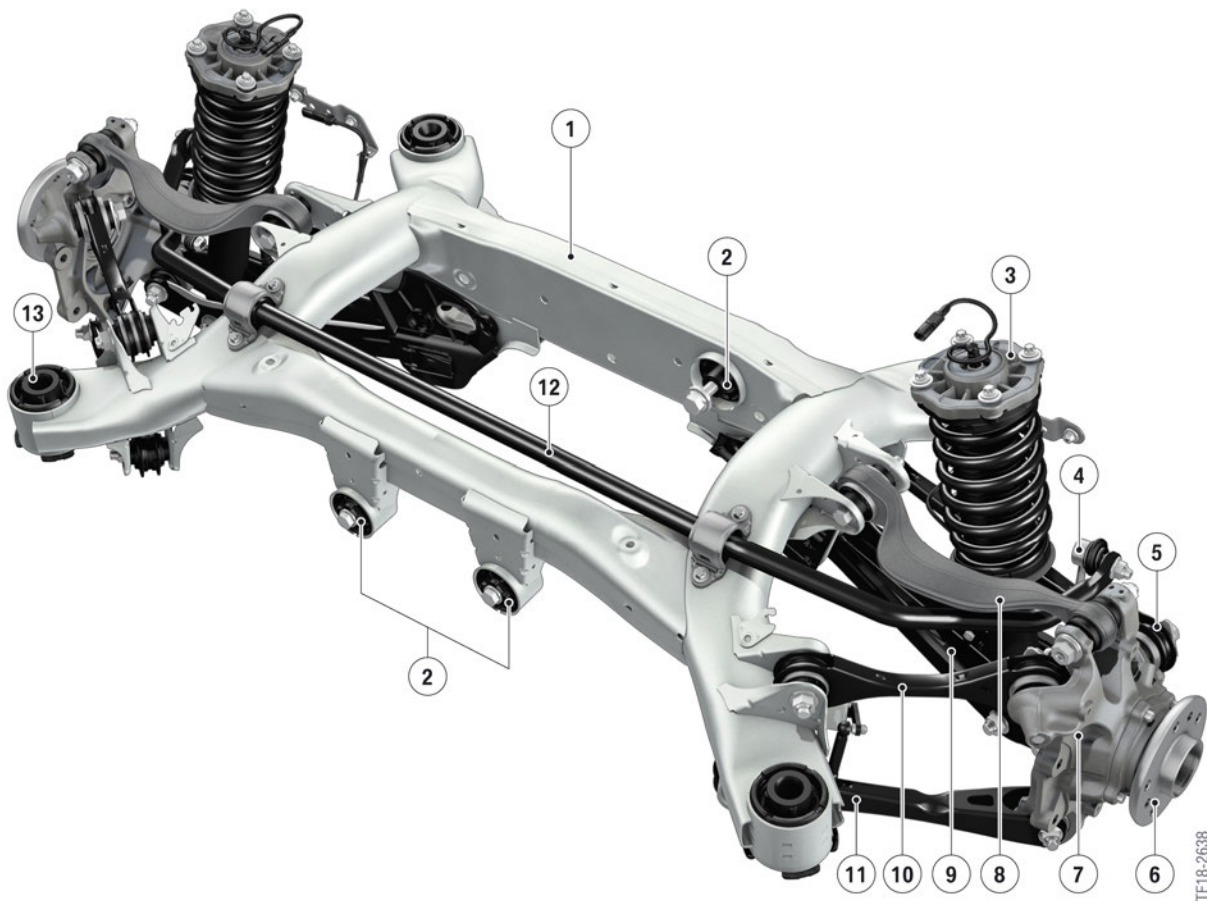
The rear suspension is based on the HA5 rear suspension from the G01/G02. Many components and mounts are new or adapted versions specific to the F97/F98. The rear suspension subframe specific to the F97/F98 is fixed to the body by means of M-specific hard rubber mounts.

The following components and mounts are new M-specific or adapted versions:

- Rear axle support
- Wheel carrier
- Wheel hub
- Spring strut
- Support bearing
- Anti-roll bar.

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension



F97/F98, HA5 rear suspension

Index	Explanation
1	M rear axle support
2	Attachment point for rear axle final drive
3	M spring strut with M support bearing
4	Anti-roll bar link
5	Camber link
6	M wheel hub
7	M wheel carrier
8	Wishbone
9	Camber control arm
10	Control arm
11	Trailing arm
12	M anti-roll bar (Ø 24.7 mm)
13	Attachment point of rear axle bearing (with hard rubber mount)

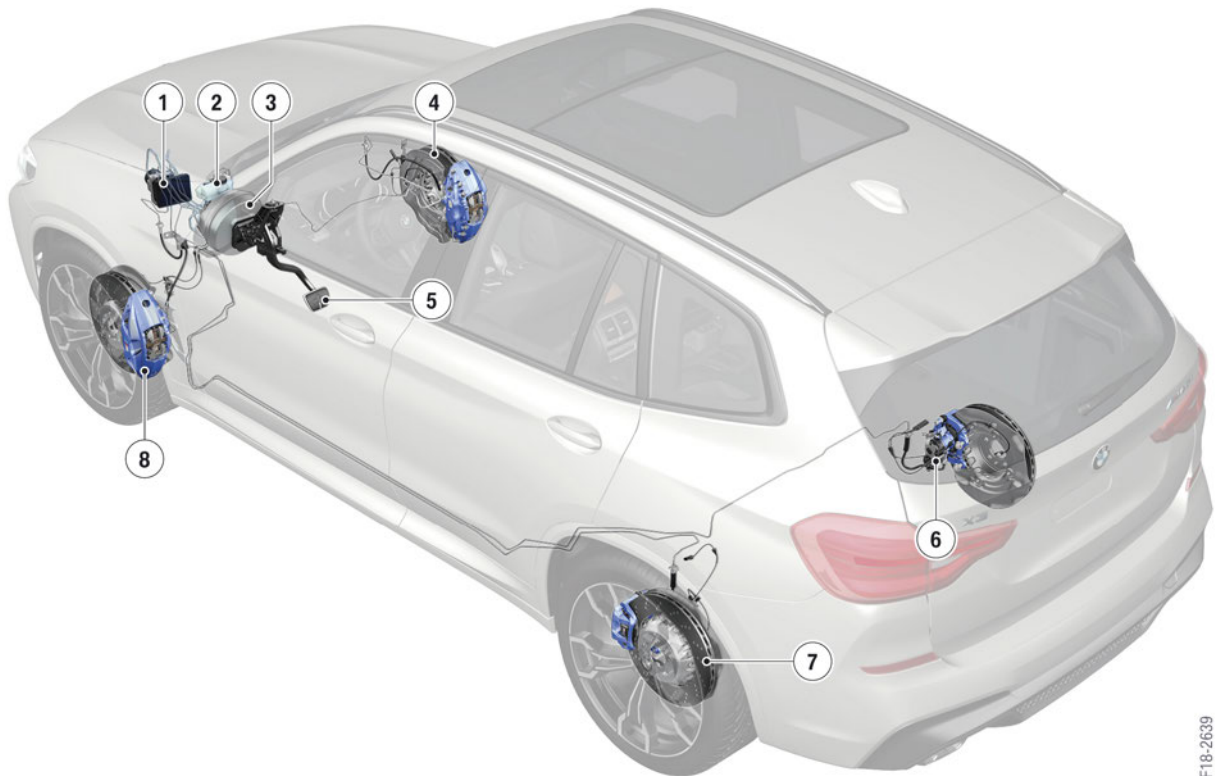
# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

### 5.3. Brakes and wheels/tires

#### 5.3.1. Brakes

##### M compound brake



F97/F98, brake system

TF18-2639

Index	Explanation
1	M Dynamic Stability Control (M DSC)
2	Brake fluid expansion tank
3	Brake servo (left-hand drive vehicle)
4	Front M compound brake disc
5	Brake pedal
6	Rear single-piston floating caliper with actuator for the electromechanical parking brake
7	Rear M compound brake disc
8	Front four-piston fixed caliper

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

The M compound brake provides even greater braking power than the sports brake offered on the G01/G02 BMW X3/X4 M40i. In a direct comparison it also offers:

- Reduction in the vehicle weight, resulting in improved agility and dynamics, accelerating ability and fuel consumption
- Reduction in the rotating mass, resulting in improved accelerating ability, response and handling
- Increased fading stability and greater thermal resistance
- Perforated disc ring, sports-style look, optimized response characteristics in the wet
- Usage of intelligent lightweight construction
- Technology transfer from M sport
- Unique, authentic M design.

