Technical training.
Product information.

F48 Chassis and Suspension

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General information

Symbols used

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

⚠

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

Information status and national-market versions

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

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

Additional sources of information

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

- Owner's Handbook
- Integrated Service Technical Application.

Contact: conceptinfo@bmw.de

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

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F48 Chassis and Suspension
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F48 Chassis and Suspension

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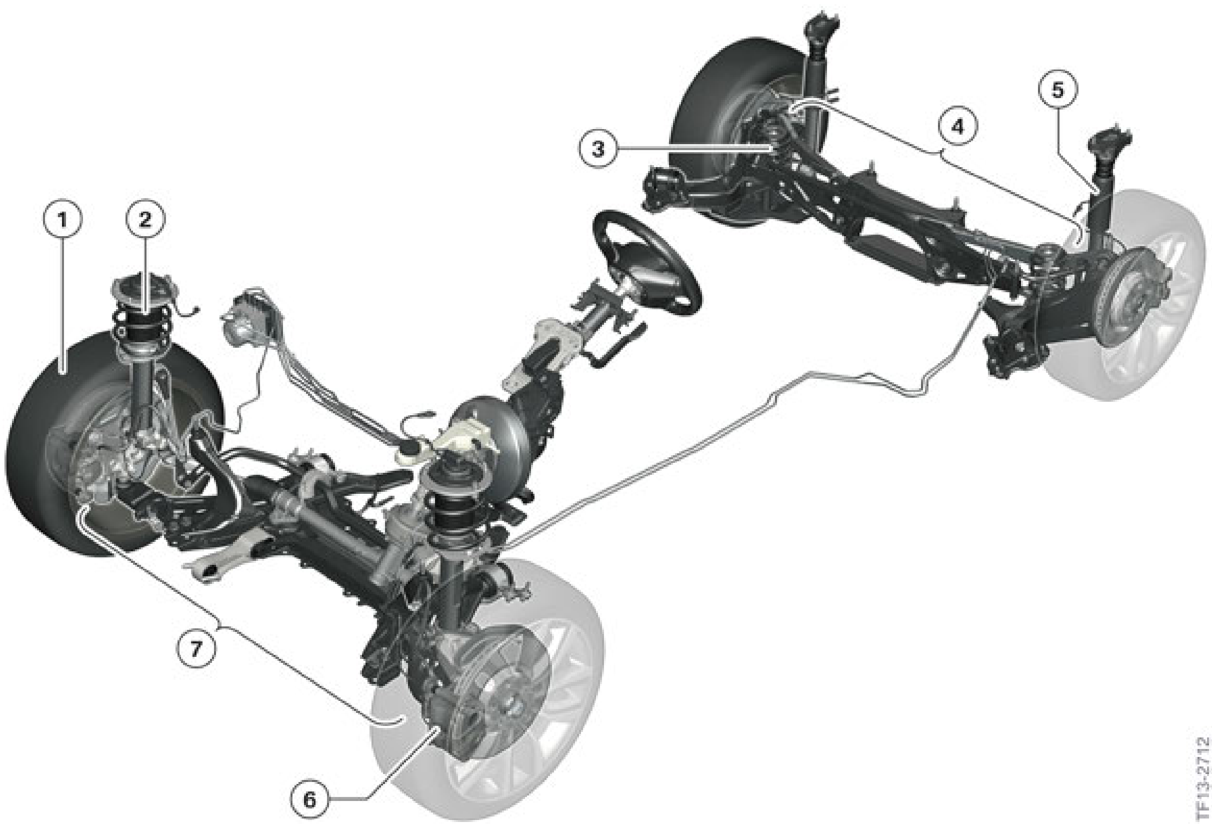

F48 Chassis and suspension

Index	Explanation
1	Wheels
2	Suspension/damping action
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4	Central link rear axle
5	Damping action
6	Brakes
7	Single-joint spring-strut-type front axle

The dynamic handling characteristics of the new BMW X1 are achieved by a completely newly developed chassis and suspension with a wide toe and complex support bearings, among other things. The spring and shock absorber setting highlight the interactive character of the F48.

F48 Chassis and Suspension

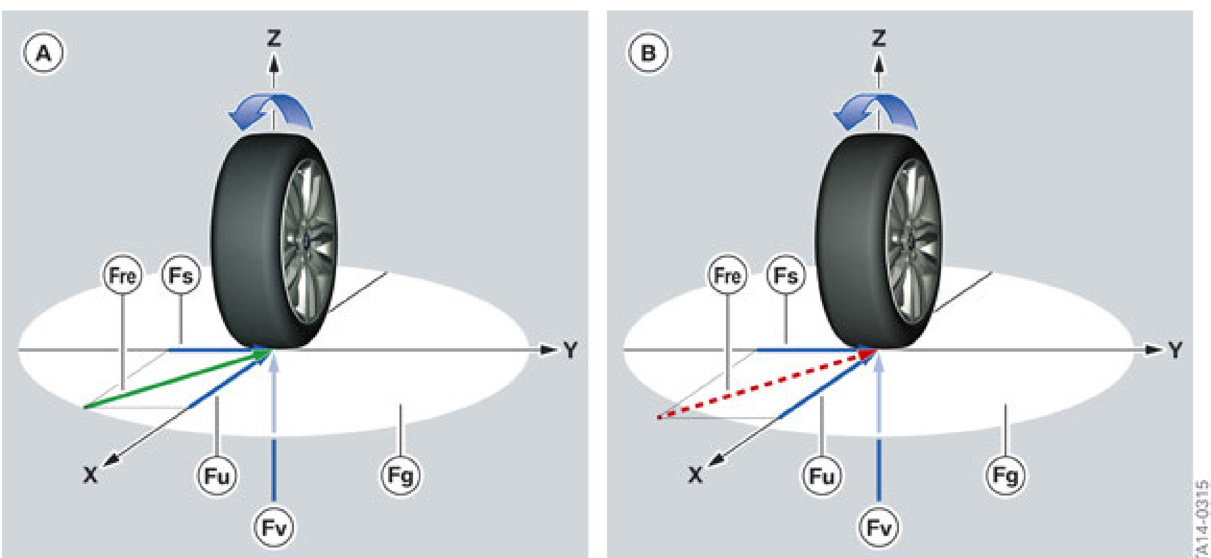
1. Introduction

Special features:

- Newly developed single-joint spring-strut-type front axle
- Negative kingpin offset.
- Newly developed central link rear axle
- Diagonal dual-circuit brake system (X-split)
- Low-friction steering system
- Optional Dynamic Damper Control (SA 223)
- Optional M sports suspension (SA 704)

1.1. Longitudinal and cornering forces at the wheel

The wheels at the vehicle must transmit longitudinal and cornering forces via the tire contact areas. The following graphic shows the connection between the driving power and the cornering force at the wheel.



Driving power and cornering force at the wheel

Index	Explanation
A	Resulting force = Maximum overall force
B	Resulting force too high
Fre	Resulting force
FS	Cornering force
Fu	Driving power
Fv	Vertical wheel force
Fg	Maximum overall force

The area shown in white corresponds to the maximum available overall force, which the wheel can transmit to the roadway. The maximum overall force is influenced by the properties of the tire, the road condition and the vertical wheel force. If, for example, the coefficient of friction between the wheel and the roadway decreases due to wet conditions, the available overall force is reduced.

The resulting force of driving power and cornering force cannot exceed the maximum overall force. If the resulting force is too high, the wheel loses adhesion and puts the vehicle in an unstable driving condition. If the driving power increases, a lower cornering force is available. The opposite is also true, meaning that the maximum driving power is only possible for straight-ahead driving.

In contrast to vehicles with a rear-wheel drive, the front wheels of X1 vehicles also have to absorb the driving powers, in addition to the steering forces. Hence why an uneven axle-load distribution, with a higher axle load at the front axle, is desired in vehicles with a front-wheel drive.
The vertical wheel force is thus increased and also the maximum available overall force.

In the new BMW X1 xDrive28i, the axle load at the front axle is approximately 56 %.

