# Technical training.
## Product information.

# G05 Powertrain/Chassis

Edited for the U.S. market by:
**BMW Group University**
Technical Training
ST1831 11/1/2018

## BMW Service

# General information

### Symbols used

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

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

### Information status: July 2018

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.bmwcenternet.com.

### 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)

# G05 Powertrain/Chassis

## Contents

# G05 Powertrain/Chassis

## Contents

# G05 Powertrain/Chassis

## Contents

# G05 Powertrain/Chassis

## 1. Drive

A new feature of the G05 is more stringent compliance with the exhaust emission standards. This is achieved by implementing changes to the injection system (increasing injection pressure up to 350 bar) or to engine cooling type (Split Cooling).

### 1.1. Powertrain variants G05


G05 powertrain

#### 1.1.1. Models

**The G05 will be launched in the US market in November 2018 with the following models:**

| Model | Engine | Power output [kW (HP)] | Torque [Nm (lb-ft)] | Displacement [$cm^3$] |
|---|---|---|---|---|
| BMW X5 xDrive40i | B58B30M1 | 250 (335) | 500 (330) | 2998 |
| BMW X5 xDrive50i | N63B44M3 | 340 (456) | 650 (479) | 4395 |

# G05 Powertrain/Chassis

## 1. Drive

### 1.2. Differences in drives F15/G05

| Component | F15 | G05 |
|---|---|---|
| Engine generation | N-series engines | B-series engines |
| Rear axle differential lock | no | yes |
| Rear axle lateral torque distribution | yes | no |
| Brake system | Dynamic Stability Control (DSC) | Dynamic Stability Control integrated (DSCi) |

# G05 Powertrain/Chassis

## 2. Engines

### 2.1. B58TU Engine

#### 2.1.1. Special features of B58TU engine

B58TU engine

- Split cooling
- Cylinder head-integrated exhaust manifold
- Single-part chain drive
- High-pressure injection of up to 350 bar.

# G05 Powertrain/Chassis

## 2. Engines

### 2.2. N63TU3 Engine

#### 2.2.1. Special features of N63TU3 engine


N63TU3 engine

- Exhaust turbocharger with overboost function
- Indirect charge air cooling with bypass pipe
- High-pressure injection of up to 350 bar
- Digital Motor Electronics (DME) 8.8T

### 2.3. Further information

#### 2.3.1. Product Info

Detailed descriptions of the engines can be found in the following Product Information:

- Product Information B58TU Engine
- Product information N63TU3 Engine

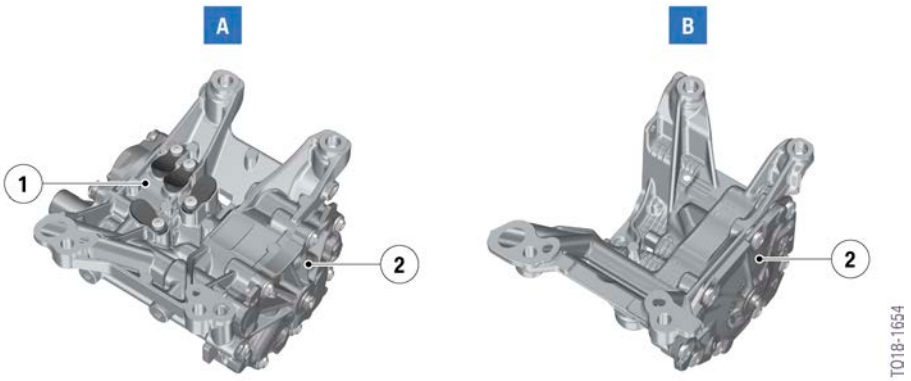
# G05 Powertrain/Chassis

# 3. Engine Mechanical

## 3.1. Vacuum supply

### 3.1.1. Vacuum pump

Vehicles with gasoline engines and "conventional brake systems" require a vacuum pump for brake assist. Vehicles with gasoline engines and DSCi brake systems do not require a vacuum booster as the pedal force in the DSCi brake system is increased hydraulically. The graphics show the oil pumps of the B58 engine and B58TU engine with and without combined vacuum pump.




Comparison between oil pumps of B58 engine and B58TU engine

| Index | Explanation |
|---|---|
| A | B58 engine, tandem oil pump with integrated vacuum pump |
| B | B58TU engine, oil pump |
| 1 | Vacuum pump |
| 2 | Oil pump |

# G05 Powertrain/Chassis

# 4. Automatic Transmission

## 4.1. Automatic transmission GA8HPTU2

GA8HPTU2 automatic transmission

In the G05 is equipped with the GA8HPTU2 automatic transmission. Two variants are used, depending on the engine type:

| Engine | Automatic transmission |
|---|---|
| B58B30M1 | 8HP51 |
| N63B44M3 | 8HP76 |

### 4.1.1. Special features

The following further developments made it possible to increase the comfort, dynamics and efficiency of the 8-speed automatic transmission:

- As the gear shift intervals have increased, it has been possible to increase the range.
- The shifting dynamics have been improved through redevelopment of the electronic transmission control (EGS).
- Improved driving comfort by using a centrifugal pendulum to counteract the rotational irregularity of the engine.
- Enhanced customer experience due to new operating possibilities with the driving experience switch or shift paddles.

**Emergency release**

As is already known to be the case with the automatic transmission 8HPTU, the automatic transmission 8HPTU2 can be also be unlocked in different ways in the event of a breakdown to ensure the vehicle can be rolled:

- Mechanical emergency release.
- Electronic emergency release.

Towing the vehicle with one axle lifted is **not** permitted! Although the automatic transmission would in fact survive towing for a time depending on the speed without being damaged, it cannot be guaranteed that the parking lock would be permanently unlocked due to modification of the mechanical or electronic transmission emergency release. If the parking lock were suddenly to be engaged during a towing operation, the components and vehicle could be damaged and a serious accident could occur!

# G05 Powertrain/Chassis

# 5. Front Axle Differential

## 5.1. Use of front axle transmission

### 5.1.1. Variants

**Two different front axle transmissions with the following designation are used:**

- VAG 168AL
- VAG 175AL

**Adaptations**

- Adapted axle ratio for the G05.
- Changeover to a low viscosity oil.
- Optimization of transmission oil flow for lower transmission oil temperatures and reduction of heat entering the front axle transmission.
- Reduction in weight and splash losses due to welding of ring gear.

These measures have made it possible once again to increase the efficiency of the front axle transmission and reduce carbon dioxide emissions.

# G05 Powertrain/Chassis

# 6. Rear Axle Final Drive

## 6.1. Use of rear axle differential

### 6.1.1. Variants

**Two different rear axle differentials with the following designation are used:**

- HAG 205AL
- HAG 215LW

**Adaptations**

- Adapted axle ratio for the G05.
- Use of thin oil.
- Technical measures for optimizing the weight.

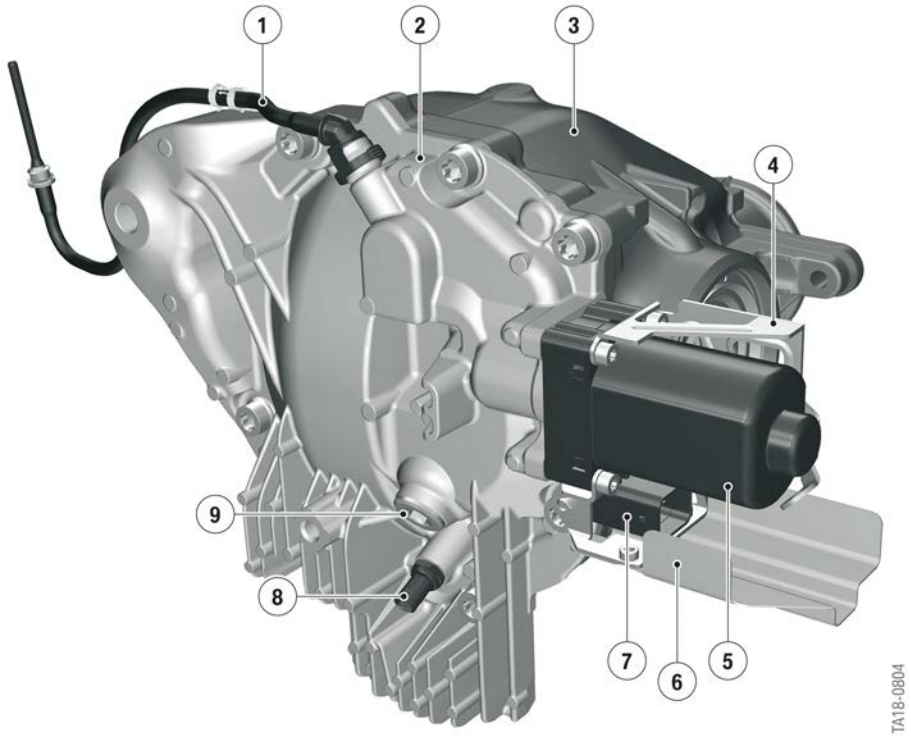
As a result of these measures, it was possible to increase the efficiency of the rear axle differential and reduce carbon dioxide emissions.

## 6.2. Rear axle differential with lock

The all-wheel drive version of the G05 can be equipped with a rear axle differential with locking function HAG 215LWS. The regulated rear axle differential lock can be identified by an e-motor which is screwed on from the outside. Furthermore, a housing cover made of aluminium is installed which closes the existing grey cast iron housing to the rear.