Designation	Unit	G01/G02 M40i	F97/F98
Front brake		4-piston fixed caliper	4-piston fixed caliper
Brake disc, front	[mm]	348 x 36	395 x 36
Rear brakes		1 piston, floating caliper	1 piston, floating caliper
Brake disc	[mm]	345 x 24	370 x 24
Parking brake		electro-mechanical	electro-mechanical

The front brake is entirely specific to the F97/F98. It is a large, perforated M compound brake disc combined with a four-piston fixed caliper. The brake disc diameter is 47 mm larger than that of the G01/G02 M40i. The exterior of all brake calipers is blue metallic in color with the M logo.



TF18-2640

F97/F98, front brake



# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

The diameter of the rear perforated M compound brake disc is 25 mm larger than that of the G01/G02 BMW M40i. Apart from the blue paint finish, the rear brake caliper including the electromechanical parking brake has been carried over from the standard production models and is a single-piston floating caliper.

The characteristic maps of the M Dynamic Stability Control have been adapted specifically to the M design.

### **M carbon ceramic brakes**

M carbon ceramics brakes are not offered.



---

### **Brake noise**

- Humming of the BMW M compound brake disc at high speeds
- Squeaking brakes shortly before coming to a halt
- Cracking noises from the area of the BMW M compound brake discs when hot.

Explain to the customer at this point that such noises occurring temporarily or in specific situations are inherent in the design and do not represent a quality problem. They are a consequence of the special performance of the brakes and do not pose any danger or risk of damage.

Point out that the customer can use his/her braking technique to help prevent the noises occurring or ensure they quickly disappear again. For example, after washing the vehicle it is important to dry the brakes out by braking (braking a few times from 50 km/h (31 mph) to 0 is sufficient). Or that the brakes can have a tendency to squeak if they go through long periods when they are only exposed to light braking, which is why braking hard a few times can help out (= higher brake temperature). After driving the vehicle very hard and subjecting the braking system to high loads (high brake disc temperatures) the driver should try to make sure that the brakes are able to cool down while the vehicle is moving and not to keep the brakes on the first time the vehicle comes to a stop. As a result of the increased material transfer from the brake pads to the disc after very hard driving, a humming noise can occur which disappears again after a short time.

### **Brake dust**

Is an effect of a high-performance braking system. The BMW M models are high-performance vehicles which are designed for fast and dynamic driving and embody a racing pedigree. The specially designed brakes make possible the high braking performance required by the vehicle and in so doing generate larger amounts of dust due to the greater levels of friction. The brake dust tells the customer that his/her BMW M vehicle has been driven in an appropriate manner. What is important is to ensure that it is regularly removed by washing the vehicle, as otherwise it will eat into the surface of the wheel.

---

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

### 5.3.2. Wheels/tires



F97/F98, wheels

Index	Explanation
A	M standard 20" wheel (764M)
B	M optional 21" wheel (765M)

The following wheel/tire combinations are offered:

#### Standard equipment

Designation	G01/G02 M40i	F97/F98	F97/F98 Competition
LM EH2+ wheel rim, standard wheel at front (cast)	8J x 20 Styling 787M	9 J x 20 Styling 764M	9.5J x 21 Styling 765M
LM EH2+ wheel rim, standard wheel at rear (cast)	9.5J x 20 Styling 787M	10J x 20 Styling 764M	10J x 21 Styling 765M
Color		Bi-color Orbit grey	Bi-color Black
Standard tires, front	245/44 R20	255/45 R20	255/40 R21
Standard tires, rear	275/40 R20	265/45 R20	265/40 R21
RSC tires with emergency running properties	No	No	No

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

### Optional equipment

Designation	F97/F98
LM EH2+ wheel rims (forged) styling 765M	9.5J x 21
LM EH2+ wheel rims, rear (forged) styling 765M	10J x 21
Color	Bi-color Orbit grey
Front tires	255/40 R21
Rear tires	265/40 R21
RSC tires with emergency running properties	No

### Factory equipment



The components of the above-listed wheel/tire combinations have been developed specially for the F97/F98. 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 F97/F98 and lead to forfeiture of the operating licence with forfeiture of the insurance cover.

## 5.4. Driving dynamics systems

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.

### 5.4.1. Vertical Dynamics Management

The EDC function integrated in the M vertical dynamic platform (M VDP) controls the adjustable dampers.

The drivability can be shifted toward the individual driving dynamics direction via the EDC button in the M drive dynamic control switch on the center console. The program selection can also be preconfigured in the head unit HU and selected using the corresponding M1/M2 buttons on the steering wheel.

#### Adaptive M suspension on Competition model (Dynamic Damper Control)

There are no EDC control valves as familiar from the G01/G02 fitted on the outside of the shock absorbers but instead typical M-only internal control valves. The shock absorbers have been developed with the supplier ZF Sachs and the system adapted to the F97/F98.

The EDC works with infinitely variable valves in the absorbers. The hydraulic oil flow is controlled via electromagnetic control valves. It is thus possible to make available the damping force actually required at all times. The infinitely variable control principle was introduced for the first time in the E65 and has consistently been further developed.

# F97/F98 Complete Vehicle

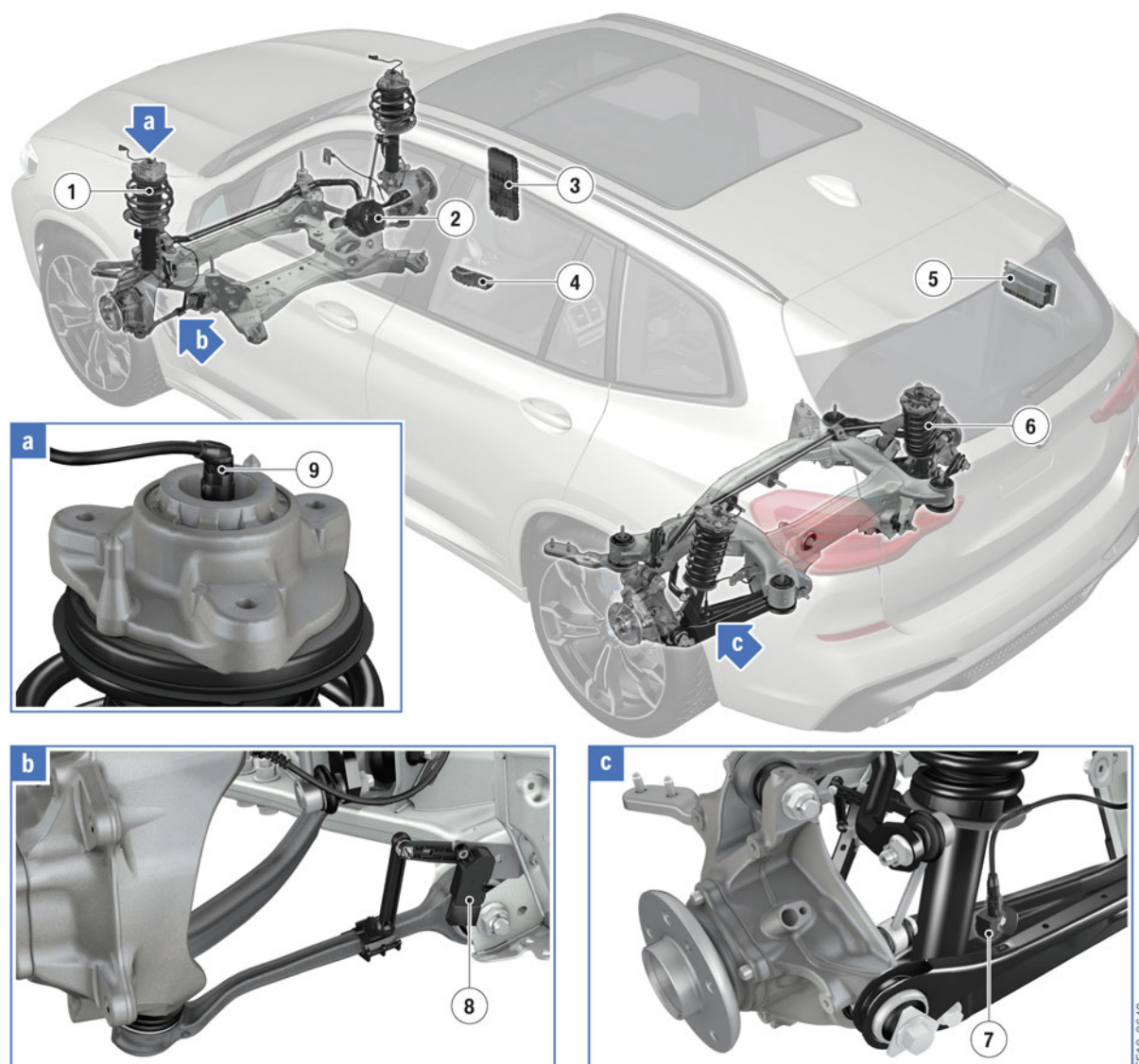
## 5. Chassis and Suspension

The following variables, among others, were processed into the corresponding control variables in the M Vertical Dynamic Platform (M VDP): vertical acceleration, wheel speed M DSC, steering angle change M EPS, angle change rate ACSM and damper piston speed .