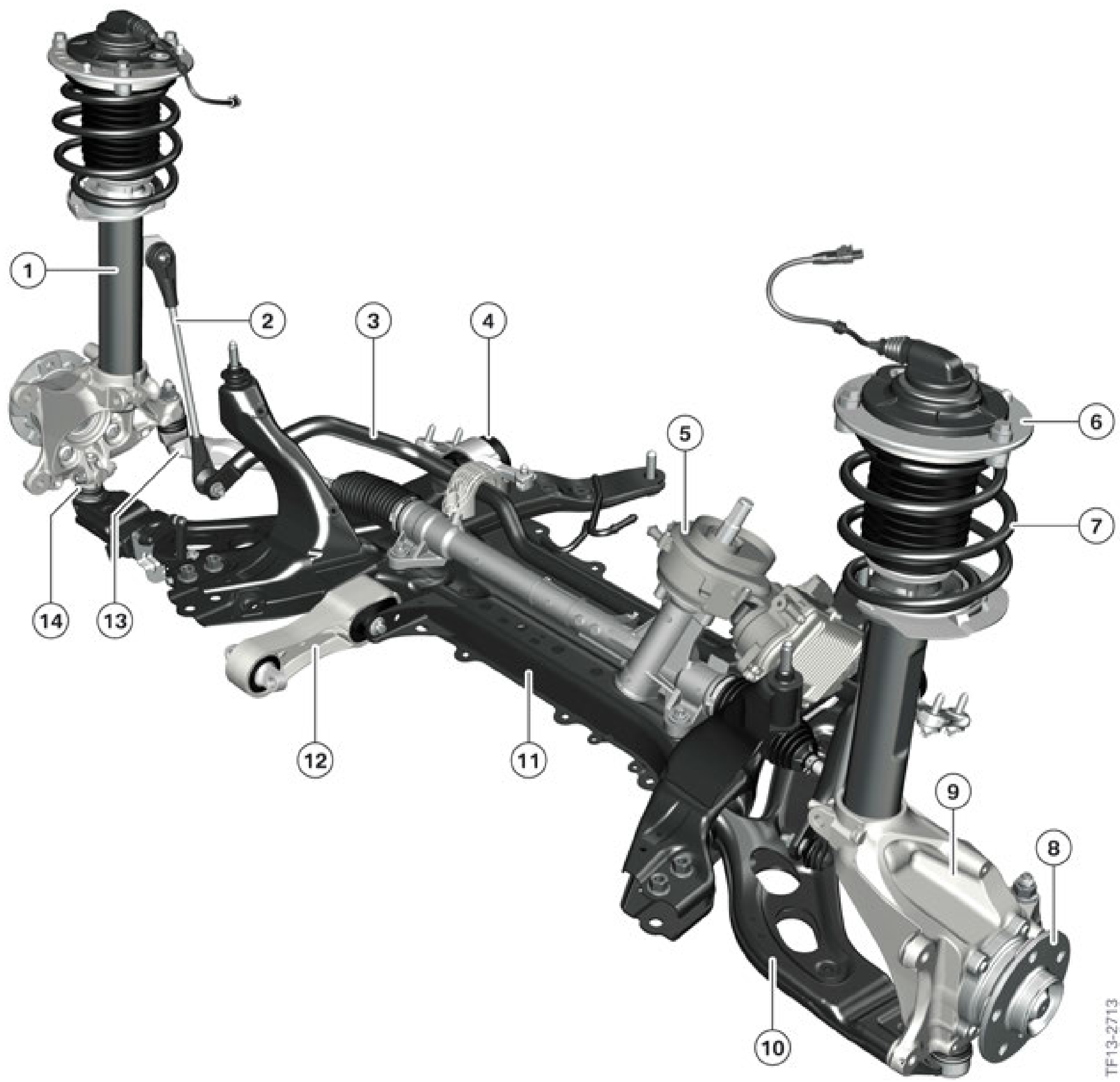
1.2. Technical data

The following table shows the technical data of the chassis and suspension of the F48.

Designation	BMW X1 xDrive28i
Wheelbase	2670
Front track width, basic wheels	1557
Rear track width, basic wheels	1562
Tires, basic wheels	205/55 R17 9 W
Basic wheel rims	7.5J x 17
Front axle	Single-joint spring-strut-type front axle
Suspension/damping action, front	Steel springs, conventional
Anti-roll bar, front	mechanical
Rear axle	Central link rear axle
Suspension/damping action, rear	Steel springs, conventional
Rear anti-roll bar	mechanical
Steering	EPS rack
Front brake	Brake disc, ventilated
Rear brakes	Brake disc, ventilated
Parking brake	Electromechanical parking brake

F48 Chassis and Suspension

2. Front Axle



F48 Single-joint spring-strut-type front axle

Index	Explanation
1	Spring strut
2	Anti-roll bar link
3	Anti-roll bar
4	Wishbone rubber mount, rear
5	Electronic Power Steering (electromechanical power steering) (EPS)
6	Support bearing
7	Coil spring
8	Wheel bearing

F48 Chassis and Suspension

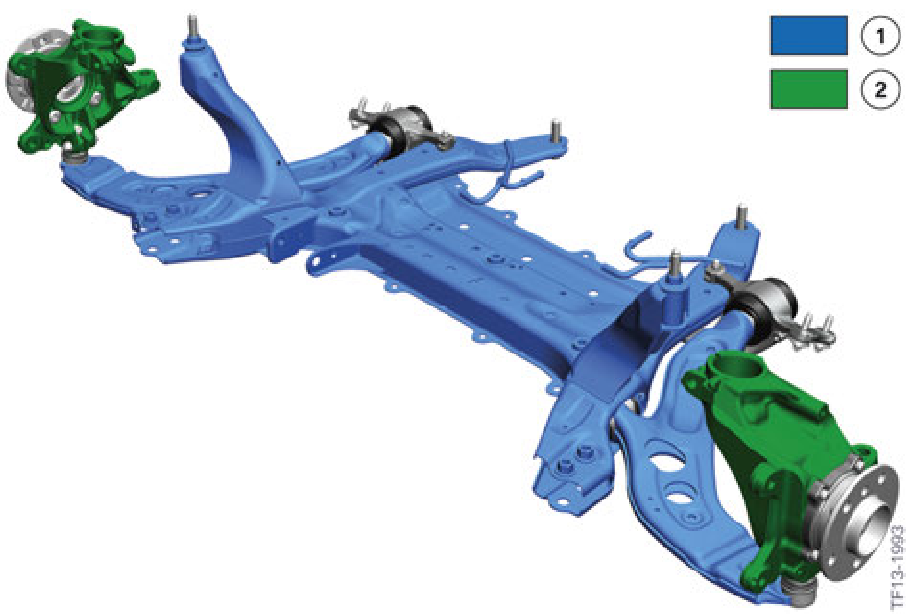
2. Front Axle

Index	Explanation
9	Swivel bearing
10	Wishbone
11	Front axle support
12	Anti-roll bar link
13	Track rod
14	Wishbone rubber mount

All components of the single-joint spring-strut-type front axle of the F48 have been fully redeveloped. Excellent axle kinematics, as well as high rigidity, ensure agile single-joint movement and a precise steering sensation, to a large extent without engine influences.

The friction-optimized wheel bearing ensures a reduction in the fuel consumption.

Within the framework of the modular principle, the front axle in the F48 is also designed for use in vehicles with other track widths.



F48 material of front axle support, wishbone and swivel bearing

Index	Explanation
1	High-strength steel
2	Aluminium

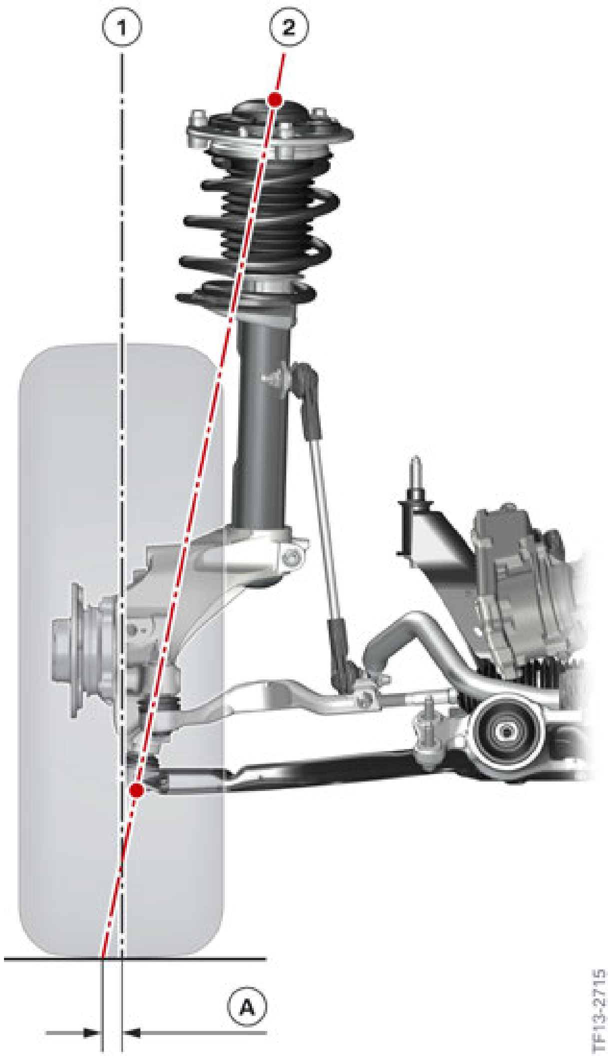
The use of aluminium (swivel bearing) and high-strength steels (front axle support, wishbone) reduces the unsprung masses.

Engine and transmission mounts absorb the weight of the respective drive components and together with the engine anti-roll bar link support the engine torque. The rear wishbone rubber mounts are designed as hydro mounts.

F48 Chassis and Suspension

2. Front Axle

2.1. Kingpin offset



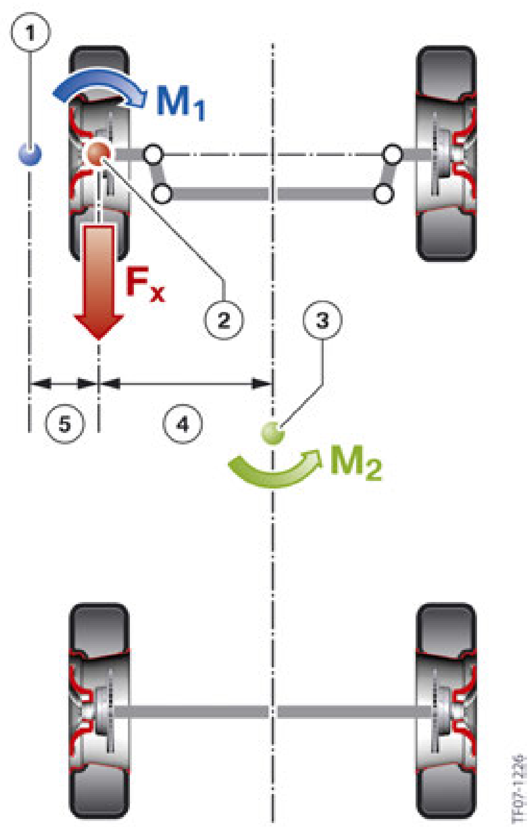
F48 Negative kingpin offset

Index	Explanation
A	Kingpin offset
1	Wheel center axis
2	Axis of movement

F48 Chassis and Suspension

2. Front Axle

The kingpin offset is the distance from the intersection point of the axis of movement with the roadway to the center of the wheel contact face. In the F48 negative kingpin offsets are used, in order to counteract the yaw moment around the vertical vehicle axis in the case of braking with only one brake circuit.



F48 effect of kingpin offset with one-sided brake force (schematic diagram)

Index	Explanation
1	Intersection point of axis of movement with roadway (exaggerated)
2	center of wheel contact face
3	center of gravity of vehicle
4	Distance from center of wheel contact face to the vehicle longitudinal axis
5	Kingpin offset
F_x	One-sided application of brake force
M_1	Torque at the wheel
M_2	Yaw moment around the vertical vehicle axis

In the F48 a diagonal dual-circuit brake system (X-split) is used. One of the wheels of the front axle and one of the wheels of the rear axle, which are located diagonally opposite, are each supplied by one brake circuit. In the event of a failure of a brake circuit, the vehicle is thus decelerated at the front axle only via one wheel.