# G05 Powertrain/Chassis

## 6. Rear Axle Final Drive




G05 rear axle differential lock HAG 215LWS

| Index | Explanation |
|---|---|
| 1 | Ventilation line |
| 2 | Housing cover |
| 3 | Housing |
| 4 | Holder for heat shield |
| 5 | Electric motor |
| 6 | Heat shield |
| 7 | Electrical connection, electric motor |
| 8 | Transmission oil temperature sensor |
| 9 | Oil filler plug |

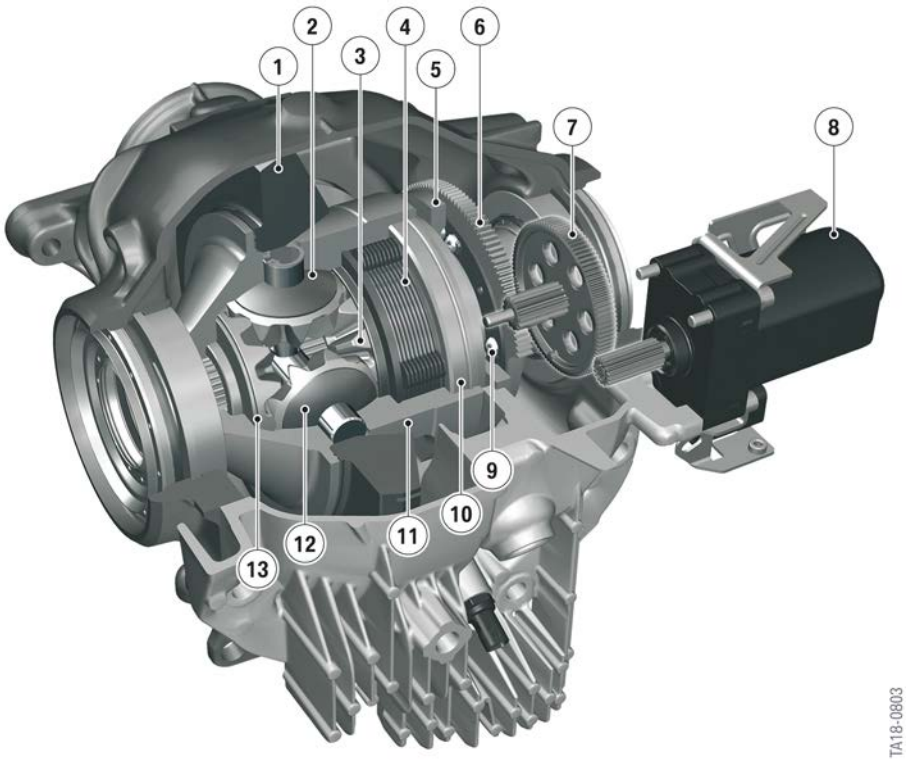
The regulated rear axle differential lock is an electromechanical rear axle differential lock which is based on the current M differential of M GmbH. The regulated rear axle differential lock allows the slip between the right and left rear wheel to be reduced by establishing a friction-locked connection between both wheels via a multidisc clutch. If required, the multidisc clutch package is closed via an e-motor and is applied between the rear wheel and differential housing. A lock-up torque of up to 1500 Nm can be generated irrespective of the requested drive torque.

The advantages compared to a differential without regulated lock are:

- Optimal traction
- Greater driving stability
- Improved handling

### 6.2.1. Design

**Inner structure**




G05 rear axle differential with lock HAG 215LWS, layout

| Index | Explanation |
|---|---|
| 1 | Ring wheel |
| 2 | Differential bevel gear |
| 3 | Bevel pinion |
| 4 | Multidisc clutch |
| 5 | Pressure disc with second ball ramp |
| 6 | Ball ramp |
| 7 | Transfer box |
| 8 | Electric motor |

| Index | Explanation |
|---|---|
| 9 | Spherical disc and ball |
| 10 | Differential cover |
| 11 | Differential housing |
| 12 | Differential bevel gear |
| 13 | Output bevel gear |

The drive torque to be transmitted at the wheels of the rear axle is calculated in the Dynamic Stability Control (DSC) and forwarded to the regulated rear axle differential lock (GHAS) control unit via a FlexRay bus. The regulated rear axle differential lock control unit calculates the adjusting torque to be set at the toothed mobile adjusting disc of the ball ramp based on the requested drive torque.

The adjusting torque required for control is generated by the electric motor. The rotational movement of the electric motor is converted to an axial movement by a ball ramp mechanism and the clutch package of the multidisc clutch is closed or opened.

The contact pressure of the multidisc clutch is increased or reduced depending on the requested torque distribution. As a result, the stepped-up engine torque is steplessly distributed between the two rear wheels corresponding to the driving situation.

For more information on the rear axle differential with lock HAG 215LWS, refer to the product information "G02 complete vehicle",Regulated rear axle differential lock.

### Oil change

The oil filling of the rear axle differential lock is designed for the entire service life of the assembly.

BMW AG vehicles with regulated rear axle differential lock are not designed for use on racing tracks. If not observed, this can lead to premature wear of the rear axle differential lock and its components. In the event of a customer complaint "Noises from the rear axle differential", an oil change in the rear axle differential must initially be performed before replacing individual components or the entire assembly!

### Model overview

The following table provides you with an overview of the models in which the rear axle differential with lock HAG 215LWS is used:

| Model | Engine | Rear axle final drive | Transformation ratio |
|---|---|---|---|
| BMW X5 xDrive40i | B58B30M1 | HAG215LWS | 3.38:1 |
| BMW X5 xDrive50i | N63B44M3 | HAG215LWS | 3,15:1 |

# G05 Powertrain/Chassis

# 7. Transfer Box

## 7.1. Transfer box ATC13-1

The transfer box ATC13-1 is the successor of the modular transfer box ATC45L from the F15.

### 7.1.1. Special features

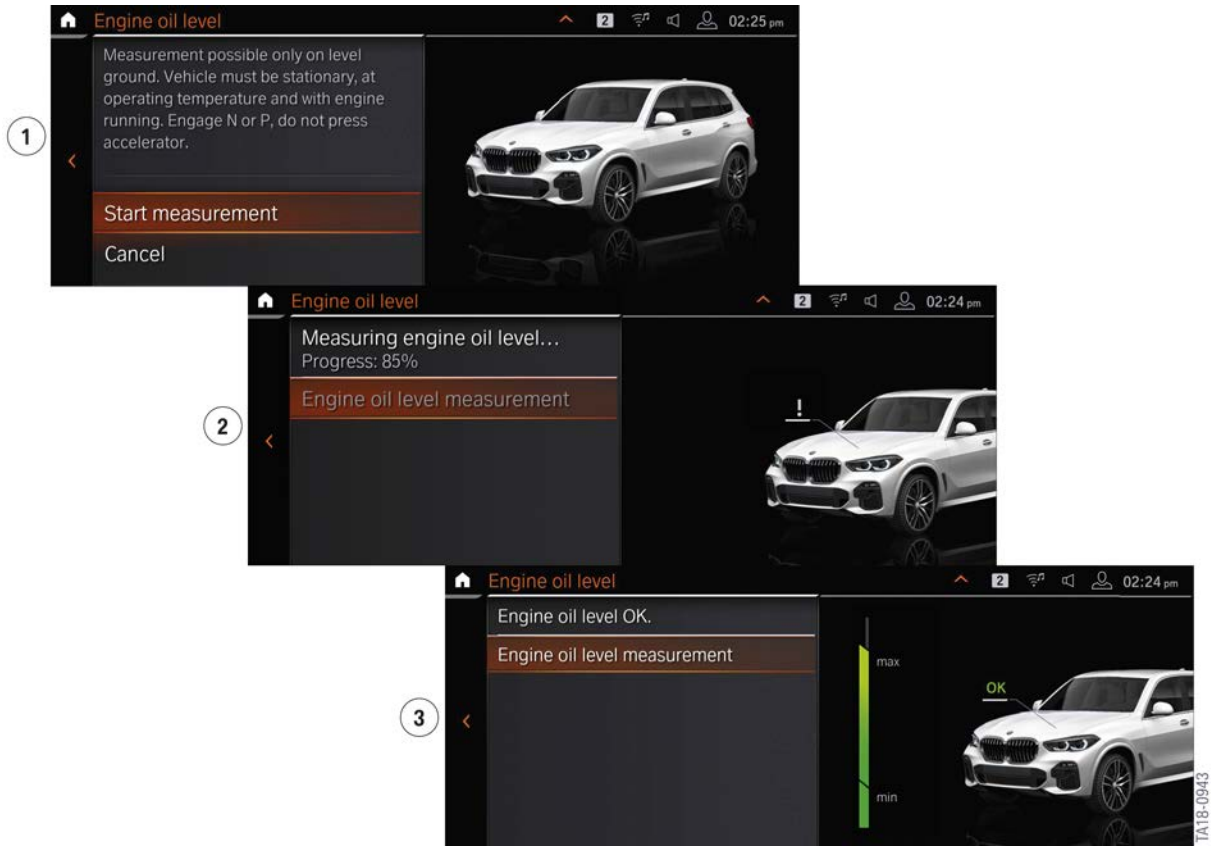
Special features of the ATC13–1 transfer box include:

- Fully variable distribution between front/rear axle is possible (100/0% and 0/100%)
- Demand-based oil level reduction in order to reduce splash losses
- Efficiency optimized by new oil line system.