In addition, the ride height between the wheel suspension and body is used as a control, reference and load variable and is read off of the ride height sensors of the headlights. There is one sensor each at the front and rear. They operate on the basis of the potentiometer principle and their signal is made available to the M Vertical Dynamic Platform (M VDP).

t

### System overview



F97/F98, EDC system overview

# F97/F98 Complete Vehicle

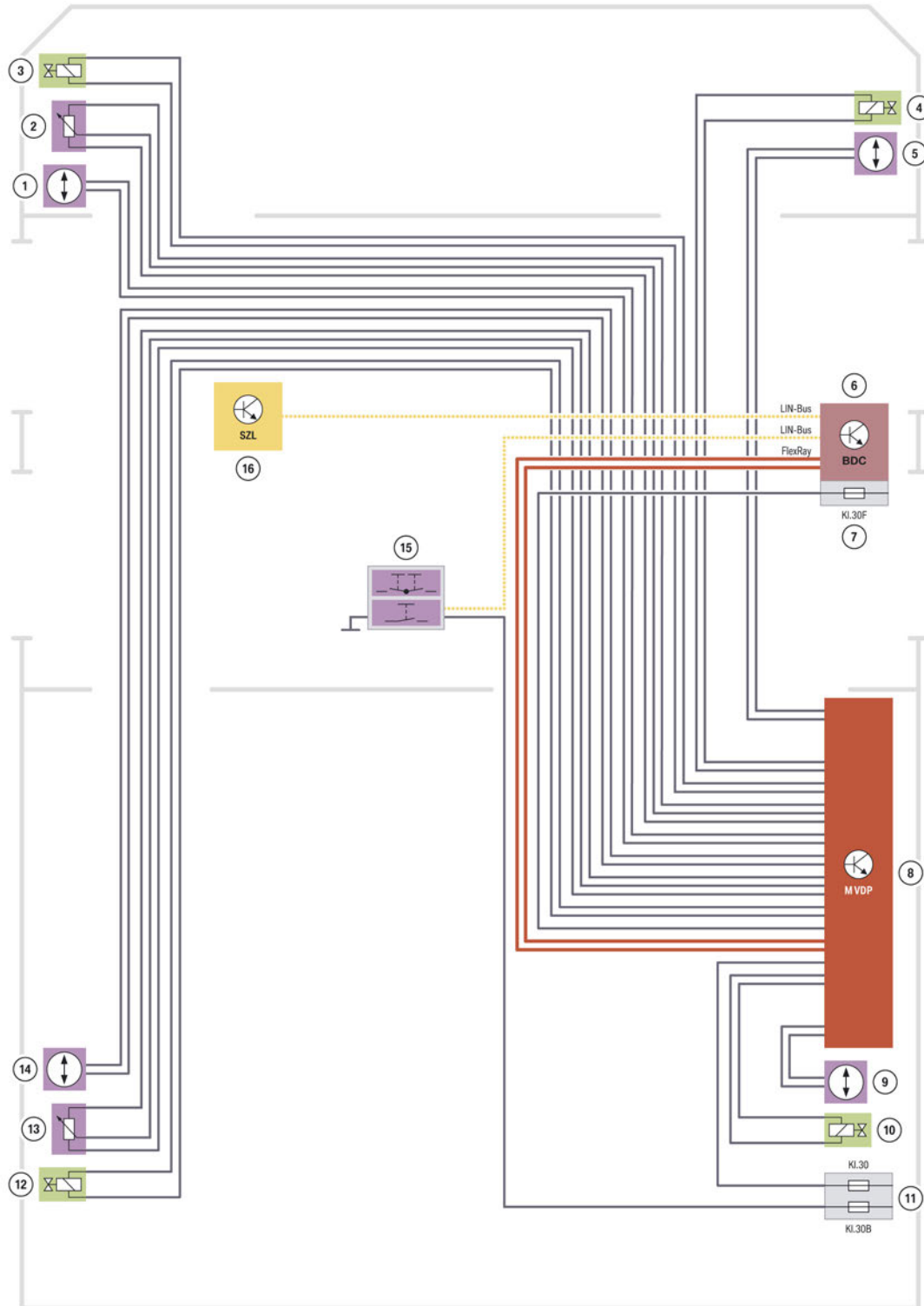
## 5. Chassis and Suspension

<b>Index</b>	<b>Explanation</b>
1	Electronic adjustable damper, front
2	Steering column switch cluster (SZL)
3	Body Domain Controller (BDC)
4	EDC button
5	M vertical dynamic platform M (VDP)
6	Electronic adjustable damper, rear
7	Rear left vertical acceleration sensor
8	Ride height sensor, front left
9	Electrical connection, EDC valve

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

### System wiring diagram



F97/F98, EDC system wiring diagram

TF18-2643

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

Index	Explanation
1	Vertical acceleration sensor, front left
2	Ride height sensor, front left
3	EDC control valve, front left
4	EDC control valve, front right
5	Front right vertical acceleration sensor
6	Body Domain Controller (BDC)
7	Power distribution box, front
8	M vertical dynamic platform (M VDP)
9	Rear right vertical acceleration sensor
10	EDC control valve, rear right
11	Power distribution box, rear
12	EDC control valve, rear left
13	Ride height sensor, rear left
14	Rear left vertical acceleration sensor
15	EDC button
16	Steering column switch cluster (SZL)

### System function

The Electronic Damper Control (EDC) is a variable, electronically controlled shock absorber adjustment system that controls the vertical dynamics. The front axle damper and rear axle damper can be controlled independent of each other. The EDC adapts the damping forces of the shock absorber more or less instantly to the changing road or driving conditions.

The EDC consists of:

- 4 continuously variable shock absorbers with coupled rebound/compression stage adjustment
- M VDP control unit
- 2 vertical acceleration sensors on the front axle (swivel bearing) for determining the wheel movement
- 2 vertical acceleration sensors on the rear axle (wheel bearing) for determining the wheel movement
- 2 ride height sensors
- Body Domain Controller as gateway.

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

The sensors in the vehicle permanently measure:

- The body and vertical acceleration
- The current lateral and longitudinal acceleration
- The vehicle speed
- The steering wheel position.

Based on this measured data, the M VDP 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.

This improves ride comfort and also increases driving dynamics.

This improves the vehicle's:

- Suitability for long-distance journeys
- Enhanced body stability and agility
- Improves driving safety by minimizing wheel load fluctuations and reducing the stopping distance.

### **Adaptive suspension (EDC) button options**

The EDC button is connected with the Body Domain Controller (BDC) via the LIN bus. The Body Domain Controller (BDC) forwards this information via the FlexRay bus to M VDP.

The Dynamic Damper Control on the F97/F98 offers the options "Comfort", "Sport" and "Sport+". All three programs feature M dynamic control on the F97/F98.

### **Note:**

In the first E92/E90 M3 models, the EDC had the three options, "Comfort", "Normal" and "Sport", whereby with the "Sport" option there is no M dynamic control, but the dampers are set very hard. This is primarily suited for a cone slalom on an even surface. However, the fastest possible times on normal roads cannot be achieved with the "Sport" option. The E93 M3 was dynamically controlled in "Sport" mode on standard production models upwards, and all succeeding models including the F97/F98 are dynamically controlled in "Sport+" mode.