However, a yaw moment around the vertical vehicle axis (M_2) occurs as a consequence, by the one-sided deceleration of the wheels at the front and rear axle. In order to guarantee sufficient driving stability in this case, a negative kingpin offset is used in the F48. As a result, in the event of braking with only one brake circuit a torque is generated at the wheel (M_1), which counteracts the yaw moment around the vertical vehicle axis (M_2).

2.2. Notes for Service

F48 toe and camber correction, front axle

Index	Explanation
1	Swivel bearing
2	Track rod

In the F48 a camber correction is only possible using three different swivel bearings available from spare parts service. These enable different camber adjustments, at intervals of 30 minutes (0.5°).

The toe adjustment is still possible via the track rods.

F48 Chassis and Suspension

2. Front Axle

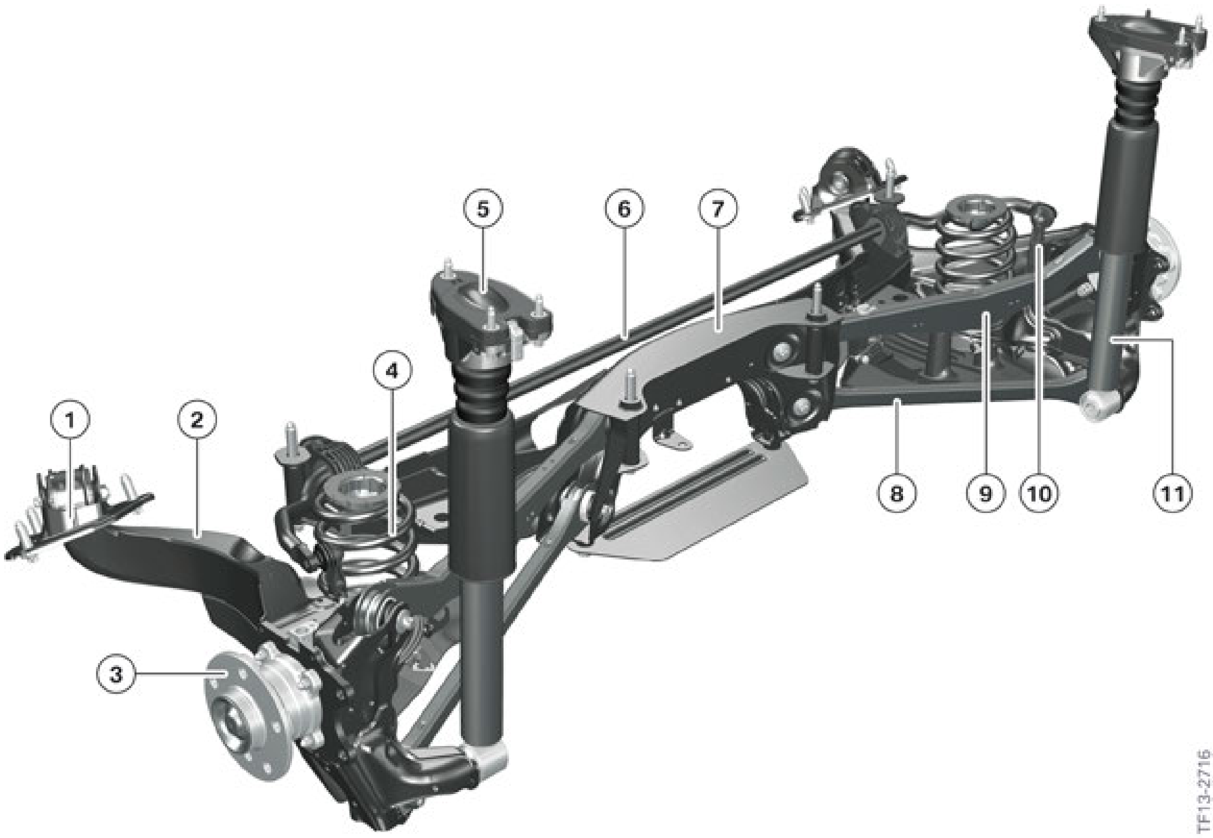
The following tables show when wheel alignment at the front axle is necessary:

Component replaced	Wheel alignment required
Front axle support	Yes
Steering gear	Yes
Wishbone	Yes
Wishbone rubber mount	Yes
Wishbone rubber mount, rear	No
Track rod	Yes
Swivel bearing	Yes
Wheel bearing	No
Spring strut	No
Coil spring	No
Support bearing	No

Screw connection unfastened	Wheel alignment required
Front axle support to body	No
Steering gear to front axle support	Yes
Wishbone to front axle support	Yes
Wishbone to swivel bearing	No
Track rod to steering gear	No
Track rod end to track rod	Yes
Track rod end to swivel bearing	No
Spring strut to swivel bearing	No
Support bearing to body	No
Bottom steering shaft to steering gear	No
Steering column to bottom steering shaft	No

F48 Chassis and Suspension

3. Rear Axle



F48 central link rear axle

Index	Explanation
1	Bearing support
2	Trailing arm
3	Wheel bearing
4	Coil spring
5	Support bearing with adapter plate
6	Anti-roll bar
7	Rear axle support
8	Wishbone, bottom
9	Wishbone, top
10	Anti-roll bar link
11	Shock absorber

In the F48 a space-saving, modular central link rear axle is used. The axle principle is particularly suitable for the dynamic handling characteristics of the vehicle. It also offers very good conditions for the integration of the xDrive. All components of the rear axle were newly developed. The targeted use of high-strength steels, as well as the increased rigidity of the wheel suspension parts, form the basis for the unique driving dynamics in this class of vehicle.

F48 Chassis and Suspension

3. Rear Axle

F48 suspension/damping action, rear

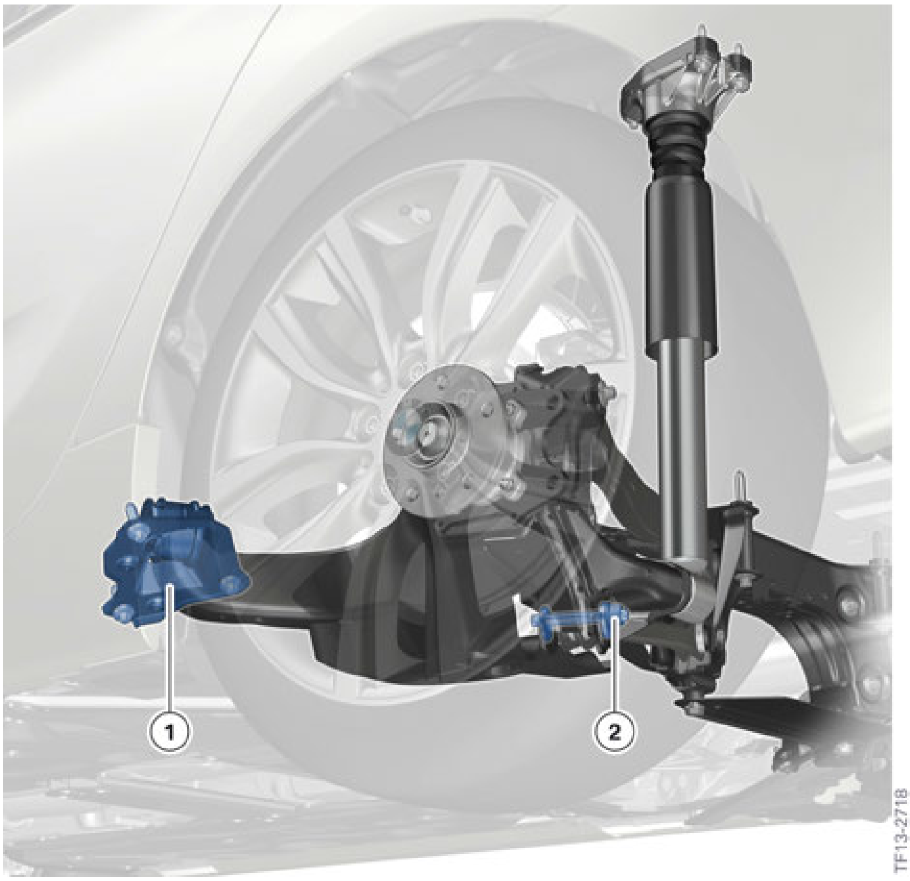
Less space is required in the wheel arch thanks to the separate arrangement of shock absorbers and coil springs. This results in a generous spatial offering and a high level of entry comfort for the rear seat passengers, as well as excellent use of the luggage compartment.

The friction-optimized wheel bearings reduce the fuel consumption.

Within the framework of the modular principle, the rear axle in the F48 is also designed for use in vehicles with other track widths.

F48 Chassis and Suspension
3. Rear Axle

3.1. Notes for Service



F48 toe and camber correction, rear axle

Index	Explanation
1	Bearing support (at trailing arm)
2	Eccentric bolt (at bottom wishbone)

The toe and camber adjustment is set via the bearing support at the trailing arm (toe), as well as via the eccentric bolt at the bottom wishbone (camber).