# G05 Powertrain/Chassis

## 8. Display/Operating Concept

### 8.1. Oil level measurement




G05 display/operating concept, oil level measurement

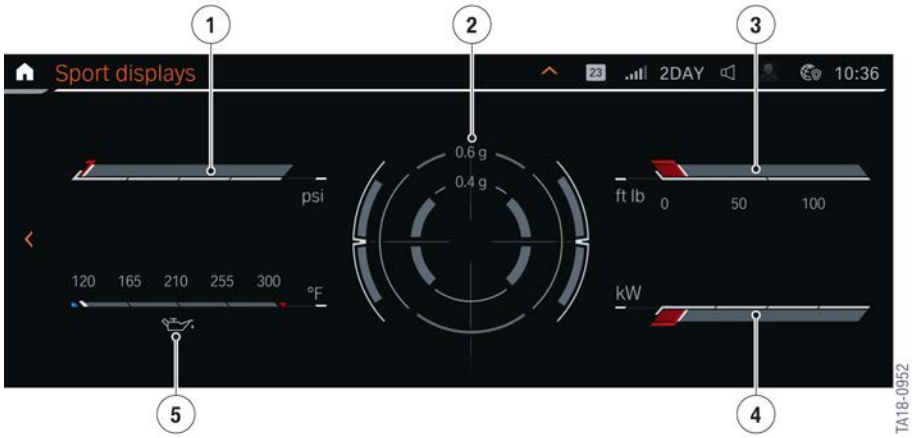
| Index | Explanation |
|---|---|
| 1 | Measurement prerequisites |
| 2 | Measurement is performed |
| 3 | Measurement ended |

The display/operating concept for the oil level measurement has been reworked. At present, when an oil level measurement is requested, a long text containing mixed information on system-specific measurement inhibitors together with the time required to perform the measurement is displayed. It has been possible to improve the measurement process by simplifying the presentation of inhibit reasons and forecast time.

# G05 Powertrain/Chassis

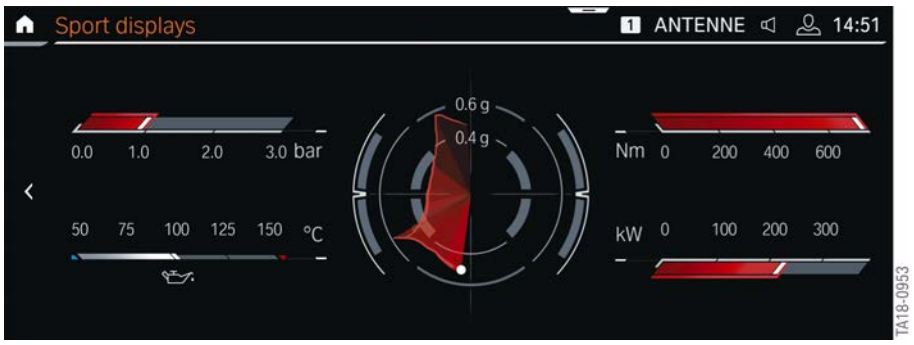
## 8. Display/Operating Concept

### 8.2. Sport displays




G05 sport displays

| Index | Explanation |
|---|---|
| 1 | Charging pressure, exhaust turbocharger |
| 2 | G-force (acceleration, deceleration, rotation) |
| 3 | Engine torque |
| 4 | Engine performance |
| 5 | Engine oil temperature |




G05 example of sport displays

The sport displays in the G05 have been reworked and redesigned. The stresses on the vehicle vary, depending on the choice of terrain and way in which the vehicle is driven. The choice of displays relates to the most important parameters for the types of terrain on which the vehicle can be driven. The charging pressure, engine torque, engine output, engine oil temperature and g-forces which occur during acceleration, deceleration and cornering are displayed.

# G05 Powertrain/Chassis

## 9. Chassis and Suspension

### 9.1. Introduction

The list of highlights in the new BMW X5 with the development code G05 is extensive. The customer can enjoy the prospect of choosing from many different equipment packages that allow him to configure his vehicle for sporty or off-road driving. The drive and chassis and suspension therefore play an important role in customer satisfaction.


Race track operation and offroad driving with the G05

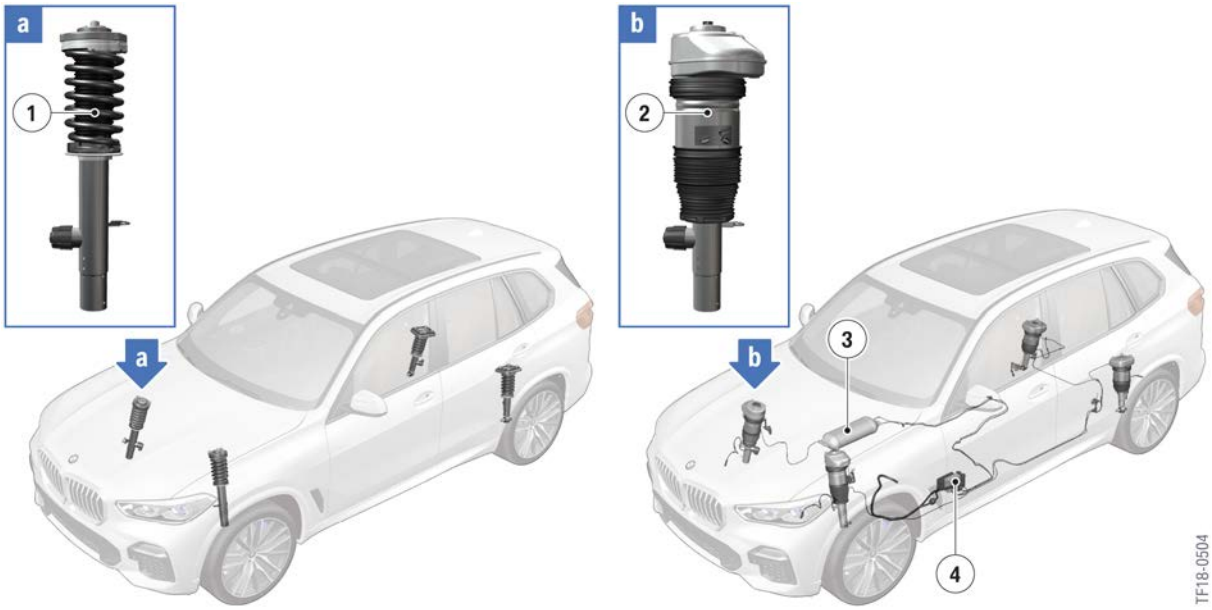
| Index | Explanation |
|---|---|
| A | Race track |
| B | Off-road |

Different chassis and suspension packages are available.

The BMW customer can choose between a sporty chassis and suspension with steel springs and a comfortable air suspension with advanced customer functions, e.g. for offroad driving.

# G05 Powertrain/Chassis

## 9. Chassis and Suspension




Chassis and suspension systems of the G05

| Index | Explanation |
|---|---|
| 1 | Steel spring strut |
| 2 | Air suspension strut |
| 3 | Pressure accumulator |
| 4 | Air supply unit |

## 9.2. Chassis and suspension comparison

| Component | F15 | G05 |
|---|---|---|
| Front axle | Double-wishbone | Double-wishbone |
| Front suspension | Steel | Steel or air |
| Front damping | Conventional or Electronic Damper Control (EDC) | Electronic Damper Control (EDC) |
| Anti-roll bar, front | Conventional or hydraulic active stabilizer | Conventional or electric active stabilizer (EARS) |
| Rear axle | Integral rear axle IV | Five-link rear suspension |
| Rear suspension | Steel or air | Steel or air |
| Rear damping | Conventional or Electronic Damper Control (EDC) | Electronic Damper Control (EDC) |
| Rear anti-roll bar | Conventional or hydraulic active stabilizer | Conventional or electric active stabilizer (EARS) |

# G05 Powertrain/Chassis

## 9. Chassis and Suspension

| Component | F15 | G05 |
|---|---|---|
| Brake system | Dynamic Stability Control (DSC) | Integrated brake system (DSCi) |
| Front brake | Brake discs up to dia. 385 mm | Brake discs up to dia. 395 mm |
| Rear brakes | Brake discs up to dia. 345 mm | Brake discs up to dia. 398 mm |
| Parking brake | Electromechanical parking brake (EMF) | Electromechanical holding brake |
| Brake circuit distribution | Black/white | Diagonal |
| Tire inflation pressure monitoring | RDCi tire pressure control | RDCi tire pressure control |
| Tire pressure | Information in the B-pillar | Electronic tire pressures in the CID |
| Front steering | Electronic Power Steering (EPS) or hydraulic active steering | Electronic Power Steering (EPS) or Integral Active Steering |
| Rear steering | No | Rear axle slip angle control (HSR) |

### 9.3. Overview of system descriptions

The systems already familiar from other vehicle models will not subsequently be examined in depth in this document. If required, the detailed system descriptions can be found in the product information listed below.

| Topic | Product information |
|---|---|
| Steering | G12 Chassis and Suspension |
| Tire Pressure Monitor (RDCi) | Tire Pressure Monitor RDCi |
| Electronic tire pressures label | G30 Chassis and suspension |
| Electronic Damper Control (EDC) | G12 Chassis and Suspension |
| Electric Active Roll Stabilization (EARS) | G12 Chassis and Suspension |

# G05 Powertrain/Chassis

## 9. Chassis and Suspension

### 9.4. Chassis and suspension packages

| Variants | Suspension | EDC | EARS | EPS | GHAS | HSR |
|---|---|---|---|---|---|---|
| Basic |  | --- | --- |  | --- | --- |
| M Sport Package (ZPM) (Includes Adaptive M Suspension) |  |  | --- |  | --- | --- |
| Dynamic Handling Package (ZDH) (Includes Adaptive M Suspension Professional) |  |  |  | --- |  Note |  |
| Adaptive Comfort |  |  | --- | --- | --- |  |
| Off-road Package (ZOR) |  |  | --- | --- |  Note |  |

The air suspension is not available in combination with the active stabilizer.