# F97/F98 Complete Vehicle

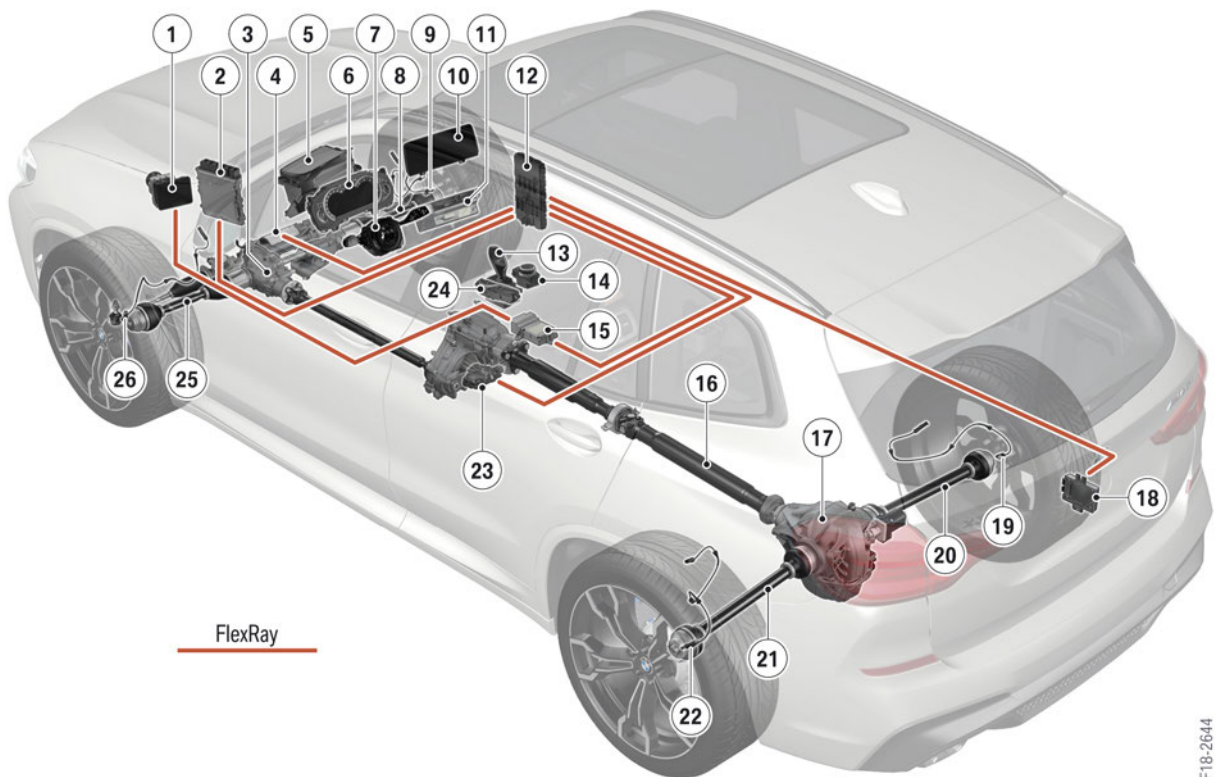
## 5. Chassis and Suspension

### M drive dynamic control switch, EDC program description:

- "Comfort" mode on the F97/F98 delivers a distinctly comfortable ride to satisfy any demands for comfort on the part of BMW X3 M or BMW X4 M customers. The basic damper hardness is comfortable without forfeiting safe handling in an emergency (such as during rapid evasive maneuvers).
- "Sport" supports a demanding M dynamic and sporty driving style with increased basic damper hardness and sufficient remaining comfort (for example on country roads or bumpy racetracks such as the Nürburgring Nordschleife).
- "Sport+" on the F97/F98 now also means that M dynamic control comes into effect, with the basic shock absorber stiffness being further increased relative to "Normal". It may therefore also be the best selection for the fastest times on different route profiles on very even surfaces, unlike a route profile similar to a "cone-lined slalom".

### 5.4.2. M Dynamic Stability Control (M DSC)

The M Dynamic Stability Control (M DSC) represents the longitudinally dynamic system network. This control unit coordinates the interaction between the M Servotronic, engine control, M VTG and the regulated M rear axle differential lock M GHAS.



F97/F98, longitudinal dynamics system overview

TF18-2644

# F97/F98 Complete Vehicle

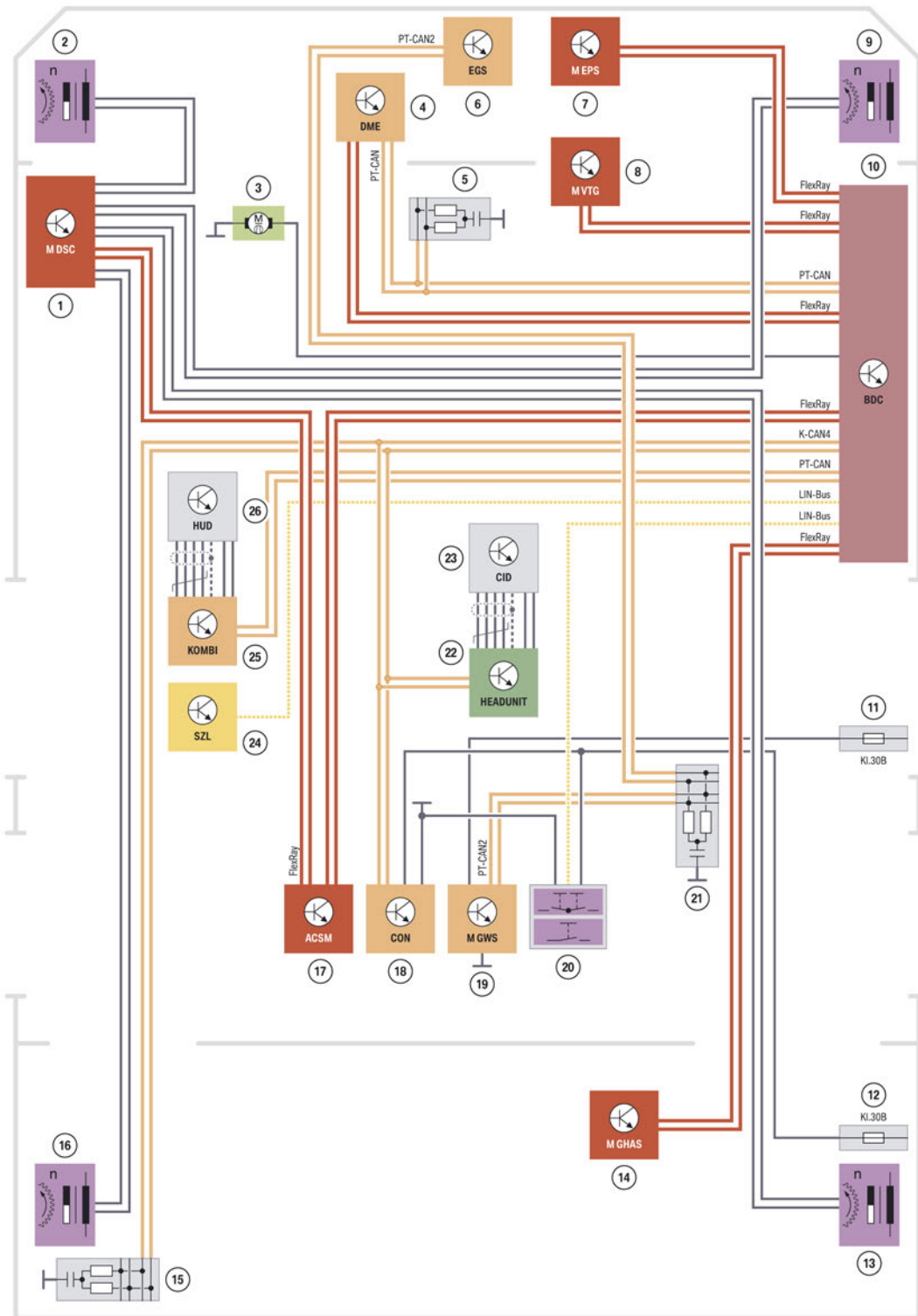
## 5. Chassis and Suspension

Index	Explanation
1	M Dynamic Stability Control (M DSC)
2	Digital Motor Electronics (DME)
3	Front axle differential
4	M Servotronic (M EPS)
5	Head-Up Display HUD (M-specific)
6	Instrument cluster KOMBI (M-specific)
7	Steering column switch cluster (SZL)
8	Output shaft, front right
9	Wheel speed sensor, front right
10	Central Information Display (CID)
11	Head Unit HU (M-specific)
12	Body Domain Controller (BDC)
13	M gear selector switch (M GWS)
14	Controller (CON)
15	Advanced Crash Safety Module (ACSM)
16	Prop shaft
17	M rear axle differential lock
18	Regulated M rear axle differential lock (M GHAS)
19	Wheel speed sensor, rear right
20	Output shaft, rear left
21	Output shaft, rear left
22	Wheel speed sensor, rear left
23	M transfer box (M VTG)
24	M drive dynamic control switch
25	Output shaft, front left
26	Wheel speed sensor, front left
FlexRay	FlexRay bus