The following tables show when wheel alignment at the rear axle is necessary:

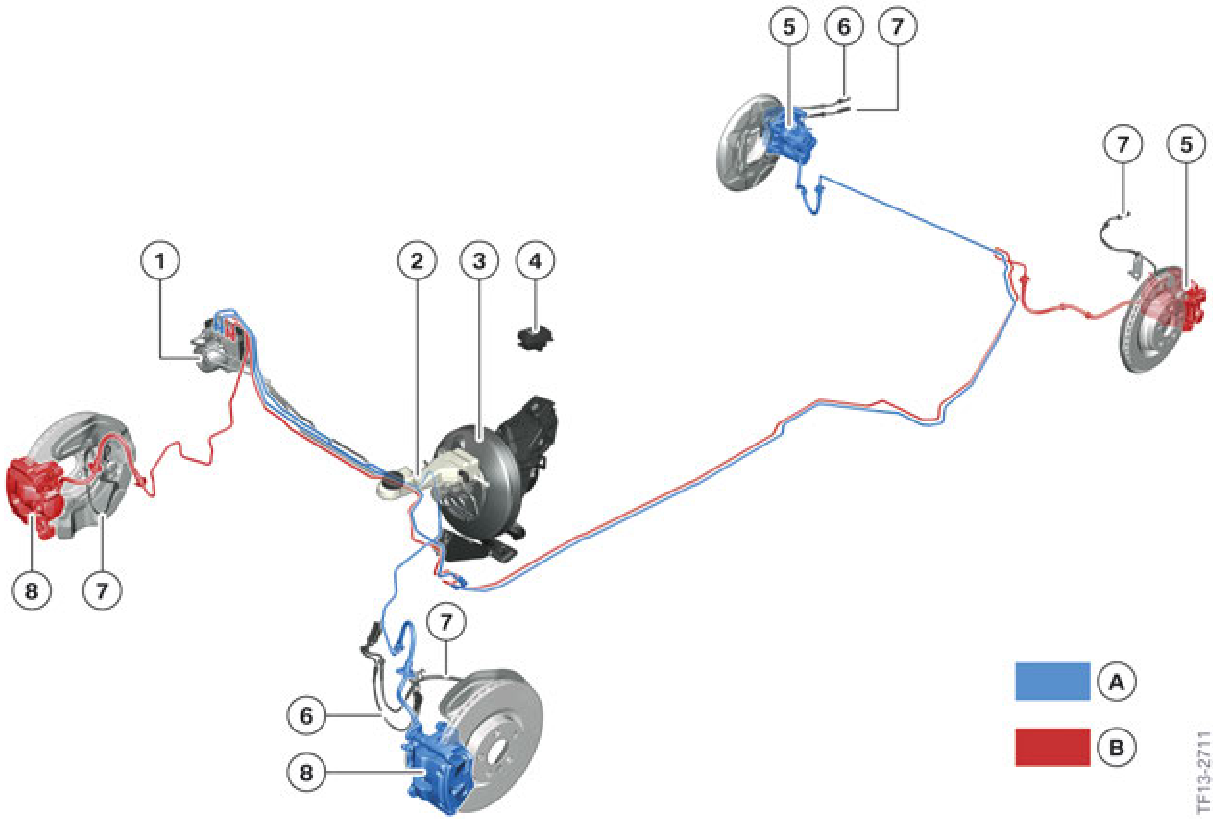
Component replaced	Wheel alignment required
Rear axle support	Yes
Wishbone, top	Yes
Wishbone, bottom	Yes
Bearing support (at trailing arm)	Yes
Wheel bearing	No
Shock absorber	No

F48 Chassis and Suspension
3. Rear Axle

Component replaced	Wheel alignment required
Trailing arm	Yes
Anti-roll bar link	No
Anti-roll bar	No

Screw connection unfastened	Wheel alignment required
Rear axle support to body	No
Top wishbone to rear axle support	Yes
Bottom wishbone to rear axle support	Yes
Top wishbone to trailing arm	No
Bottom wishbone to trailing arm	Yes
Trailing arm rubber mount to trailing arm bearing support	Yes
Shock absorber to trailing arm	No
Anti-roll bar link to trailing arm	No
Wheel bearing to trailing arm	No
Anti-roll bar to rear axle support	No
Trailing arm bearing support to body	Yes

4. Brake



F48 overview of the brake system (with X-split)

Index	Explanation
A	Brake circuit 1
B	Brake circuit 2
1	Dynamic Stability Control (DSC)
2	Brake fluid expansion tank
3	Brake servo
4	Parking brake button
5	Brake caliper (with actuator for EMF)
6	Brake pad wear sensor
7	Wheel speed sensor
8	Brake caliper

In the F48 a diagonal dual-circuit brake system (X-split) is used. One of the wheels of the front axle and one of the wheels of the rear axle, which are located diagonally opposite, are supplied by one brake circuit. In the event of a failure of a brake circuit, a braked front wheel is always available.

As a result, the prescribed minimum deceleration is achieved in the event of a failure of a brake circuit despite a low rear axle load.

However, a yaw moment occurs around the vertical vehicle axis in the case of braking with only one brake circuit, because one braked front wheel transmits significantly higher brake forces than the rear wheel braked on the other side of vehicle.

In order to guarantee sufficient driving stability, a negative kingpin offset is therefore used in the F48.

4.1. Electromechanical parking brake

The activation of the EMF is also performed in the F48 via the Dynamic Stability Control (DSC).
A separate control unit could therefore be dispensed with.

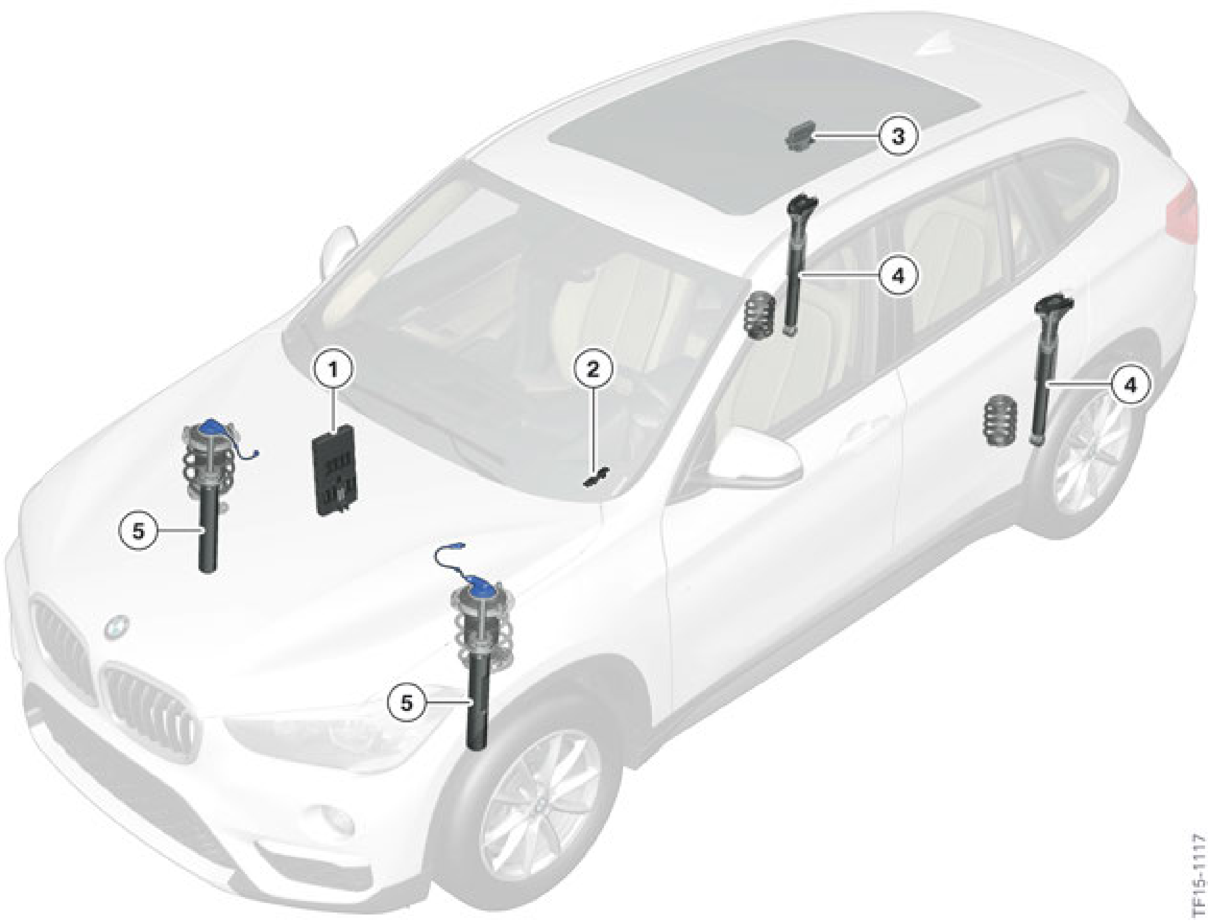
F48 Chassis and Suspension

5. Dynamic Damper Control

A Dynamic Damper Controller (SA 223) is available as optional equipment for the F48. With this system the customer can adjust the characteristics of the vehicle to a tighter, more agile setting.

The chassis and suspension is effected manually in two stages. The system manages without sensors. In addition, the different suspensions are more noticeable by the customer.

5.1. System components



F48 Dynamic Damper Control

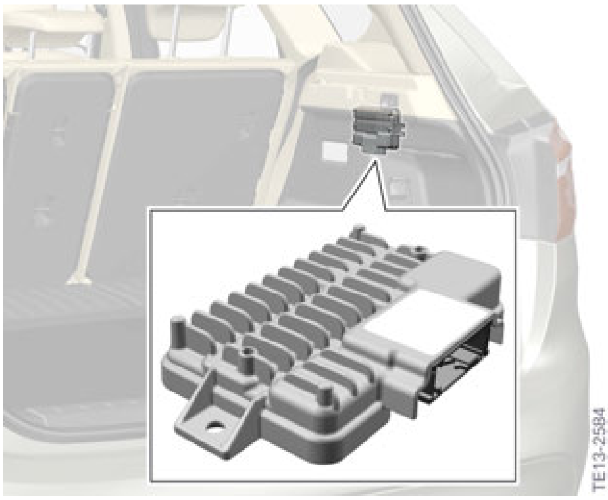
Index	Explanation
1	Body Domain Controller (BDC)
2	Operating unit, center console (with driving experience switch)
3	Optional equipment system (SAS)
4	Rear shock absorber with adapter plate and electrical line
5	Front shock absorber with protective cap and electrical line

The mounting of the shock absorbers at the support bearing is different to vehicles without dynamic damper control. The front shock absorber is secured using a self-locking 12-edge nut M14x1.5, the rear shock absorber is secured using a self-locking 6-edge nut M12x1.0 and double-cone disc.