#### 9.4.1. Abbreviations

| Index | Explanation |
|---|---|
| EARS | Electric Active Roll Stabilization |
| EDC | Electronic Damper Control |
| EPS | Electromechanical Power Steering |
| GHAS | Regulated rear axle differential lock |

### 9.4.2. Basic chassis and suspension

Compared to the predecessor (F15), the standard chassis and suspension variant without optional equipment already offers regulated dampers in the basic version and therefore a significant improvement in driving comfort also with significantly enhanced BMW-typical driving dynamics characteristics.

In contrast to all other chassis and suspension packages, the basic version of the Driving Experience Control does not affect regulation of the Electronic Damper Control (EDC).

### 9.4.3. Adaptive M suspension (SA 2VF)

This chassis and suspension package offers modified suspension and damping characteristics compared to the basic chassis and suspension via the Driving Experience Control.

**Influence of the Driving Experience Control on the EDC control**

- COMFORT
- SPORT

The SPORT driving mode offers a much sportier damping characteristic at the expense of driving comfort.

### 9.4.4. Adaptive M suspension Professional (SA 2VW)

From a functional standpoint, this chassis and suspension package has a particularly strong influence on the cornering behavior of the vehicle. This is achieved by using the electric active roll stabilization front (EARSV) and the electric active roll stabilization rear (EARSH). Both active stabilizers are adjusted by the vertical dynamic platform (VDP). The increase in driving dynamics is largely due to a significant reduction in the roll angle of the body during cornering and a neutral drivability with low understeering tendency. What is notable about this suspension control system is that the increase in driving dynamics is not achieved in any manner whatsoever at the expense of the driver's comfort.

### 9.4.5. 2–axle Air Suspension (SA 2VR)

Due to the two-axle ride level control, there are no adverse effects whatsoever on comfort.

The driving characteristics can be modified in the usual manner via the Driving Experience Control.

Includes a level change rocker button which allows the customer to set 5 different ride heights in total from –40 mm to +40 mm.

# G05 Powertrain/Chassis

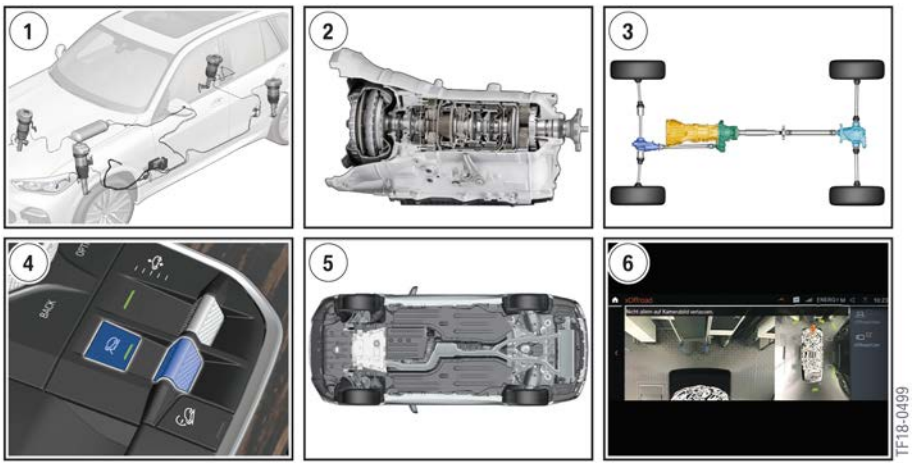
## 9. Chassis and Suspension

### 9.4.6. xOffroad package(SA ZOR)

The offroad package contains the 2–axle Air suspension (SA 2VR) and the electronically regulated rear axle differential lock (GHAS).

In addition to the level change rocker button for the air suspension, this chassis and suspension package also includes an offroad button. The driver can select 4 different offroad driving modes via the offroad button. This allows the driving characteristics to be adapted to the local conditions, e.g. snow, sand, gravel or rock. Additionally, a preconfigured ride level is set based on the offroad mode selected. The resulting additional ground clearance increases the fording depth and offroad capability on challenging sections, e.g. embankments or ramps with steep drive-up angle.

## 9.5. xOffroad package




Overview of modifications to the xOffroad optional equipment in the G05

| Index | Explanation |
|---|---|
| 1 | Air suspension for more ground clearance |
| 2 | Modification of the automatic transmission shift strategy for offroad driving |
| 3 | xDrive and regulated rear axle differential lock (GHAS) |
| 4 | Offroad button for various offroad programs |
| 5 | Reinforced underride protection |
| 6 | xOffroad camera for offroad driving (only with Parking Assistant Plus 5DN) |

The G05 is the first vehicle in the BMW Group to include optional equipment which is designed to increase offroad capability. The xOffroad package is available for all vehicle types.

# G05 Powertrain/Chassis

## 9. Chassis and Suspension

### 9.5.1. Operation


Center Operation Unit in the G05

| Index | Explanation |
|---|---|
| 1 | Offroad button (only with xOffroad optional equipment) |
| 2 | LED display of vehicle level |
| 3 | Level change rocker button (only with optional equipment Adaptive Comfort) |
| 4 | Offroad rocker button (only with optional equipment xOffroad) |
| 5 | Hill Descent Control |
| 6 | Parking brake button |
| 7 | Automatic Hold |
| 8 | Driving experience switch |
| 9 | START-STOP button |

The offroad button is the offroad Driving Experience Control. It supports the driver with the assistance of various transmission modes in challenging terrain. The Driving Experience Control for road cannot be operated at the same time as the offroad button. In contrast to the level change rocker button for the air suspension, the offroad rocker button not only influences the vehicle level, but also the drive, chassis and suspension and assistance systems. Once the offroad driving program has been exited by pressing the offroad button the last Driving Experience Control mode to be selected for road is enabled.

**The xOffroad mode can be activated as follows:**

- By actuating the offroad rocker button
- By actuating the offroad button.

**The xOffroad mode can be exited as follows:**

- By actuating the offroad button
- By actuating the Driving Experience Control.

### 9.5.2. Operating strategy

To support the driver when driving offroad, 4 different transmission modes are available. These can be activated by pressing the offroad rocker button. The transmission modes support the driver through systematic adjustment of various drive and chassis and suspension systems. The vehicle can therefore be perfectly tuned to the offroad conditions.


Operating strategy of xOffroad chassis and suspension in the G05

| Driving Mode | Application | Influence | Operation |
|---|---|---|---|
| **A**<br>xSnow | Snow | – accelerator pedal<br>– shift strategy. |  |
| **B**<br>xSand | Sand | – accelerator pedal<br>– shift strategy<br>– higher degree of locking (xDrive/GHAS)<br>– ride height (+20 mm)<br>– EDC control<br>– DSCi control. |  |
| **C**<br>xGravel | Gravel | – ride height (+20 mm)<br>– EDC control |  |
| **D**<br>xRocks | Rock | – accelerator pedal<br>– shift strategy<br>– higher degree of locking (xDrive/GHAS)<br>– ride height (+40 mm)<br>– EDC control<br>– DSCi control. |  |

**Effects on the drive**

| Offroad mode | Accelerator pedal | Transmission |
|---|---|---|
| xSnow | Reduced | – lower shift speeds<br>– soft gearshifts |
| xSand | Aggressive | – higher shift speeds |
| xGravel | Normal | - - - |
| xRocks | Optimum modulation | – higher shift speeds |

**Effects on the blocks**

| Offroad mode | xDrive | Efficiency Mode* | GHAS |
|---|---|---|---|
| xSnow | - - - | - - - | - - - |
| xSand | Higher degree of locking when cornering | Deactivated | Higher degree of locking on slopes and with roll tendency up to 10 km/h (6 mph) |
| xGravel | - - - | Deactivated | - - - |
| xRock | Higher degree of locking when cornering | Deactivated | Higher degree of locking on slopes and with roll tendency up to 10 km/h (6 mph) |

* The Efficiency Mode was introduced in the G12 with the new transfer box ATC13-1. In Efficiency Mode the multidisc clutch in the transfer box is fully opened so that no power flows to the wheels of the front axle. The lubrication has been further reduced which ensures that the fuel consumption is lower.

The effects on the control of the xDrive all-wheel system and control of the regulated rear axle differential lock (GHAS) shown in the table cannot be perceived by the driver. This is a subtle pilot control. Due to the exceptionally high control speed of both systems, a permanently high pilot control of the degree of locking when offroad mode is activated is no longer necessary.