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

### System wiring diagram



F97/F98, longitudinal dynamics system wiring diagram

TF18-2645

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

<b>Index</b>	<b>Explanation</b>
1	M Dynamic Stability Control (M DSC)
2	Wheel speed sensor, front left
3	Auxiliary coolant pump, heating
4	Digital Motor Electronics (DME)
5	PT-CAN terminating resistor
6	Electronic transmission control (EGS)
7	M Servotronic (M EPS)
8	M transfer box (M VTG)
9	Wheel speed sensor, front right
10	Body Domain Controller (BDC)
11	Power distribution box, front
12	Power distribution box, rear
13	Wheel speed sensor, rear right
14	Regulated M rear axle differential lock (M GHAS)
15	K-CAN4 terminating resistor
16	Wheel speed sensor, rear left
17	Advanced Crash Safety Module (ACSM)
18	Controller (CON)
18	M gear selector switch (M GWS)
20	M drive dynamic control switch
21	PT-CAN2 terminating resistor
22	Head Unit HU (M-specific)
23	Central Information Display (CID)
24	Steering column switch cluster (SZL)
25	Instrument cluster KOMBI (M-specific)
26	Head-Up Display HUD (M-specific)

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

### 5.4.3. Integrated actuation (longitudinal transverse dynamics)

What is known as integrated actuation is used on the F97/F98. The integrated actuation in the M DSC comprises the DSC, which is responsible for the longitudinal dynamics, and a transverse dynamics management control unit (QDM) integrated in the DSC control unit. This means that the current driver's choice is distributed to the appropriate actuator via this M DSC control unit. That results in the following benefits when driving the F97/F98:

- Excellent traction, especially on low coefficients of friction
- M-specific agility and playfully intuitive control of the vehicle
- Superiority in every day use
- Variable functions of the M xDrive are possible, depending on the driver's choice.

The actuator and control units that are used depending on the driver's choice are:

- M Servotronic (M EPS)
- M VDP Electronic Damper Control (EDC)
- M regulated M rear axle differential lock (M GHAS)
- M Dynamic Stability Control (M DSC)
- M transfer box (M VTG)
- Digital Motor Electronics (DME)



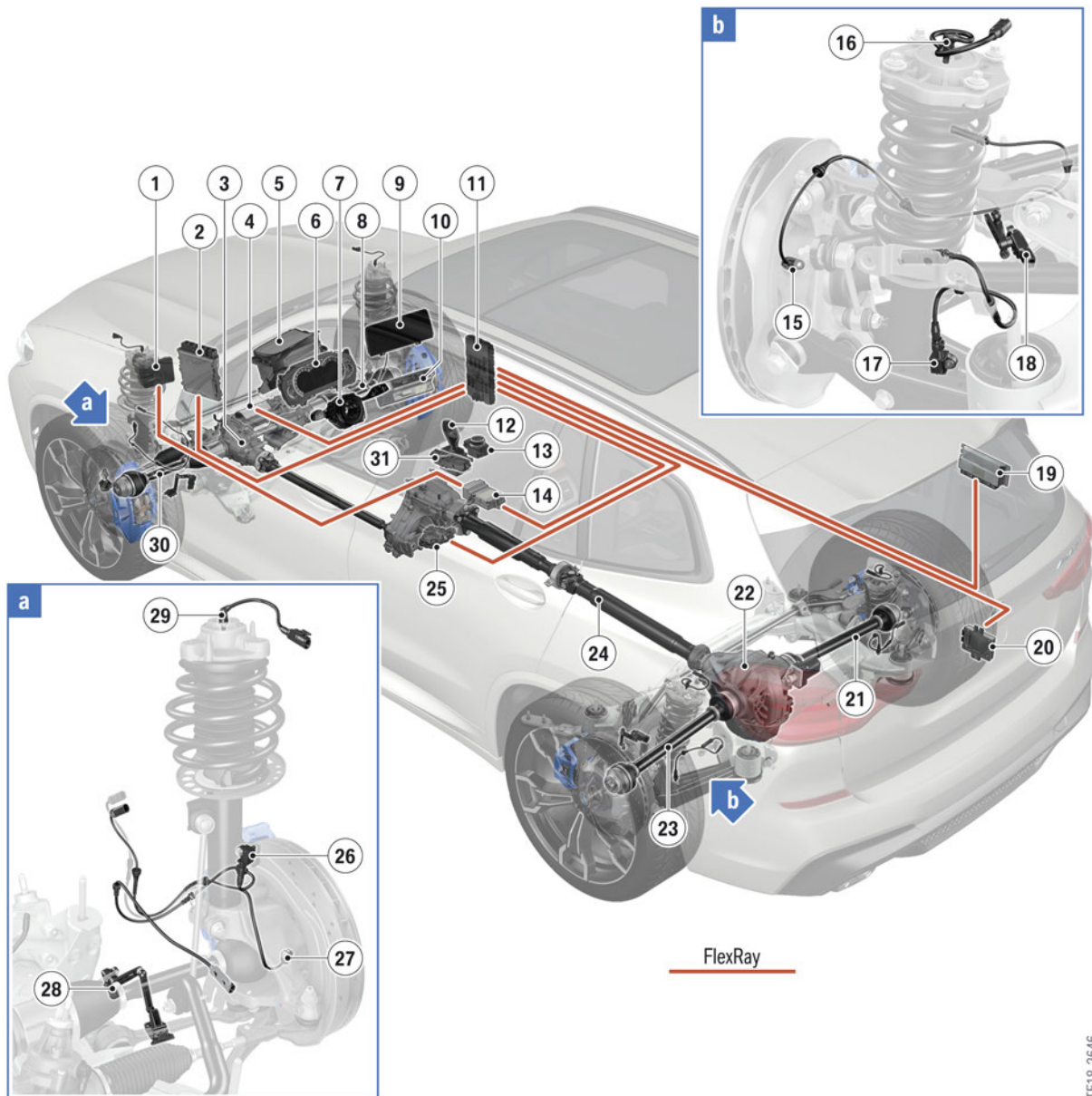
---

The transverse dynamics management control unit QDM is not a separate control unit, but is integrated in the M DSC. It therefore cannot be replaced separately.

---

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension



F97/F98, integrated actuation system overview

TF18-2646

Index	Explanation
1	M Dynamic Stability Control (M DSC)
2	Digital Motor Electronics (DME)
3	Front axle differential
4	M Servotronic (M EPS)
5	Head-Up Display HUD (M-specific)
6	Instrument cluster KOMBI (M-specific)
7	Steering column switch cluster (SZL)