F48 Chassis and Suspension

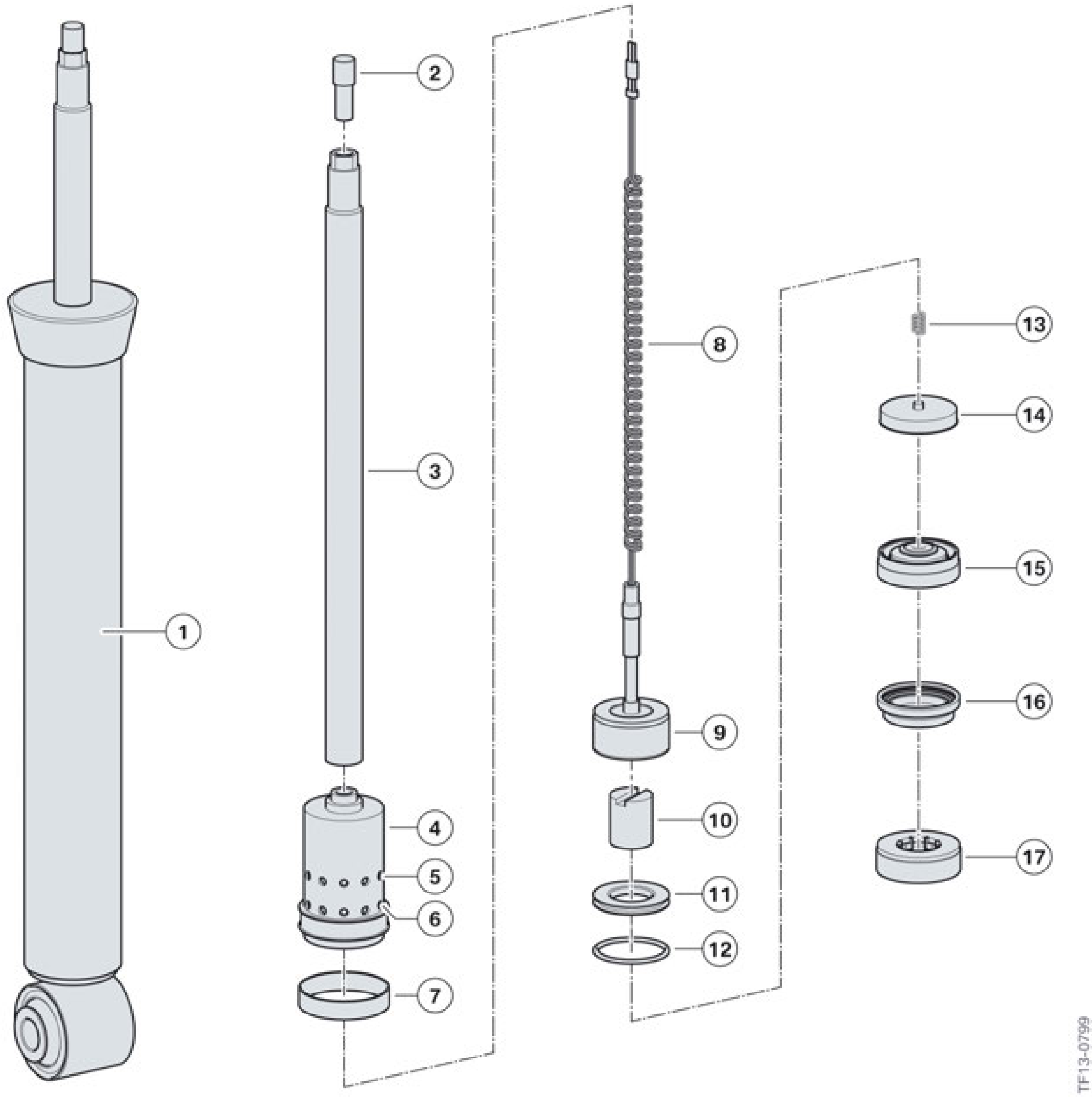
5. Dynamic Damper Control

The optional equipment system (SAS) receives information about the position of the driving experience switch from the Body Domain Controller and activates the 2-stage adjustable shock absorber accordingly.



F48 Optional equipment system

The optional equipment system (SAS) is located behind the right luggage compartment trim panel.



F48 Structure of the switchable shock absorbers

Index	Explanation
1	Shock absorber
2	Socket housing
3	Piston rod
4	Working piston
5	Piston bore hole, normal valve
6	Piston bore hole, sport valve
7	Gasket

Index	Explanation
8	Electrical line
9	Solenoid coil
10	Ferromagnetic core
11	Sealing washer
12	O-ring
13	Coil spring
14	Round slide
15	Normal valve
16	Bypass valve
17	Sport valve

5.2. Operation and function

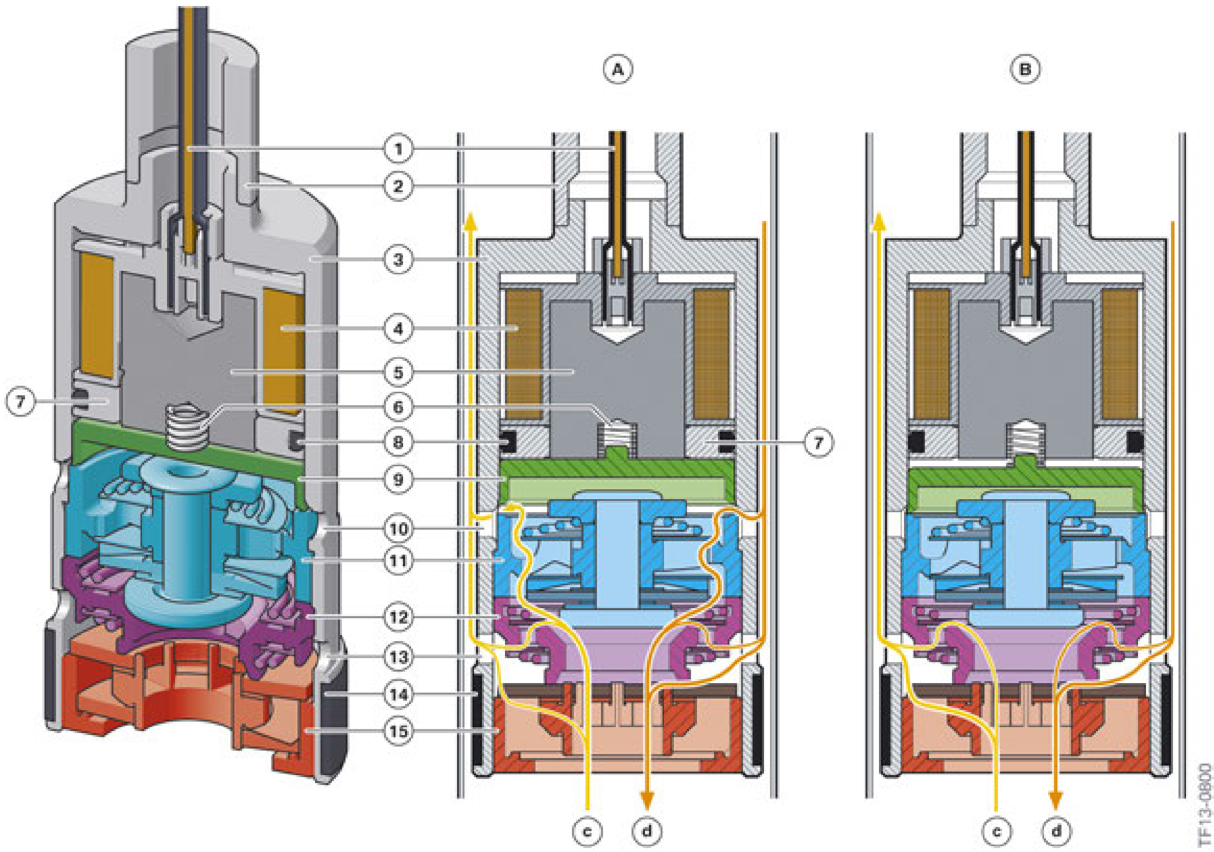
The characteristics of the shock absorbers can be adapted in two stages using the driving experience switch:

- COMFORT and ECO PRO: NORMAL suspension
- SPORT: SPORT suspension (configurable*).

* In SPORT mode there is the option to give the drive train and the chassis and suspension components a sporty dimension independent of each other.

The Body Domain Controller detects the position of the driving experience switch and transmits this information via FlexRay to the optional equipment system (SAS).

From a speed of 4 km/h the optional equipment system (SAS) checks the position of the driving experience switch and activates the shock absorbers accordingly. At vehicle standstill the shock absorbers are not activated. In the basic setting the shock absorbers are in the SPORT suspension setting. They change to NORMAL suspension setting upon activation.



F48 working piston, Dynamic Damper Control

Index	Explanation
A	Normal suspension
B	Sport suspension
c	Compression stage
d	Rebound
1	Electrical line
2	Piston rod
3	Working piston
4	Solenoid coil
5	Ferromagnetic core
6	Coil spring
7	Sealing washer
8	O-ring
9	Round slide
10	Piston bore hole, normal valve
11	Normal valve

Index	Explanation
12	Bypass valve
13	Piston bore hole, sport valve
14	Gasket
15	Sport valve

A normal valve and sport valve are located in the working piston of the shock absorber. The flow channel through the normal valve can be enabled with a solenoid valve.

5.2.1. NORMAL suspension

In the upper area of the working piston there is a solenoid with a solenoid coil and ferromagnetic core. With the activation of the solenoid the round slider lying underneath is pulled upwards and the flow channel is enabled through the normal valve.