Both systems also continuously regulate the adjusted degree of locking when offroad mode is not activated and independently of the local conditions.

**Effect on the chassis and suspension**

| Offroad mode | Air suspension | EDC | DSCi |
|---|---|---|---|
| xSnow | +/–0 mm | - - - | - - - |
| xSand | +20 mm | Offroad (soft) | Slip expansion at low speed |
| xGravel | +20 mm | Offroad (soft) | - - - |
| xRocks | +40 mm | Offroad (soft) | Slip expansion at low speed |

When the speed threshold of 30 km/h (18 mph) ("Rock" offroad mode) or 60 km/h (37 mph) ("Sand/Gravel" offroad mode) is exceeded, the ride height is adjusted with reference to the lower drive level in each case. When the speed falls below the defined threshold again, the initial level is automatically restored by raising the vehicle.

For a detailed description of the various ride heights, refer to the section Two-axle ride level control –> Operating strategy.

**Effect on assistance systems**

| systems | Snow | Sand | Gravel | Rock |
|---|---|---|---|---|
| Automatic Start/ Stop | Deactivated | Deactivated | Deactivated | Deactivated |
| Offroad camera | Activated | Activated | Activated | Activated |

**Abbreviations**

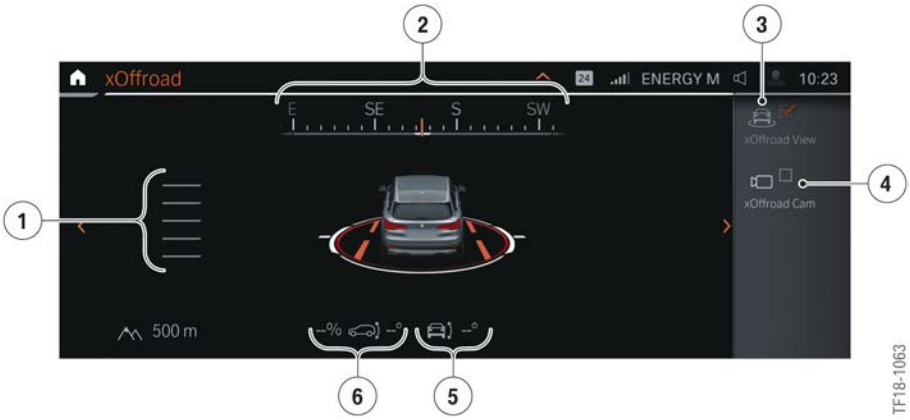
| Term | Explanation |
|---|---|
| DSCi | Dynamic Stability Control integrated |
| xDrive | All wheel drive system |
| GHAS | Regulated rear axle differential lock |
| Automatic Start/Stop | Automatic engine start/stop function |

### 9.5.3. Displays


x-display in the CID of the G05

| xOffroad mode | Explanation |
|---|---|
| xSnow | Optimized setting for calmed drivability on smooth road |
| xSand | Optimized setting for heavy terrain with loose ground; DSC deactivated for maximum traction |
| xGravel | Optimized setting for light terrain |
| xRocks | Optimized setting for heavy terrain with uneven ground; DSC deactivated for maximum traction |

A specially optimized display for offroad driving in the Central Information Display (CID) informs the driver about the ground clearance of the vehicle and also the roll tendency, the inclination or the downhill gradient of the offroad section.

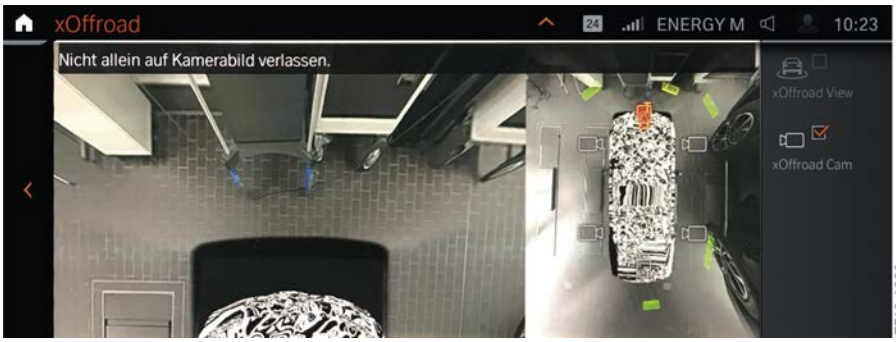



CID display of the xOffroad menu in the G05

| Index | Explanation |
|---|---|
| 1 | Vehicle level |
| 2 | Compass |
| 3 | xOffroad view |
| 4 | xOffroad camera |
| 5 | Roll tendency in degrees |
| 6 | Inclination and downhill gradient in percent and degrees |

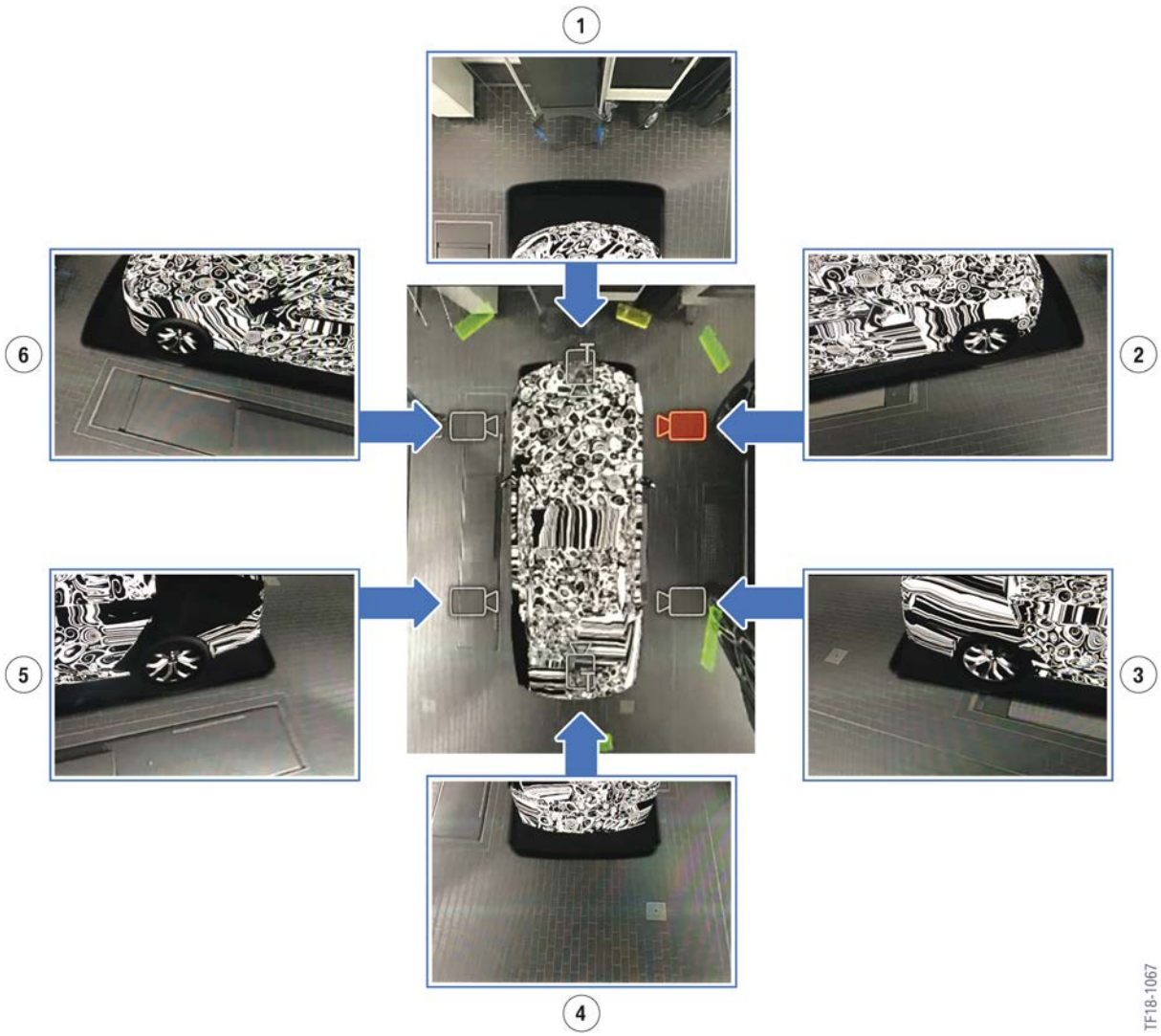
The xOffroad camera supports the driver in narrow offroad sections. This provides him with a perfect all-round view of the vehicle.