# F97/F98 Complete Vehicle

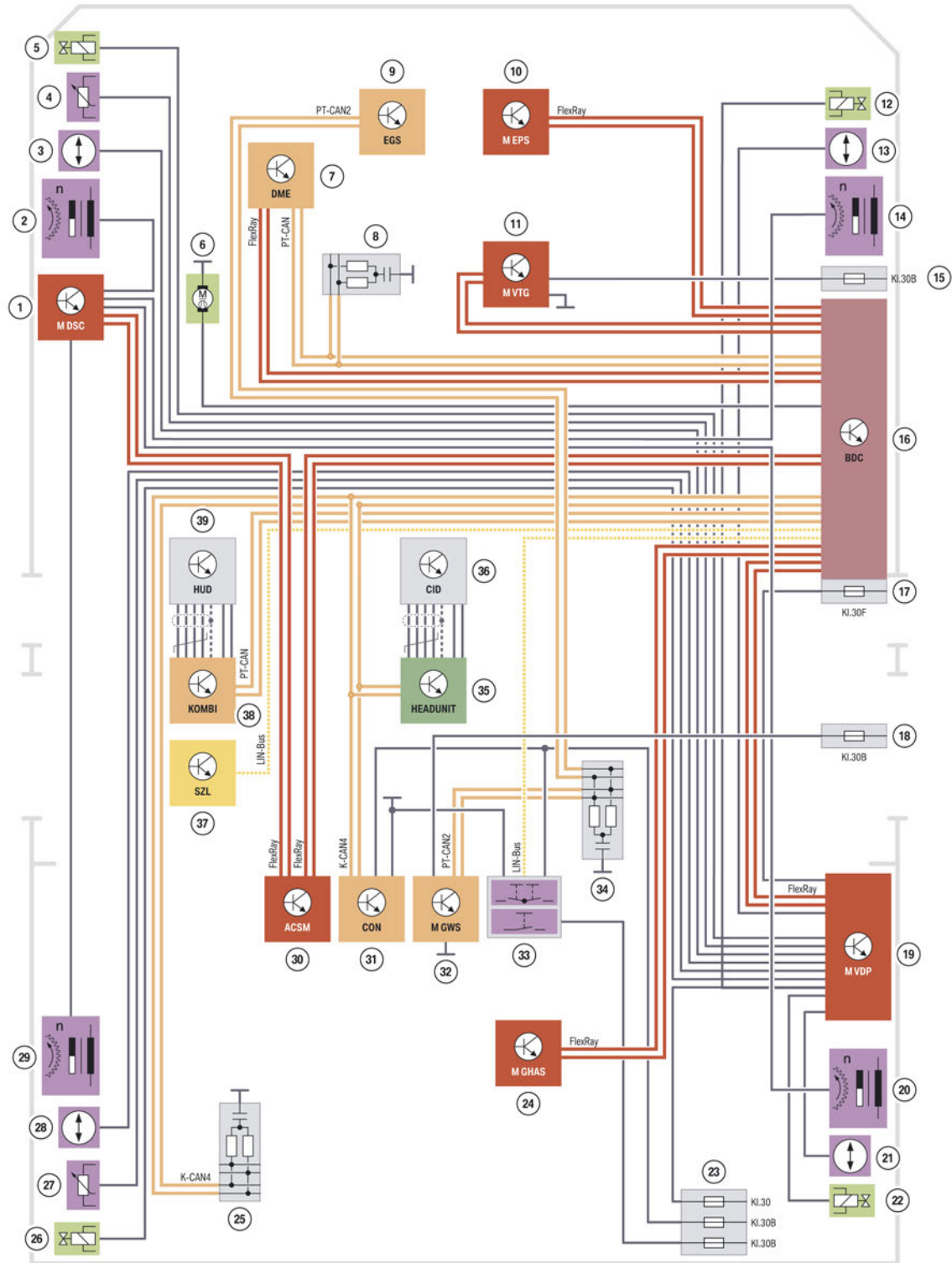
## 5. Chassis and Suspension

Index	Explanation
8	Output shaft, front right
9	Central Information Display (CID)
10	Head Unit HU (M-specific)
11	Body Domain Controller (BDC)
12	M gear selector switch (M GWS)
13	Controller (CON)
14	Advanced Crash Safety Module (ACSM)
15	Rear wheel speed sensor
16	Electrical connection, EDC valve, rear
17	Vertical acceleration sensor, rear
18	Ride height sensor, rear
19	M vertical dynamic platform (M VDP)
20	Regulated M rear axle differential lock (M GHAS)
21	Output shaft, rear left
22	M rear axle differential lock
23	Output shaft, rear left
24	Prop shaft
25	M transfer box (M VTG)
26	Vertical acceleration sensor, front
27	Front wheel speed sensor
28	Ride height sensor, front
29	Electrical connection, EDC valve, front
30	Output shaft, front left
31	M drive dynamic control switch

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

### System wiring diagram



TF18-2647

F97/F98, integrated actuation system wiring diagram (simplified)



# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

Index	Explanation
1	M Dynamic Stability Control (M DSC)
2	Wheel speed sensor, front left
3	Vertical acceleration sensor, front left
4	Ride height sensor, front left
5	EDC control valve, front left
6	Auxiliary coolant pump, heating
7	Digital Motor Electronics (DME)
8	PT-CAN terminating resistor
9	Electronic transmission control (EGS)
10	M Servotronic (M EPS)
11	M transfer box (M VTG)
12	EDC control valve, front right
13	Front right vertical acceleration sensor
14	Wheel speed sensor, front right
15	Fuse 30B (power distribution box, front)
16	Body Domain Controller (BDC)
17	Fuse 30F (power distribution box, front)
18	Fuse 30B (power distribution box, front)
19	M Vertical Dynamic Platform (M VDP)
20	Wheel speed sensor, rear right
21	Rear right vertical acceleration sensor
22	EDC control valve, rear right
23	Power distribution box, rear
24	Regulated M rear axle differential lock (M GHAS)
25	K-CAN4 terminating resistor
26	EDC control valve, rear left
27	Ride height sensor, rear left
28	Rear left vertical acceleration sensor
29	Wheel speed sensor, rear left
30	Advanced Crash Safety Module (ACSM)
31	Controller (CON)
32	M gear selector switch (M GWS)
33	M drive dynamic control switch
34	PT-CAN2 terminating resistor
35	Head Unit HU (M-specific)

# F97/F98 Complete Vehicle

## 5. Chassis and Suspension

Index	Explanation
36	Central Information Display (CID)
37	Steering column switch cluster (SZL)
38	Instrument cluster KOMBI (M-specific)
39	Head-Up Display HUD (M-specific)

### 5.4.4. M dynamic mode and M DSC OFF mode

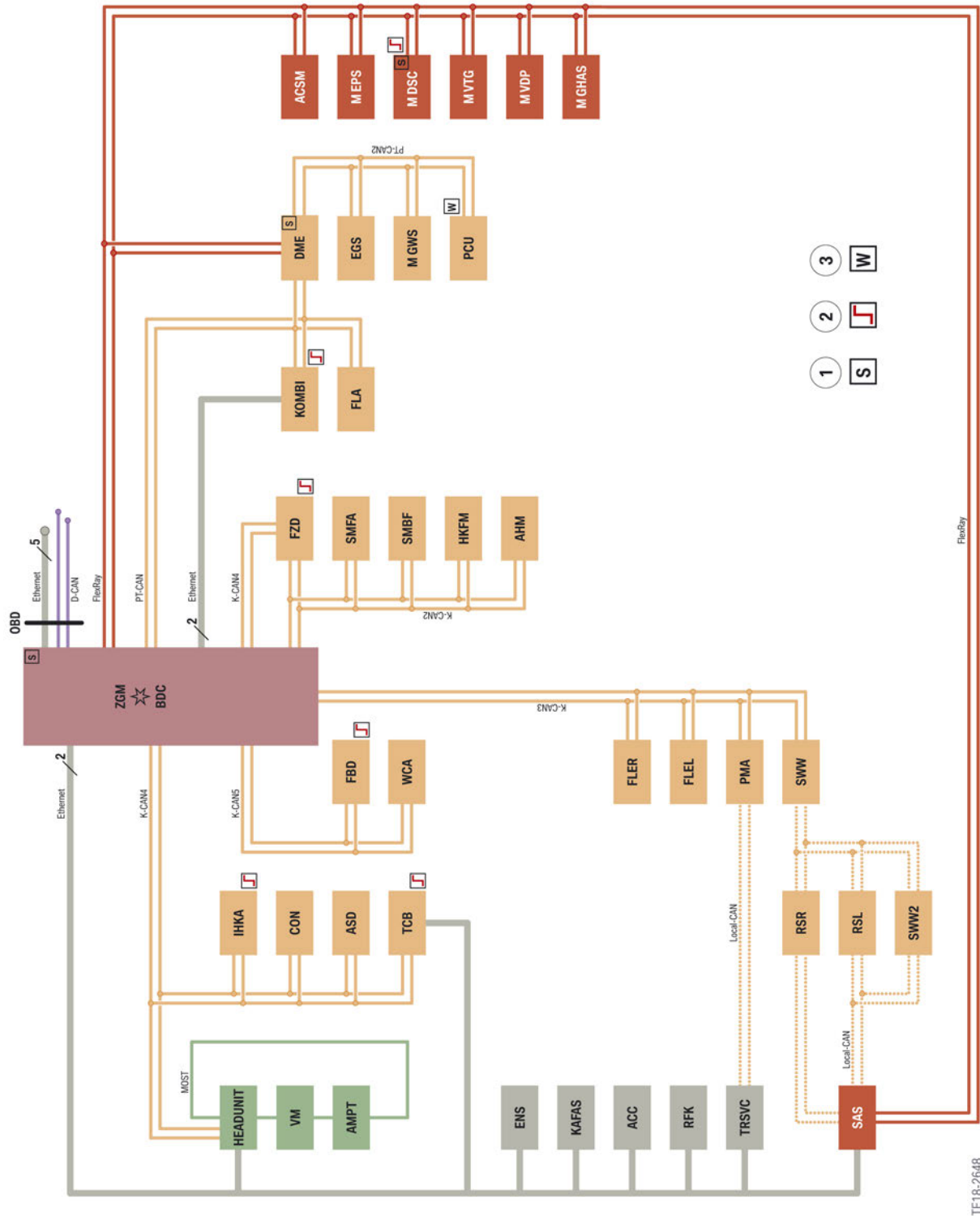
In M Dynamic Mode (MDM) the control threshold of the brake interventions is expanded/raised and the engine power reduction by ASC is applied significantly later. This enables driver-oriented dynamic and sporty driveability. The "M DSC OFF" mode is described separately in one of the following chapters.