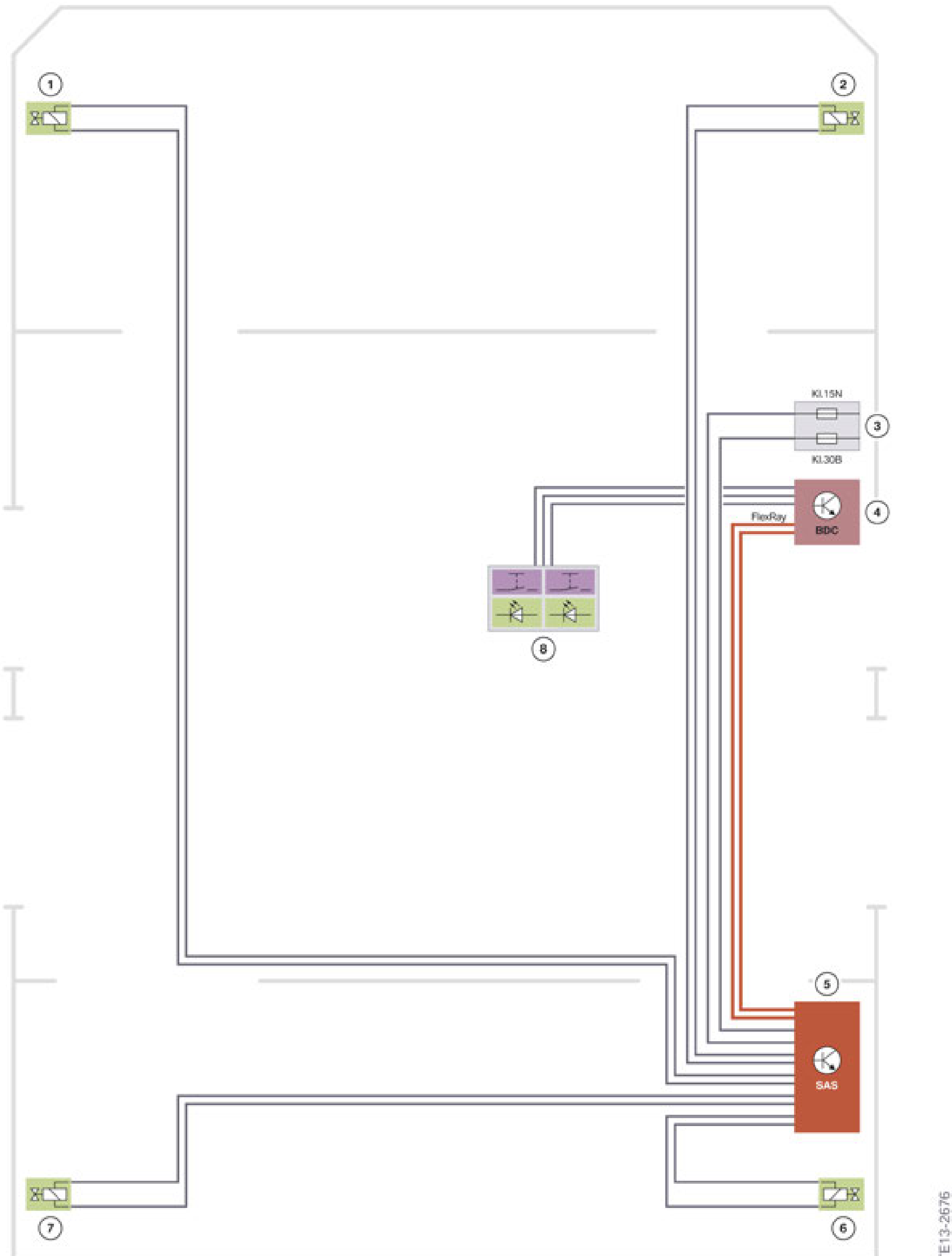
The oil flow through the working piston is directed through the sport valve and the normal valve.

5.2.2. SPORT suspension

If the solenoid is not activated, a coil spring pushes the control edge of the round slider onto the valve seat of the normal valve. The oil flow through the normal valve is thus interrupted. The oil flow through the working piston is only directed through the sport valve.

5. Dynamic Damper Control

5.3. System wiring diagram



F48 System wiring diagram for Dynamic Damper Control

Index	Explanation
1	Solenoid valve for shock absorber, front left
2	Solenoid valve for shock absorber, front right
3	Power distribution box, passenger compartment
4	Body Domain Controller (BDC)
5	Optional equipment system (SAS)
6	Solenoid valve for shock absorber, rear right
7	Solenoid valve for shock absorber, rear left
8	Driving experience switch (in operating unit, center console)

5.4. Notes for Service

The dynamic damper control is capable of self-diagnosis and if necessary can input a fault in the fault memory.

As the suspension is always in Sport mode at vehicle standstill, the shock absorbers can also be activated with help of the diagnosis system using the "Component activation" function.

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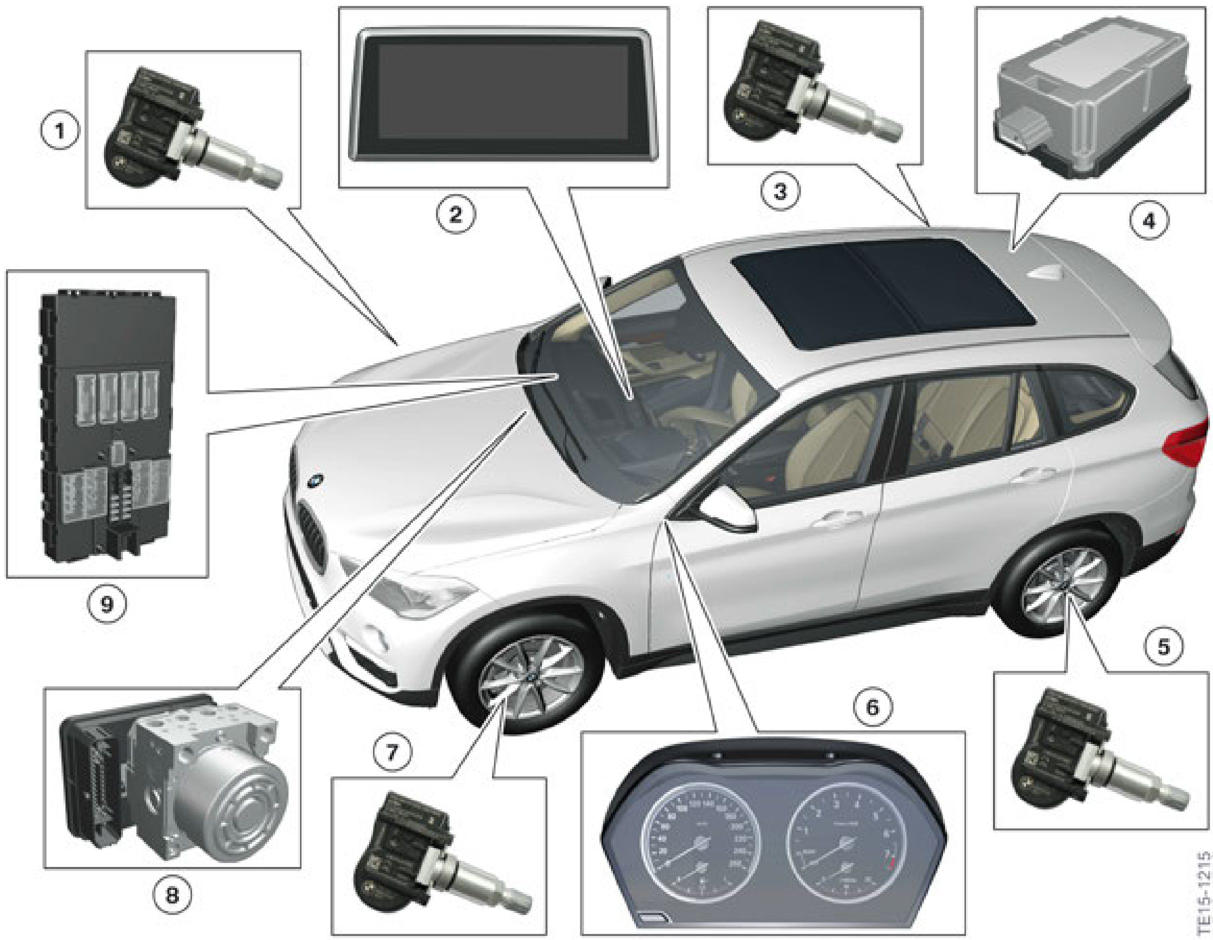
Risk of damage!

In the event of improper repair work, the shock absorbers or their plug connections may incur damage. It is imperative the current repair instructions are observed when working at the Dynamic Damper Control.

F48 Chassis and Suspension

6. Tire Pressure Monitoring System



F48 Tire Pressure Monitoring System (TPMS)

Index	Explanation
1	Wheel electronics, front right
2	Central information display (CID)
3	Wheel electronics, rear right
4	Remote control receiver
5	Wheel electronics, rear left
6	Instrument cluster (KOMBI)
7	Wheel electronics, front left
8	Dynamic Stability Control (DSC)
9	Body Domain Controller (BDC)

According to an US regulation, car manufacturers have to equip their models introduced on the market since 2012 with a system for monitoring the tire pressure, which warns the driver of too little air in the tires. From 2014 all new vehicles must already have this technology.

F48 Chassis and Suspension

6. Tire Pressure Monitoring System

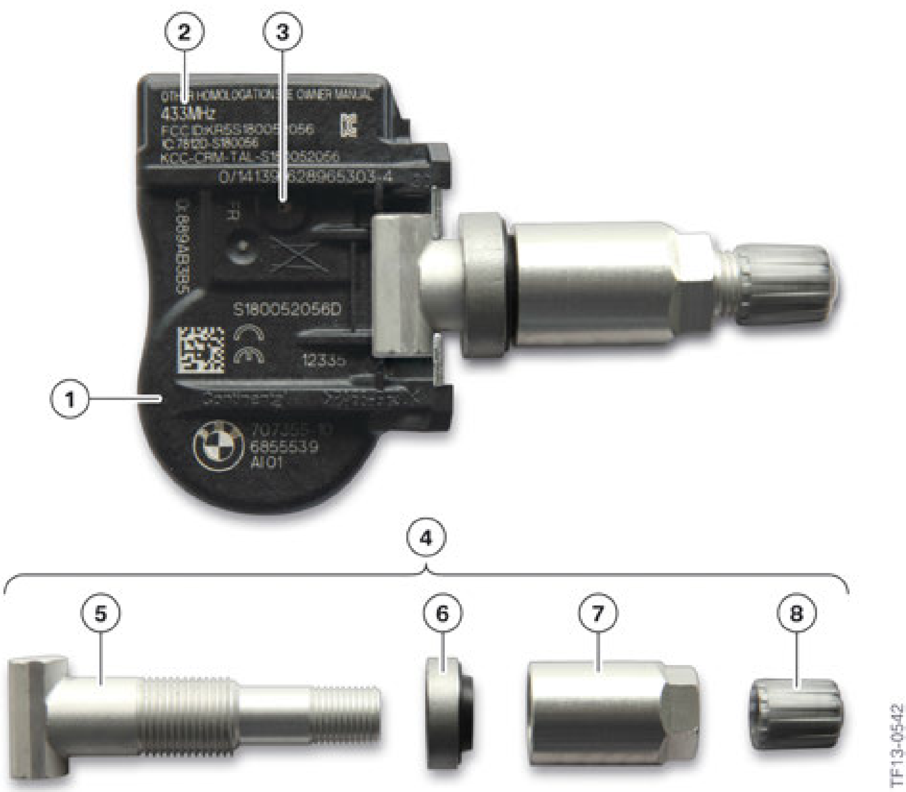
In the F48 the tire pressure monitoring are standard equipment. TPMS is a system which monitors the tire pressures. The function is integrated in the Dynamic Stability Control (DSC), whereby no separate TPMS control unit is required.