### xOffroad camera




xOffroad camera view in the G05

The xOffroad camera is available in all driving modes. It can be used by the driver irrespective of the settings of the Driving Experience Control for road or the offroad button.




xOffroad camera views in the G05

| Index | Explanation |
|---|---|
| 1 | View of front of vehicle |
| 2 | View of front right wheel |
| 3 | View of rear right wheel |
| 4 | View of rear end |
| 5 | View of rear left wheel |
| 6 | View of front left wheel |

**Speed-dependent functions of the xOffroad camera**

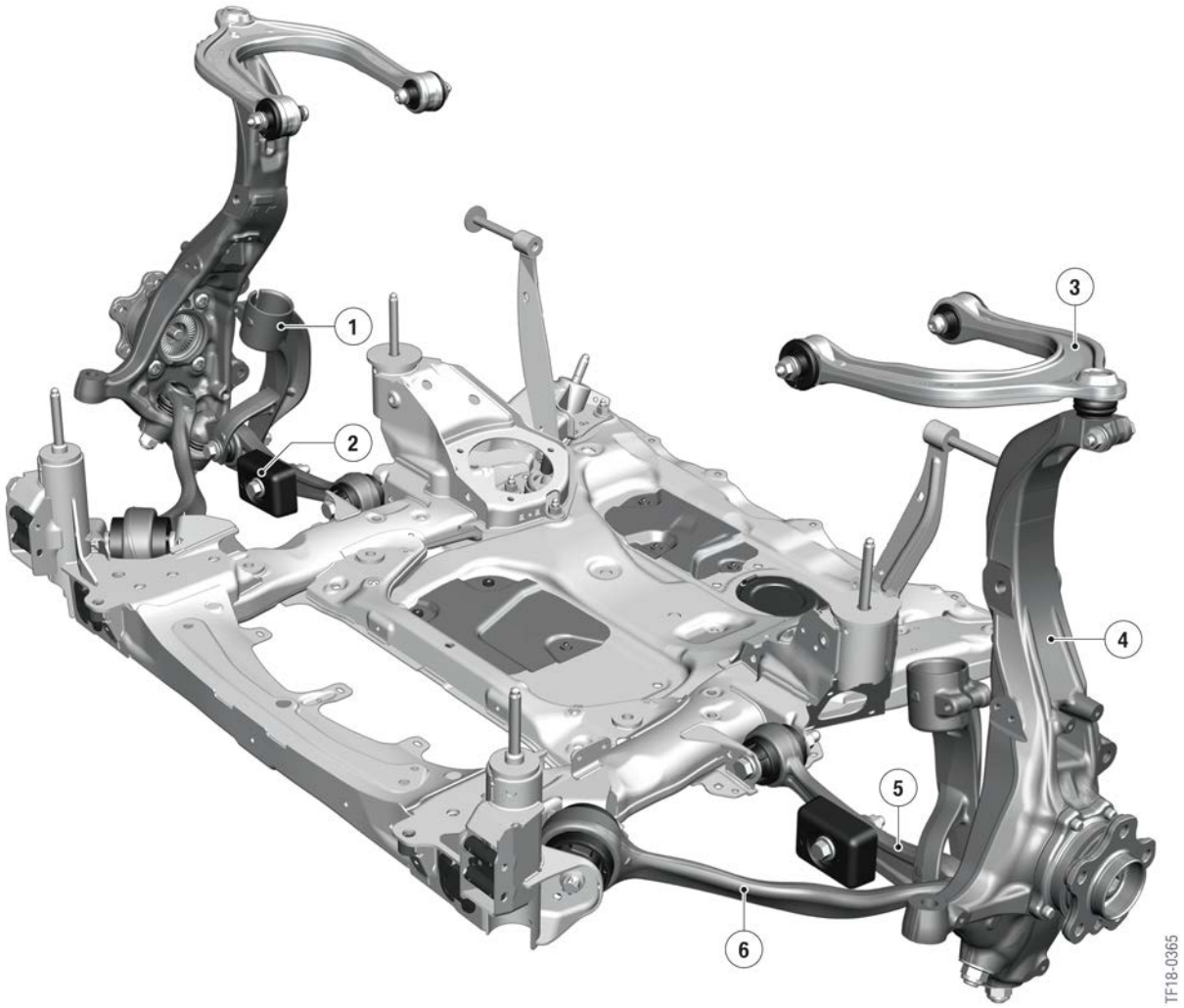
| Speed range | Function |
|---|---|
| 0 – 15 km/h 0 (0 – 10 mph) | Freely selectable camera view. |
| 15 – 36 km/h (10 – 22 mph) | Front camera is selected automatically, the other camera symbols are switched off. |
| > 36 km/h (> 22 mph) | xOffroad camera not available. |

# G05 Powertrain/Chassis

## 10. Axles

The familiar double-wishbone front axle and five-link rear axle which feature in other series are used.

### 10.1. Front axle




Double-wishbone front axle in the G05

| Index | Explanation |
|---|---|
| 1 | Spring strut rest |
| 2 | Vibration absorber |
| 3 | Triangle wishbone, top |
| 4 | Swivel bearing |
| 5 | Wishbone, bottom |
| 6 | Trailing link |

The modified geometry of the spring strut holder allows the drive shaft to be easily accessed.

# G05 Powertrain/Chassis

## 10. Axles

### 10.1.1. Vibration absorber

The purpose of the vibration absorbers (2) is to compensate for the rolling noises of the front wheels.

**They are used from the following wheel size:**

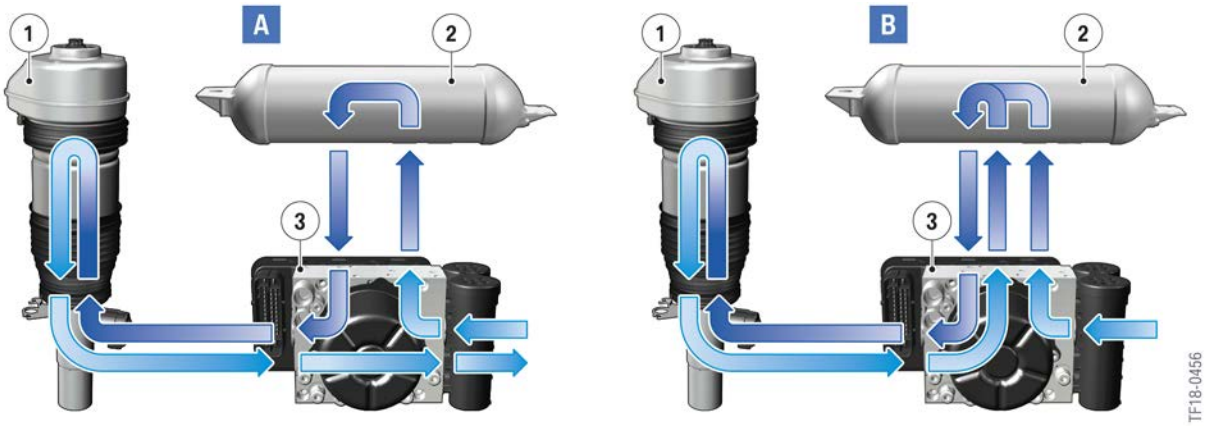
19" wheel set with run-flat tires.

When upgrading the wheel/ tire combination in vehicles without a vibration absorber, it is advisable to check the feasibility of retrofitting the vibration absorber. This increases comfort and prevents customer complaints.

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

A newly developed air suspension which, in addition to its efficiency, offers many advanced customer functions.




Schematic representation of open and closed air spring systems

| Index | Explanation |
|---|---|
| A | Open system |
| B | Closed system |
| 1 | Air suspension strut |
| 2 | Pressure accumulator |
| 3 | Air supply unit |

The air suspensions used up till now at BMW were open systems. The G05 is the first BMW to be equipped with a closed system. In the closed system, continuous pneumatic pressure compensation does not occur between the environment and control system does not take place and instead takes place within the control system between the pressure accumulator and air suspension struts. This means the pneumatic pressure generated by the mechanical compressor can be used for several control operations. This increases the efficiency of the system and ensures an outstanding degree of utilization.

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

### 11.1. History

| Figure | Suspension |
|---|---|
| E53  | steel/steel<br>steel/air<br>air/air |
| E70  | steel/steel<br>steel/air |
| F15  | steel/steel<br>steel/air |
| G05  | steel/steel<br>air/air |

# G05 Powertrain/Chassis

# 11. Two-axle Ride Level Control

## 11.2. Comparison of G12 with G05

| Component | G12 | G05 |
|---|---|---|
| Twin axle air suspension | Two-axle ride level control | Two-axle ride level control |
| Control unit for self-levelling suspension (function logic) | Vertical Dynamic Platform (VDP) | Electronic ride height control (EHC) |
| Channels | 3-channel control | 3-channel control |
| Drive level | High level (+20 mm)<br>Normal level (+/–0 mm)<br>Sport level (–10 mm) | Offroad level (+40 mm)<br>High level (+20 mm)<br>Normal level (+/–0 mm)<br>Dynamic level (–10 mm)<br>Sport level (–20 mm)<br>Load level (–40 mm) |
| Control options of air suspension | Ride height selection switch<br>Driving experience switch | Level change rocker button<br>Driving experience switch<br>Offroad button<br>Offroad rocker button<br>Load level button<br>Display Key |
| Shock absorber | EDC High two-stage | EDC High single-stage |

## 11.3. Structure and function

The main purpose of the air suspension is to increase driving comfort. The system performs adjustment mainly at standstill, e.g. in order to compensate for a change in height due to the vehicle load. The inertia of the system means that it cannot react to driving dynamics disturbance variables, which may occur when the vehicle is driven quickly on twisting roads.