The DTC button is connected with the Body Domain Controller (BDC) via the LIN bus. The Body Domain Controller (BDC) forwards this information via the FlexRay bus to M Dynamic Stability Control (M DSC).

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics

### 6.1. Bus overview



F97/F98, bus overview

TE18-2648

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics

Index	Explanation
1	Start-up node control units for starting and synchronizing the FlexRay bus system
2	Control units authorized to perform wake-up function
ACC	Active Cruise Control
ACSM	Advanced Crash Safety Module
AHM	Trailer module
AMPT	Amplifier Top (top high fidelity amplifier)
ASD	Active Sound Design
BDC	Body Domain Controller
CON	Controller
D-CAN	Diagnosis-on-Controller Area Network
DME	Digital Motor Electronics
EGS	Electronic Gear Control
Ethernet	Cable-based data network technology for local data networks
FBD	Remote control service
FLA	High-beam assistant
FLER	Frontal Light Electronics Right
FLEL	Frontal Light Electronics Left
FlexRay	Fast, preset and fault-tolerant bus system for use in the automotive sector (10 MBit/s)
FZD	Roof function center
Head unit	Head Unit HU (M-specific)
HKFM	Tailgate function module
IHKA	Integrated automatic heating / air conditioning
KAFAS	Camera-based driver assistance systems
K-CAN2	Body Controller Area Network 2 (500 kBit/s)
K-CAN3	Body Controller Area Network 3 (500 kBit/s)
K-CAN4	Body Controller Area Network 4 (500 kBit/s)
K-CAN5	Body Controller Area Network 5 (500 kBit/s)
KOMBI	Instrument cluster (M-specific)
Local-CAN	Local Controller Area Network
M DSC	M Dynamic Stability Control
M EPS	M Servotronic
M GHAS	Regulated M rear axle differential lock
M GWS	M gear selector lever
M VDP	M vertical dynamic platform

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics

Index	Explanation
M VTG	M transfer box
MOST	Media Oriented System Transport (22.5 MBit/s)
OBD	Diagnostic socket
PT-CAN	Powertrain Controller Area Network (500 kBit/s)
PT-CAN2	Powertrain Controller Area Network 2 (500 kBit/s)
PMA	Parking Maneuvering Assistant
RFK	Rear view camera
RSL	Radar sensor left (avoidance assistant)
RSR	Radar sensor right (avoidance assistant)
SAS	Optional equipment system
SMBF	Front passenger seat module
SMFA	Driver's seat module
SWW	Lane change warning
SWW2	Lane change warning (2)
TCB	Telematic Communication Box
TRSVC	Top Rear Side View Camera (Surround View)
WCA	Wireless charging tray
ZGM	Central Gateway Module

The following deviations exist in comparison with the standard G01/G02:

### FlexRay

The S58B30T0 engine is equipped exclusively with the DME variant DME 8.6.S.

By means of the special M GmbH software application, the control units for the EPS electronic power steering, VTG transfer box, DSC dynamic stability control, VDP vertical dynamics platform and GHAS regulated rear differential lock become the M Servotronic (M EPS), M VTG, M DSC, M VDP and M GHAS.

### PT-CAN2

By means of the special M GmbH software and hardware application, the GWS gear selector switch becomes the M GWS gear selector switch with Drivelogic button.

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics

### 6.2. On-board information

#### 6.2.1. M configuration menu

##### Configuration via the center console switch cluster:

Via the M drive dynamic control switch in the center console, the driver can adapt the vehicle to his or her individual needs.



F97/F98, M drive dynamics switch

Index	Explanation
1	M DSC-OFF
2	Engine dynamics control
3	Electronic Damper Control
4	M Servotronic
5	Sound pattern for exhaust
6	SETUP button (direct jump into the configuration menu in the head unit HU)

The "Setup" button in the center console can be used to jump directly into the M configuration menu in the head unit HU.

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics

### Configuration via the head unit HU:

The M configuration menu can be found in the Settings menu. There are now two individually adjustable configurations, Setup M1 and Setup M2.



F97/F98, M configuration menu HU

Index	Explanation
1	Configure M1
2	Configure M2
3	M xDrive
4	Head-Up Display M view

The following settings can be made on the relevant M configuration menu:

- M Dynamic Stability Control (M DSC)
- M xDrive (provided DSC OFF is selected)
- Engine
- Chassis and suspension
- Steering

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics



F97/F98, M configuration menu HU

Index	Explanation
1	DSC
2	M xDrive
3	Engine
4	Chassis and suspension
5	Steering

The following settings can also be made:

- Transmission shift program with Drivelogic
- Head-Up Display



F97/F98, M1 Configuration

Index	Explanation
6	Transmission
7	Head-Up Display
8	Reset M1

The settings performed there are called up by pressing the corresponding button of the two available M buttons on the multifunction steering wheel.



# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics



F97/F98, M button

Index	Explanation
1	M1 Button
2	M2 Button

The activation of an M configuration is displayed by a M1 or M2 symbol in the instrument cluster. The corresponding symbol flashes if, for example, ABS, M DSC or M xDrive intervene upon activation of the request or if a malfunction exists in the system. A renewed activation is only possible after the intervention is completed or the malfunction has been eliminated.

During a journey, the retrieved configuration can be changed at any time. The corresponding M driving dynamics control switch 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 configuration menu to the customer's needs and also reset again to the factory setting. Each M button is individually configurable and the overall configuration is also assigned to the vehicle remote control being used.

The following functions and configurations can be selected and set:

### M Dynamic Stability Control (M DSC)

- **ON** Maximum possible driving stability with 4WD
- **MDM** Reduced stabilizing intervention with 4WD Sport. Permits driving with a higher lateral and longitudinal acceleration on dry and wet roadways
- **OFF** Stability control switched off. ABS control remains active.

### M DSC OFF

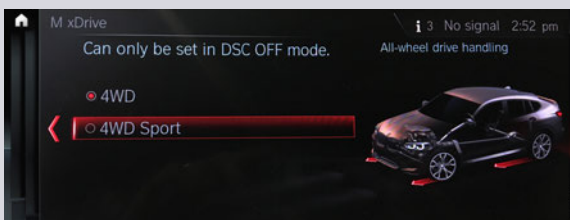
When M DSC is deactivated, the M xDrive menu is automatically displayed in the head unit HU in the Central Information Display (CID). In the M DSC OFF mode, the customer can select 1 of 2 M xDrive modes:

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics



**4WD M** DSC OFF with traction-optimized all-wheel drive and neutral handling characteristics



**4WD Sport M** DSC OFF with sporty agile all-wheel drive

- Oversteering possible

The selected M xDrive mode is displayed in the instrument cluster and can also be stored as part of the configurable M1/M2 setup.