In each of the four mounted wheels there is wheel electronics, which record the tire pressure and the temperature in the tires. The wheel electronics send this information with radio signals to the remote control receiver. The remote control receiver forwards this information via the BDC to the DSC with help of the vehicle electrical system. The evaluation function of the information takes place in the DSC control unit.

The tire pressures are displayed via the central information display. Warnings due to insufficient tire pressure are output via the central information display or instrument cluster.

6.1. Notes for Service

The service life of the batteries of the wheel electronics is roughly 10 years or 300,000 km. Before each tire change the battery status of the wheel electronics should be determined using the diagnosis system, as it is not possible to check when the tires are mounted. If the remaining service life of the tires exceeds that of the battery, the wheel electronics must also be replaced.



F48 Wheel electronics with repair kit

Index	Explanation
1	Wheel electronics
2	Specification of transmission frequency
3	Pressure sensor
4	Repair kit
5	Valve unit
6	Sealing ring
7	Union nut
8	Valve cap

In the event of a leak at the valve unit a repair kit is available. Therefore, the entire wheel electronics do not have to be replaced.

7. Steering

F48 Overview of steering

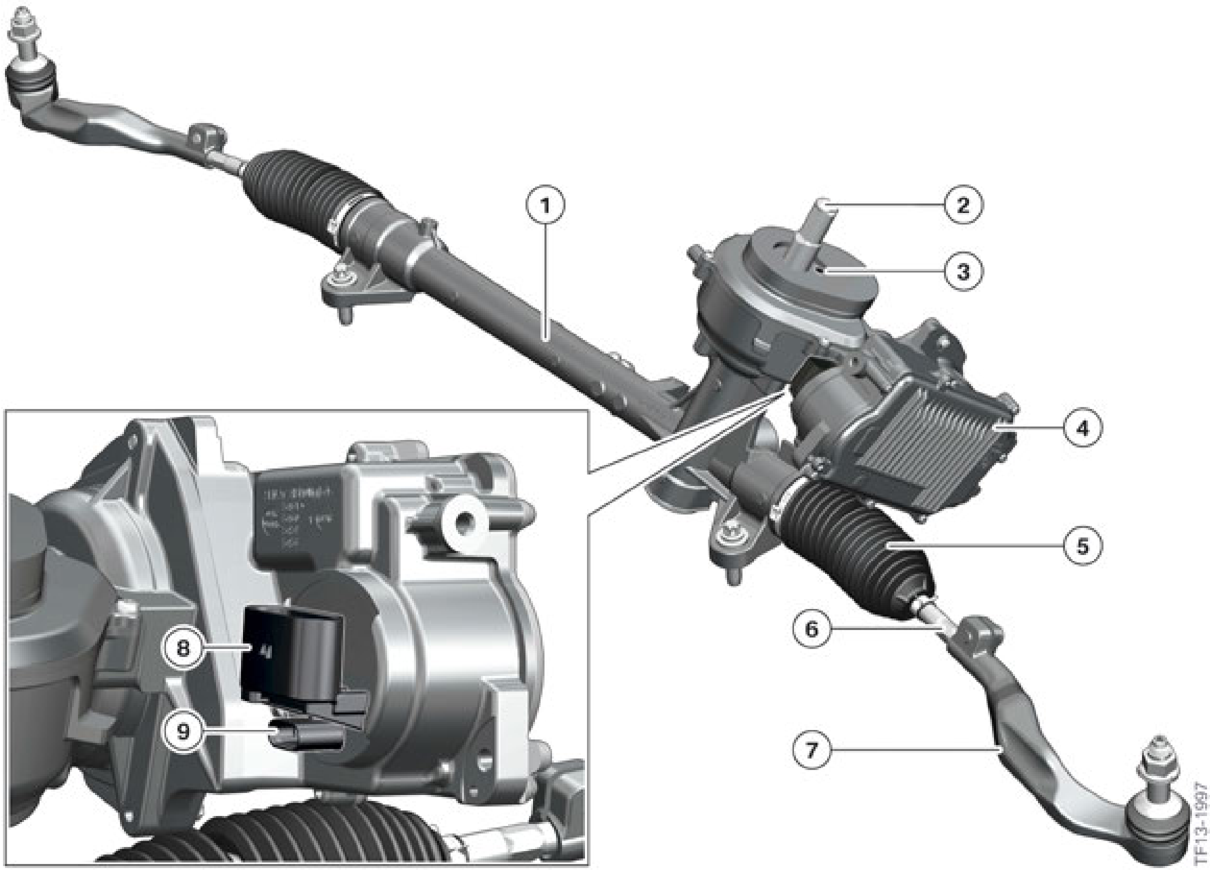
Index	Explanation
1	Steering wheel
2	Steering column adjustment
3	Top steering shaft
4	Bottom steering shaft
5	Electronic Power Steering (EPS)

The steering assistance and also the resetting forces can be freely defined with the Electronic Power Steering (EPS). This means the steering behavior and drivability can be adapted optimally to the corresponding driving situation.

F48 Chassis and Suspension

7. Steering

The lower and upper steering shafts can be telescoped together. This protects the driver against severe injuries in the event of a frontal crash. With the mechanical steering column adjustment the steering wheel position can be optimally adjusted to the seat position and body height.



F48 Electronic Power Steering (EPS)

Index	Explanation
1	Rack housing
2	Input shaft
3	Housing ventilation
4	EPS unit
5	Gaiter
6	Track rod
7	Track rod end
8	Socket, 12 V voltage supply
9	Socket, FlexRay

The 12 V steering has a maximum assistance output of 0.3 kW. The steering assistance takes place via the EPS unit parallel to the input shaft. The electric motor transmits the requested steering assistance to the pinion shaft via the worm drive. The steering system thus works with particularly low friction.

The EPS unit is made up of the following components:

- EPS control unit
- Three-phase electric motor
- Inverter for converting the 12 V direct current voltage to three-phase AC voltage, for the activation of the electric motor

In addition to the input shaft, there is housing ventilation. The formation of condensate is thus prevented due to alternating temperatures.

The individual components that can be replaced individually in Service at the EPS are the gaiters, the track rods and the track rod ends. It is not possible to exchange the EPS control unit or the electric motor separately.

The EPS is a prerequisite for implementation of the Parking Maneuver Assistant (PMA).

The Variable sport steering (SA 2VL) known from current BMW models is also available as an option.

7.1. Steering angle

The steering angle in the F48 is not recorded by a separate sensor at the steering wheel, but by the EPS control unit. It evaluates the signals of a rotor position sensor in the electric motor of the EPS unit.

The following values are stored in the EPS control unit for the purpose of determining the steering angle:

- Geometrical center of rack
- Straight-ahead value
- Number of rotor revolutions

7.1.1. Geometrical center of rack

The geometrical center of the rack is stored in the EPS control unit by the steering manufacturer (Nexteer) during installation and cannot be changed.

7.1.2. Straight-ahead value

Depending on the size of the production tolerance, the straight-ahead value deviates by a few degrees from the geometric center of the rack. It must be taught in again after the installation of the steering or after every removal of the steering mounting bolts. This can be effected with help of the diagnosis system via the service function "Commissioning".

Once stored, the straight-ahead value will not be deleted if the vehicle voltage is lost and can be overwritten as often as is required.

7.1.3. Number of rotor revolutions

In order to be able to calculate the position of the steering shaft, the revolutions of the rotor in the electric motor of the EPS unit must be continuously counted after the straight-ahead value is stored. In the event of a loss of the voltage supply, this value is lost and must be taught in again.

The number of rotor revolutions or the steering angle can be determined by two different teach-in routines:

- **Static**
  Turn steering wheel when ignition is switched on from the steering wheel center position to the limit position at the right, to the limit position at the left and back again to the steering wheel center position.
- **Dynamic**
  1. Rough value: The steering angle is calculated based on a short straight-ahead driving route at a driving speed of < 18 km/h with a precision of +/- 30° (approximately 2 revolutions of the rotor).
  2. Precise value: The steering angle is determined on a short straight-ahead driving route at a driving speed of < 60 km/h with a precision of +/– 7.5°.