### 11.3.1. Control when driving

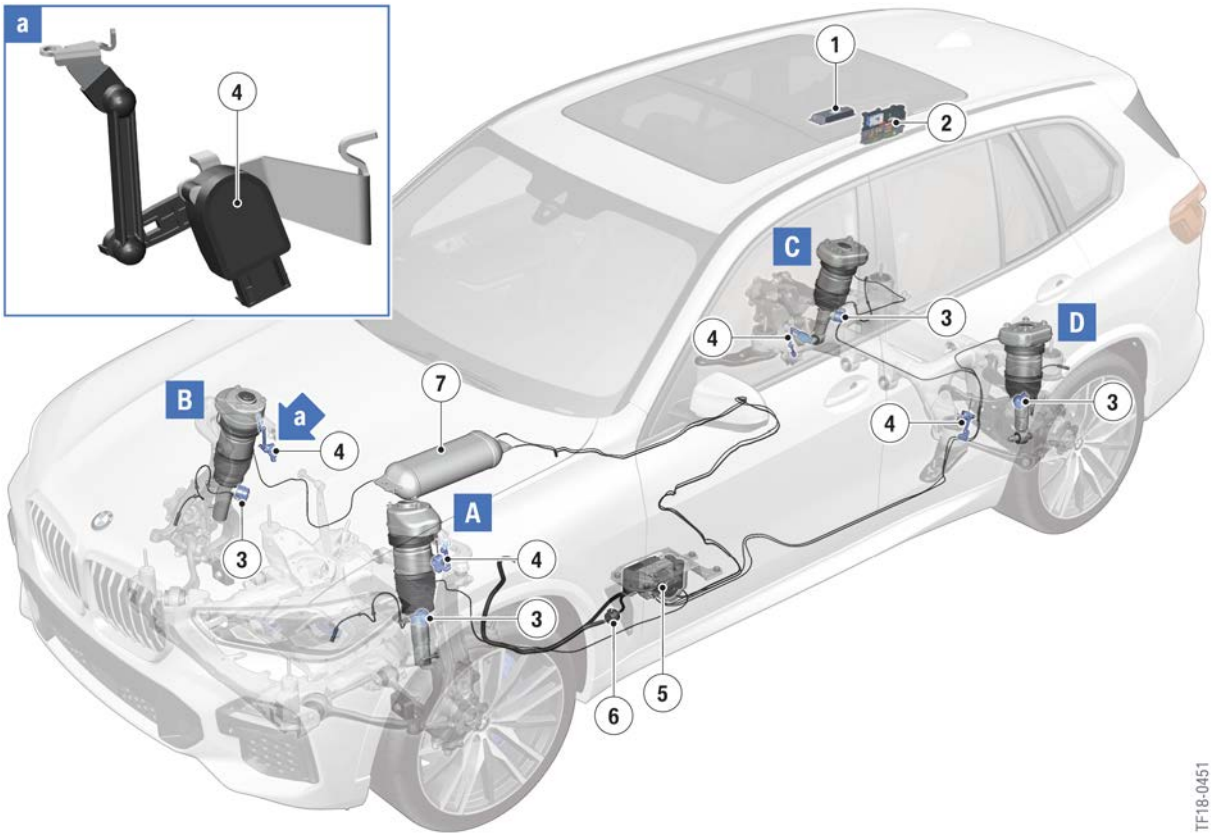
Adjustment is however possible when driving with low transverse and longitudinal dynamics.

**An adjustment may be triggered when driving for one of the following reasons:**

- Speed-dependent driving level control
- Driving level control due to reduction in fuel level (change in load status)
- Driving level control due to changes in the temperature of the air in the air suspension struts
- Manual adjustment of the driving level due to customer request (e.g. Driving Experience Control SPORT mode, level change rocker button or offroad rocker button).

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control




Overview of two-axle ride level control in the G05

| Index | Explanation |
|---|---|
| A | Air suspension strut, front left |
| B | Air suspension strut, front right |
| C | Air suspension strut, rear right |
| D | Air suspension strut, rear left |
| 1 | Vertical Dynamic Platform (VDP) |
| 2 | Power distribution box, rear |
| 3 | Control valve of the Electronic Damper Control (EDC) |
| 4 | Ride height sensor |
| 5 | Air supply unit |
| 6 | Air filter |
| 7 | Pressure accumulator |

The vertical dynamic platform (VDP) reads in the current ride heights via 4 ride height sensors and sends these to the control unit for electronic ride height control (EHC). Deviations between the target and actual level are calculated by the EHC control unit and adjusted if necessary via the solenoid valves inside the air supply unit. The required air volume is removed from or supplied to the pressure accumulator. If the pressure in the pressure accumulator is insufficient, this is equalized by an electrical compressor. The compressor is controlled by the EHC control unit.

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

The air suspension in the G05 is controlled by a 3-channel control system. With this system, the two air suspension struts of the front axle are jointly controlled and the air suspension struts of the rear axle are controlled separately. The aim of this approach is to be able to compensate for any tilting of the vehicle rear axle that occurs due to uneven load conditions. As the load status at the front axle on the right and left is the same under all operating conditions, control is effected in this case via a common channel. To do so, the EHC control unit generates a mean value from the two actual values of the ride height sensors on the front axle and adjusts the driving level until the target level and actual level correspond. The advantage of this type of control is that the corresponding driving level can be approached without continuous readjustment.

To avoid dazzling of oncoming traffic, the front axle is lowered first followed by the rear axle. The axles are raised in the reverse order (rear axle followed by front axle).

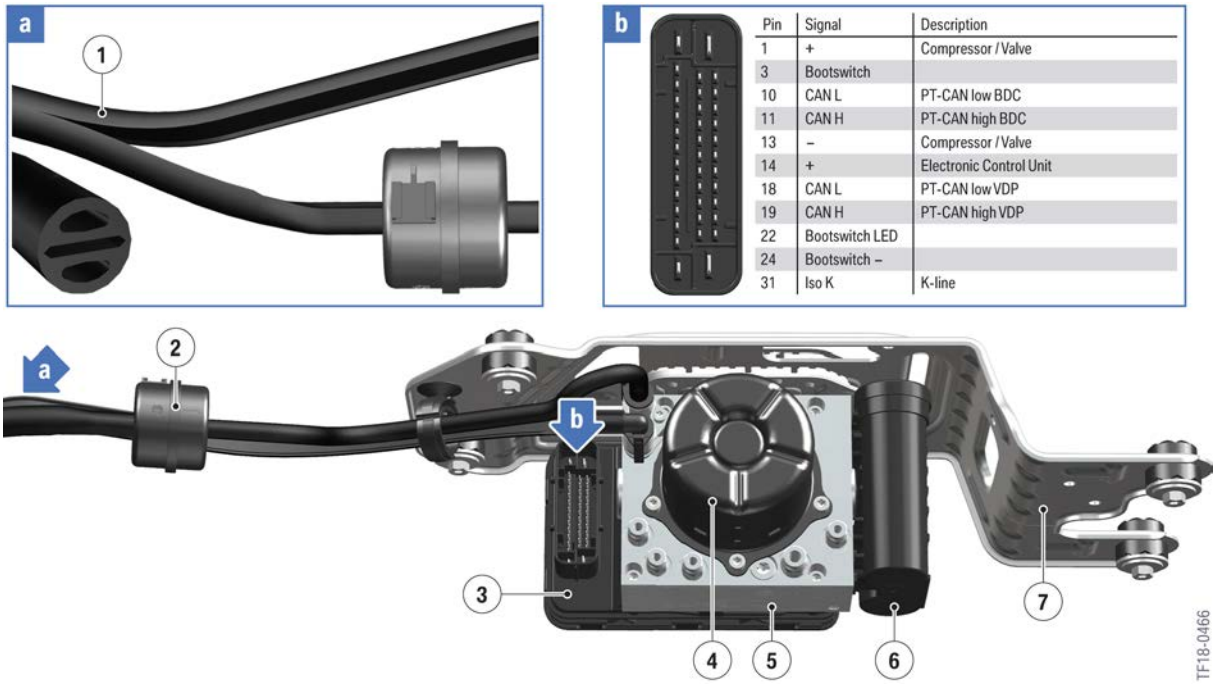
To prevent water being drawn in, the air intake hose has been installed as high up as possible. This has the benefit of providing a good fording depth. An air drier dehumidifies the air drawn in to prevent corrosion and icing inside the pneumatic system.

### 11.3.2. Air supply unit

The air supply unit consists of the electronic ride height control (EHC) control unit, electrical compressor and a solenoid valve block.

To prevent vibrations being transferred to the body when the compressor is running, the holder of the air supply unit is fastened to the vehicle by rubber elements.