### Engine dynamics control including Active Sound Design (ASD) and exhaust flaps

- **Sport +**  
Precise and direct responsiveness with maximum dynamic response
- **Sport**  
Dynamic, sports-style responsiveness
- **Efficient**  
Comfortable response (urban traffic, on snow), minimized consumption

### Electronic Damper Control

- **Sport +**  
Thoroughly sports-style
- **Sport**  
Balanced
- **Comfort**  
Comfort-optimized tuning

### M Servotronic

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

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics

### Sound pattern

- **Sport/Sport +**
- **Comfort**

### Head-Up Display

- M view
- Standard 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 M driving dynamic control switch 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 until confirmed by an acoustic signal. The current configuration is assumed and overwrites the previously saved setting. This enables a quick adaptation or saving without calling up the M configuration 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.

---

### Live adjustment

During the journey, the desired ideal tuning of the individual driving dynamics systems is determined using the drive dynamic control switches and then, before "Residing OFF", one of the two M buttons on the steering wheel is pressed for a long period until the acoustic signal is heard.

### 6.2.2. M instrument cluster

The M instrument cluster in the F97/F98 is based on the multifunction instrument display (12.3" TFT display) of the F90.

The following M-specific changes exist in comparison with the G01/G02:

- Speed and engine speed display correspond to the drive concept (330 km/h in 30 km classification, 8000 rpm)
- Typical M red needles, dial illuminated in white (including in daylight without headlights switched on), X3 M/X4 M insignia.

# F97/F98 Complete Vehicle

## 6. General Vehicle Electronics



F97, instrument cluster

### M-specific displays:

- M Dynamic Mode (MDM) symbol in place of the DTC
- Additional digital speed indicator
- Display of all-wheel-drive mode
- M1 = M Setup 1
- M2 = M Setup 2
- Display of gear
- Display of Drivelogic (bar symbol such as a button)
- Display of system status: Engine dynamics, damper control and M Servotronic
- Shiftlight function inside the rev counter (only active when not activated on the HUD)
- Temperature-dependent, variable engine-revolutions advance-warning field
- Yellow indicator light to indicate standard drive.

In the instrument cluster, the current configuration of the engine dynamics, damper control and Servotronic systems is shown in the upper area between the speed indicator and the engine speed display. This function can be activated under Settings in the Configuration menu display.

The confirmation of the M configuration for M DSC, engine dynamics, transmission, EDC and M Servotronic is also issued 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.

### 6.2.3. M Head-Up Display

The multi-color head-up display available as option SA 610 can switch to the M-specific display.

The following information/parameters can be shown:

# F97/F98 Complete Vehicle

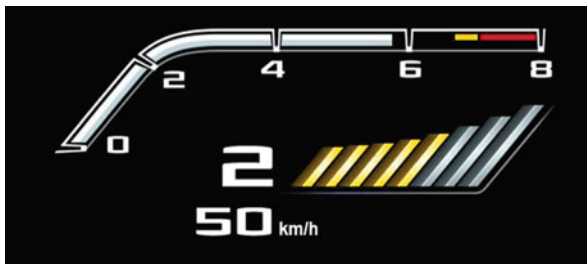
## 6. General Vehicle Electronics

- Shift point indicator by Shiftlight function
- Engine speed via speed bar and temperature-dependent engine-revolutions advance-warning field
- Transmission shift level
- Vehicle speed
- Road sign recognition
- No-overtaking display
- Navigation displays.



F97/F98, head-up display with navigation system

If the shiftlight function is activated in the HUD, it is automatically deactivated in the instrument cluster.



F97/F98, head-up display with Shiftlight function

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

### 6.2.4. Active Sound Design

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+

# F97/F98 Complete Vehicle

## 7. Brief Overview of Equipment

### 7.1. BMW X3 M/X4 M standard equipment

- M TwinPower turbo engine
- M engine dynamics switch with symbol switch
- M 8-gear automatic transmission with Steptronic, Launch Control and shift paddles on the steering wheel
- M gear selector switch with Drivelogic button
- M xDrive with integrated control in the M Dynamic Stability Control (M DSC)
- M multifunctional instrument cluster
- M configuration menu
- M Dynamic Mode (MDM) with drive dynamic control switch
- Adaptive suspension
- M Servotronic with drive dynamic control switch
- M compound brake system
- Active M differential
- M semi-electric sports seats with seat heating and seat memory for driver, Vernasca leather with impressed M logo on front seat backrests
- M leather steering wheel with 2 M buttons
- M side gills, M driver's footrest
- BMW X3 M and BMW X4 M aerodynamics package: Front and rear bumpers, front side panels with gills, exterior mirrors
- M roof spoiler for BMW X3 M or Gurney flap for BMW X4 M
- BMW X3 M or BMW X4 M insignia on rear
- Twin round M exhaust tailpipes, chrome, 90 mm dia.
- Door handles, roof spoiler and bumpers painted in body color
- BMW Individual high-gloss Shadow Line
- M double-spoke 20" light-alloy wheels, model 764M, orbit grey with different tires front and rear
- Vernasca leather
- BMW Individual headliner, anthracite (with storage shelf, D-pillar trim panels and sun visors)
- "Sensatec" instrument panel
- M door sill strips (in conjunction with option SA 7MA with "Competition" insignia)
- Ambient lighting
- LED headlights
- High-beam assistant
- Interior mirror with automatic dipping function
- Interior and exterior mirror package
- Cruise control with braking function

# F97/F98 Complete Vehicle

## 7. Brief Overview of Equipment

- Harmon Kardon surround sound system
- Park Distance Control (PDC)
- 3-zone integrated automatic heating/air-conditioning system
- Alarm system
- Universal garage door opener
- Comfort Access
- High-gloss shadow line roof rails
- Privacy glass
- Lumbar support for driver and front passenger
- Storage compartment package
- Adaptive LED headlights
- Active Protection
- Active Driving Assistant
- Navigation system Professional
- BMW Assist call
- BMW Teleservices
- ConnectedDrive services
- Advanced Real Time Traffic Information
- Remote Services
- Apple CarPlay compatibility
- Enhanced USB and Bluetooth plus Smartphone integration

### 7.2. BMW X3 M/X4 M optional equipment

- SA 1CB CO2 content
- SA 1MA M Sport exhaust system (standard with Competition package SA 7MA)
- SA 1MP M carbon front-end brace (as of 08/19)
- Option SA 248 Heated steering wheel
- SA 300 Compact spare wheel
- SA 402 Electric panoramic glass sunroof
- SA 4FH Seat with active seat ventilation
- SA 4FH M seat belts (as of 08/19)
- SA 4HA Seat heating front and rear
- OE 5AT ACC Stop & go + Active driving assistant
- OE 5DN Parking assistant plus

# F97/F98 Complete Vehicle

## 7. Brief Overview of Equipment

- SA 610 M head-up display
- OE 6NW Wireless charging
- OE 6U8 Gesture control
- OE 6WD WiFi hotspot
- SA 712 Sports seats (standard equipment with Competition package SA 7MA)
- SA 71C M carbon exterior package (as of 08/19)
- SA 7MA/7MN M Competition package (including SA 2VF Adaptive M suspension)
- OE 7ME M Driver's Package

### 7.2.1. Paint colors

- SA 475 Black Sapphire metallic
- SA A90 Dark Grey metallic
- SA C1M Phytonic Blue metallic
- SA C1N Sunstone metallic
- SA C28 Donington Grey metallic
- SA C3G Toronto Red metallic

### 7.2.2. "Merino" leather with additional features

- SA LKDA Sakhir Orange/Black (standard with Competition package SA 7MA)
- SA LKHV Adelaide Grey/Black (standard with Competition package SA 7MA)
- SA LKSW Black/Black (standard with Competition package SA 7MA)

### 7.2.3. BMW Individual "Merino" leather with additional features

- SA VAEW Ivory/Black (standard with Competition package SA 7MA)
- SA VATQ Tartufo/Black (standard with Competition package SA 7MA)



# F97/F98 Complete Vehicle

## 7. Brief Overview of Equipment

### 7.2.4. Wheels/tires

- SA 1Y4 21" V-spoke model 765M, bi-color Orbit grey with different tires front and rear
- SA 1Y5 21" V-spoke model 765M, bi-color Jet black with different tires front and rear, only in conjunction with Competition package SA 7MA
- SA 1RF 20" Double-spoke model 764M, bi-color Orbit grey with different tires front and rear
- OE 2VC Mobility set