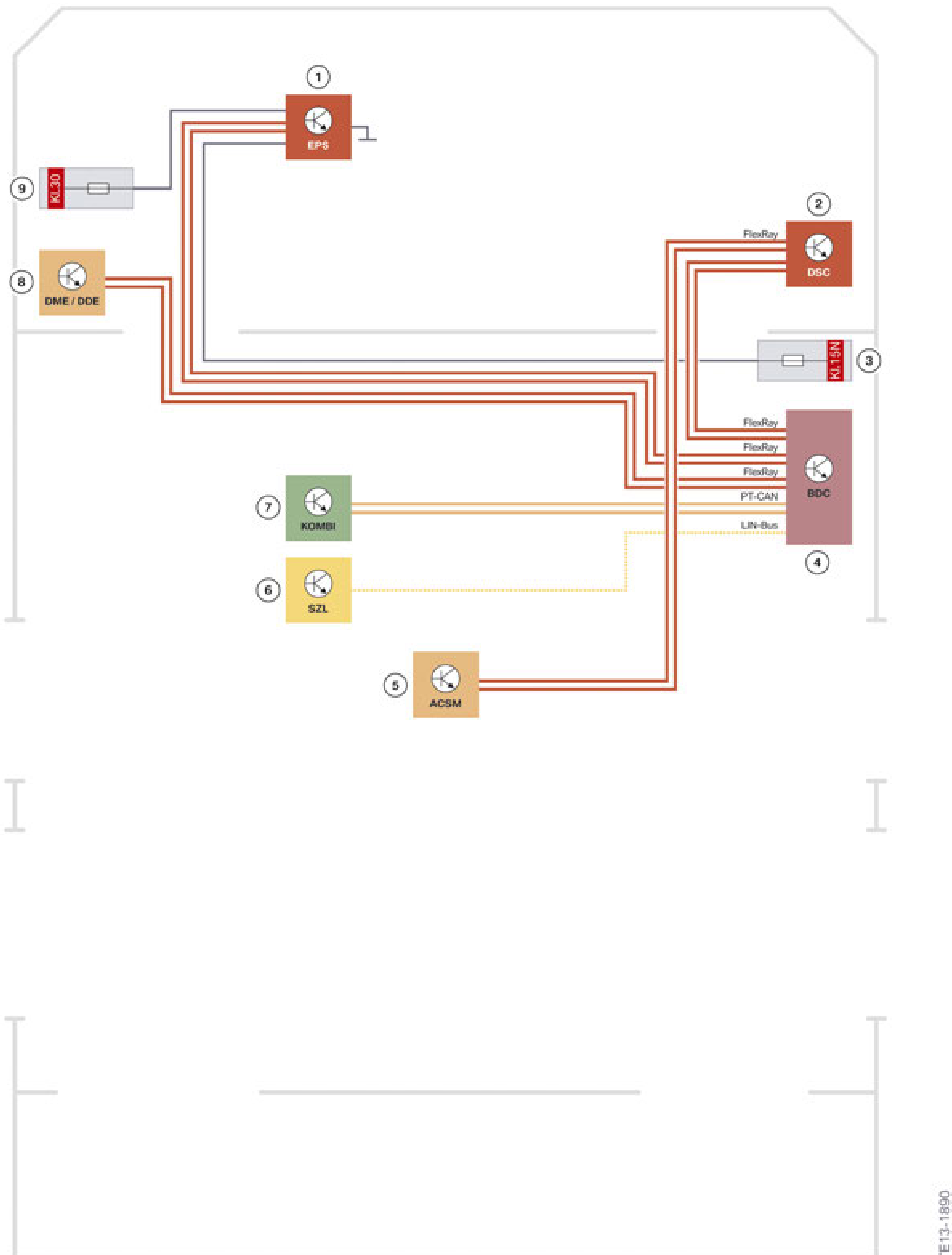
With static teaching of the steering angle, the revolutions of the rotor are counted by the EPS control unit and stored.

With dynamic teaching of the steering angle, the wheel speeds of the wheels on the rear axle, the yaw rate and the lateral acceleration are evaluated. If these values are within the stored tolerances over a short distance travelled, the steering angle is saved in the EPS control unit.

The steering angle is, however, also an important variable for calculating a wide range of DSC functions. For this reason the EPS control unit sends the steering angle information via FlexRay to the Dynamic Stability Control (DSC).

If it was not possible to determine the steering angle to the required degree of accuracy, the DSC indicator and warning light is activated if the driving speed of 12 to 37 mph is exceeded. This tells the driver that the various DSC functions are only operational to a limited extent. If the steering angle is determined dynamically during the course of the journey, the DSC functions are available again. This could, for example, occur if a customer has replaced the battery and exits the speed range of 12 to 37 mph too quickly.

7.2. System wiring diagram



F48 system wiring diagram for Electronic Power Steering (electromechanical power steering) (EPS)

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

7.3. Notes for Service

To relieve the load on the battery, the vehicle is delivered in transport mode. This means that the steering angle is not stored in the EPS control unit and must be set up again by the Service personnel with the assistance of the teach-in routine.

The EPS steering has a voltage range of between 9 V and 16 V. If a fault occurs which causes a drop in the supply voltage (up to 9 V, the current level is increased to compensate for the loss of power. To protect the system, the steering assistance is switched off if the supply voltage is less than 9 V or higher than 16 V.

System faults with the EPS are shown by the steering indicator and warning light in the instrument cluster.

Possible causes for the illumination of the indicator and warning light:

- Fault in the EPS control unit, an integrated sensor or in the electric motor
- Software error in the EPS control unit
- Over temperature threshold of EPS has been reached
- Under voltage or over voltage protection level reached
- Malfunction of external signals affecting the steering assistance
- Steering angle not taught in correctly or completely

⚠

If the EPS has been replaced or its mounting bolts have been undone, the "Start-up" service function must be run with the assistance of the diagnosis system.

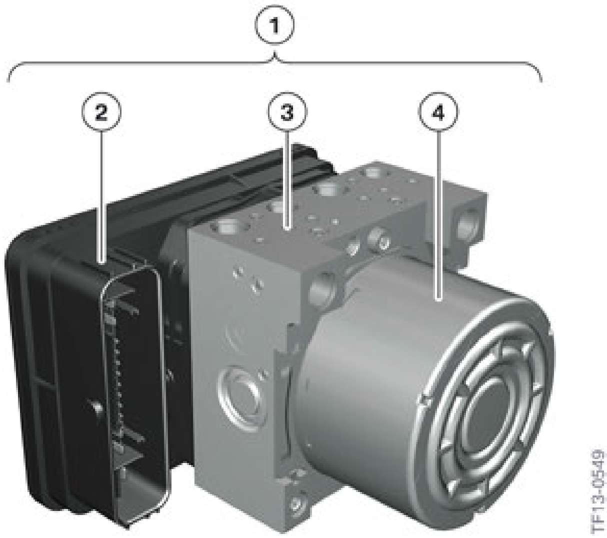
If the 12 V supply voltage to the EPS is lost, and upon deactivation of transport mode, the steering angle must be taught in statically or dynamically.

If the steering angle could not be calculated, the DSC functions are only available to a limited extent.

F48 Chassis and Suspension

8. Dynamic Stability Control

8.1. Overview



F48 DSC unit

Index	Explanation
1	DSC unit
2	DSC control unit
3	DSC hydraulic control unit
4	Electric motor

The Dynamic Stability Control forms the core of the vehicle control systems that enhance active safety. It optimizes driving stability in all driving conditions and also traction when driving off and accelerating. Furthermore, it identifies unstable driving conditions such as understeering or oversteering and helps maintain the vehicle on a steady course.

The DSC unit is made up of the DSC control unit and the DSC hydraulic control unit with electric motor. The DSC control unit is connected to the DSC hydraulic control unit using three screws and can be replaced separately in Service.

8. Dynamic Stability Control

8.2. DSC functions

Due to further developments in the meantime, the Dynamic Stability Control (DSC) functions now have many main functions and subfunctions.

Main function		Subfunction	
ABS	Antilock Brake System	EBV	Electronic brake force distribution
		CBC	Cornering Brake Control
		DBC	Dynamic Brake Control
			Dry by applying brake
			Fading Brake Support
ASC	Automatic Stability Control	MSR	Engine drag torque control
DSC	Dynamic Stability Control	GMR	Yaw moment control
			Trailer Stability Control
DTC	Dynamic Traction Control		
	Brake temperature model		
	Drive-off assistant		
LMV	Longitudinal torque distribution		
HDC	Hill Descent Control		
	Yaw moment compensation		
DCC	Dynamic Cruise Control		
RPA	Run Flat Indicator		
TPMS	Tire Pressure Monitoring System		

8.2.1. Electromechanical parking brake

Dynamic emergency braking

The law requires that there are two operating facilities for the brakes. In the F48 the second operating unit after the brake pedal is the parking brake button in the center console. If the parking brake button is pulled up while the vehicle is moving, the DSC system performs a dynamic emergency braking operation in a defined sequence. This function is intended for emergency situations in which the driver is not able to brake the vehicle using the brake pedal. Other occupants can also bring the vehicle to a standstill in this way if, for example, the driver suddenly falls unconscious.

If the parking brake button is operated during the journey above a defined driving speed, the DSC unit initiates a dynamic emergency braking operation. During dynamic emergency braking, brake pressure is generated hydraulically at all four wheel brakes. The DSC functions are fully active and the brake lights are operated. The slip of all wheels are monitored to ensure a stable braking operation until the vehicle comes to a standstill. The two actuators of the electromechanical parking brake are activated as soon as the vehicle comes to a standstill. Now only the parking brake secures the vehicle to prevent it from rolling away.

Brake test stand

The F48 has a test stand mode for checking the braking power of the electromechanical parking brake on a brake test stand. When the test stand mode is activated, the vehicle is decelerated via the actuators of the electromechanical parking brake when the parking brake button is pressed. A DSC pressure build-up in all four wheel brakes does not occur. This makes it possible to determine the brake forces of the electromechanical parking brake.

In the F48 test stand mode is automatically detected by means of a plausibility check (wheel speed comparison). The detection lasts a maximum of 5 seconds (can be recognized by slow flashing of the red parking brake indicator light).

After activation of test stand mode the system is in test stand mode. The parking brake indicator light acknowledges this status by flashing at a frequency of 1 hertz. Using the parking brake button the EMF can be applied in five stages. In this case, the braking varies between the minimum braking power in the first stage and the maximum braking power once the parking brake button has been pressed five times. If the button is operated continuously, the system increases the braking power automatically incrementally up to the maximum braking power. The flashing frequency of the parking brake indicator light changes from 1 hertz to 3 hertz when the parking brake button is pressed in test stand mode.

Automatic release

For automatic release, step on the accelerator pedal. The LED and indicator lamp go out. The parking brake is automatically released when you step on the accelerator if the following applies:

- Engine on
- Drive mode engaged
- Driver buckled in and doors closed

8.2.2. Hill Descent Control

Hill Descent Control is a downhill driving assistant that automatically controls vehicle speed on steep downhill gradients. Without applying the brakes, the vehicle moves at slightly more than walking speed. Hill Descent Control can be activated at speeds below approximately 22 mph.

When driving downhill, the vehicle reduces its speed to approximately walking speed and then keeps its speed constant. As long as there is active braking, the system is on standby. The system does not brake the vehicle during this time.

Only use HDC in low gears or in selector lever position D or R.

Increasing or decreasing vehicle speed

Specify desired speed in the range from approximately 4 mph to approximately 15 mph using the rocker switch of the cruise control on the steering wheel. Vehicle speed can be changed by lightly accelerating.

- Press the rocker switch up to the point of resistance: the speed increases gradually.
- Press up the rocker switch past the point of resistance: the speed increases while the rocker switch is pressed.
- Press the rocker switch down to the point of resistance: the speed decreases gradually.
- Press the rocker switch down past the point of resistance: when driving forward, the speed decreases to approximately 6 mph/10 km/h; when reversing, the speed decreases to approximately 4 mph.

Vehicle speed can be changed by lightly accelerating.

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