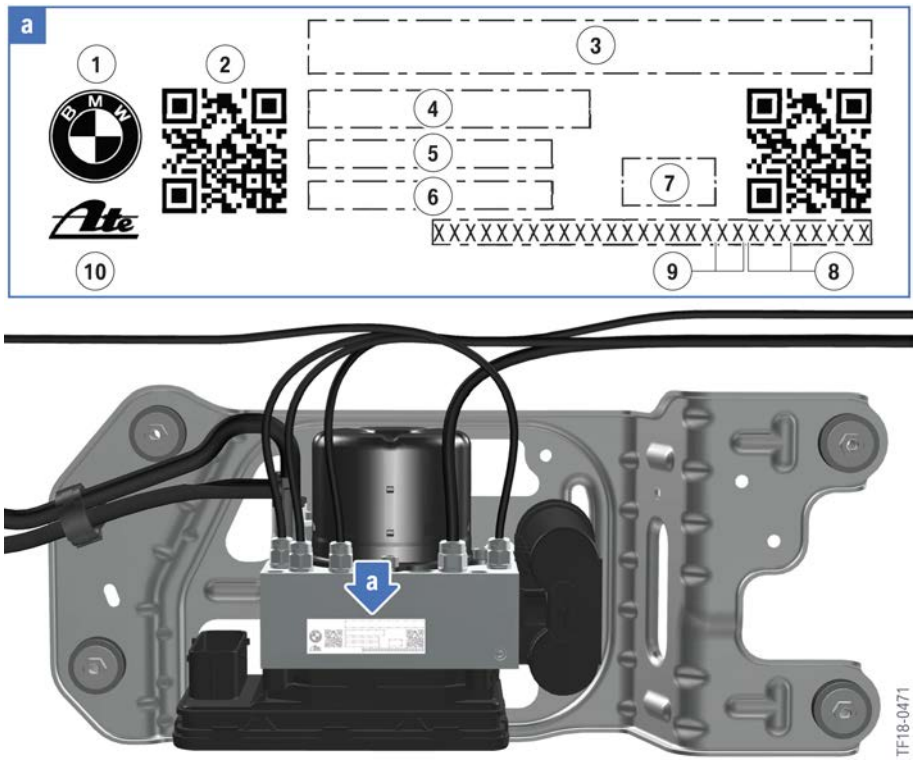
The air supply unit has 2 separate ports for the air intake and discharge hoses. These are however joined upstream of the air filter via a Y-adapter to form one hose. The air is therefore drawn in and released via one hose.




Air supply unit in the G05

| Index | Explanation |
|---|---|
| 1 | Y-connecting piece |
| 2 | Air filter |
| 3 | Control unit for electronic ride height control (EHC) |
| 4 | E-motor for mechanical compressor |
| 5 | Solenoid valve block |
| 6 | Air drier |
| 7 | Holder |

### Type plate




Type plate of air supply unit in the G05

| Index | Explanation |
|---|---|
| 1 | Vehicle manufacturer |
| 2 | Data matrix code |
| 3 | Continental logo |
| 4 | Customer number |
| 5 | Identification of manufacturer (Made in...) |
| 6 | Part number |

| Index | Explanation |
|---|---|
| 7 | Trade mark supplier code |
| 8 | Day of manufacture |
| 9 | Year of manufacture |
| 10 | ATE trademark |

**Electrical compressor**

| Technical data | |
|---|---|
| Type of current | DC |
| Supply voltage | 12 V |
| Nominal voltage | 8.5 to 16 V |
| Maximum continuous current | 38 A |
| Maximum starting current (< 200 ms) | 60 A |
| Acoustics | 60 dB |
| Operating temperature range | –40 to 100 °C (–40 to 212 °F) |
| Operating temperature range during continuous operation | –40 to 80 °C (–40 to 176 °F) |
| Short-term thermal stability | 130 °C (266 °F) |
| Storage temperature range | –40 to 80 °C (–40 to 176 °F) |

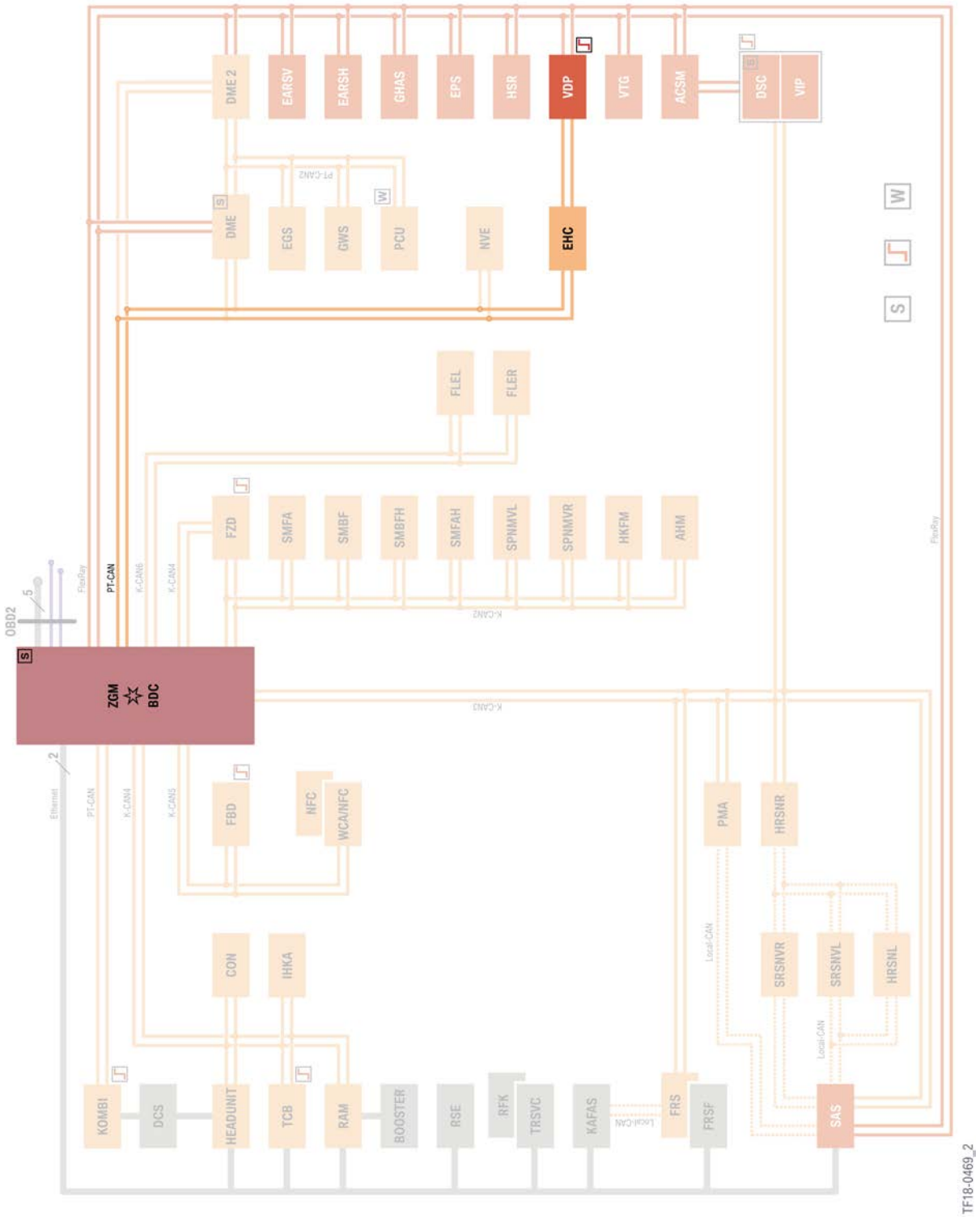
**Bus overview**

The electronic ride height control (EHC) processes the data for control of the air suspension. This receives the relevant data, such as the position of the level change rocker button, via the PT-CAN. The EHC control unit controls the actuation of the solenoid valves and the mechanical compressor thus ensuring implementation of the predefined ride heights.

The information on the current ride heights is made available by the vertical dynamic platform (VDP).

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control




Bus overview of the electronic ride height control (EHC) in the G05

| Index | Explanation |
|---|---|
| BDC | Body Domain Controller |
| EHC | Electronic ride height control |
| VDP | Vertical Dynamic Platform |

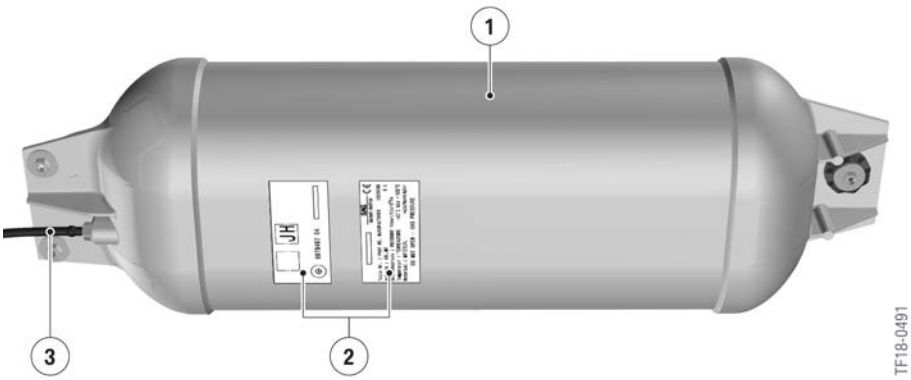
The following table shows the differences between the air suspension control of the G12 and the G05:

| Air suspension | G12 | G05 |
|---|---|---|
| Control via VDP | ● | |
| Control via EHC | | ● |

### 11.3.3. Pressure accumulator

A pressure accumulator with a volume of 8 l is used in the G05. The maximum filling pressure is 15 bar. This produces a total filling volume of 120 l.

Calculation: 8 l · 15 bar : 1 bar = 120 l




Pressure accumulator in the G05

| Index | Explanation |
|---|---|
| 1 | Pressure accumulator |
| 2 | Label |
| 3 | Compressed air line |

| Pressure accumulator | Data |
|---|---|
| Volume | 8 L |
| Temperature range | –40 to 100 °C (–40 to 212 °F) |
| Bursting pressure | 37,5 bar |
| Maximum operating pressure | 15 bar |

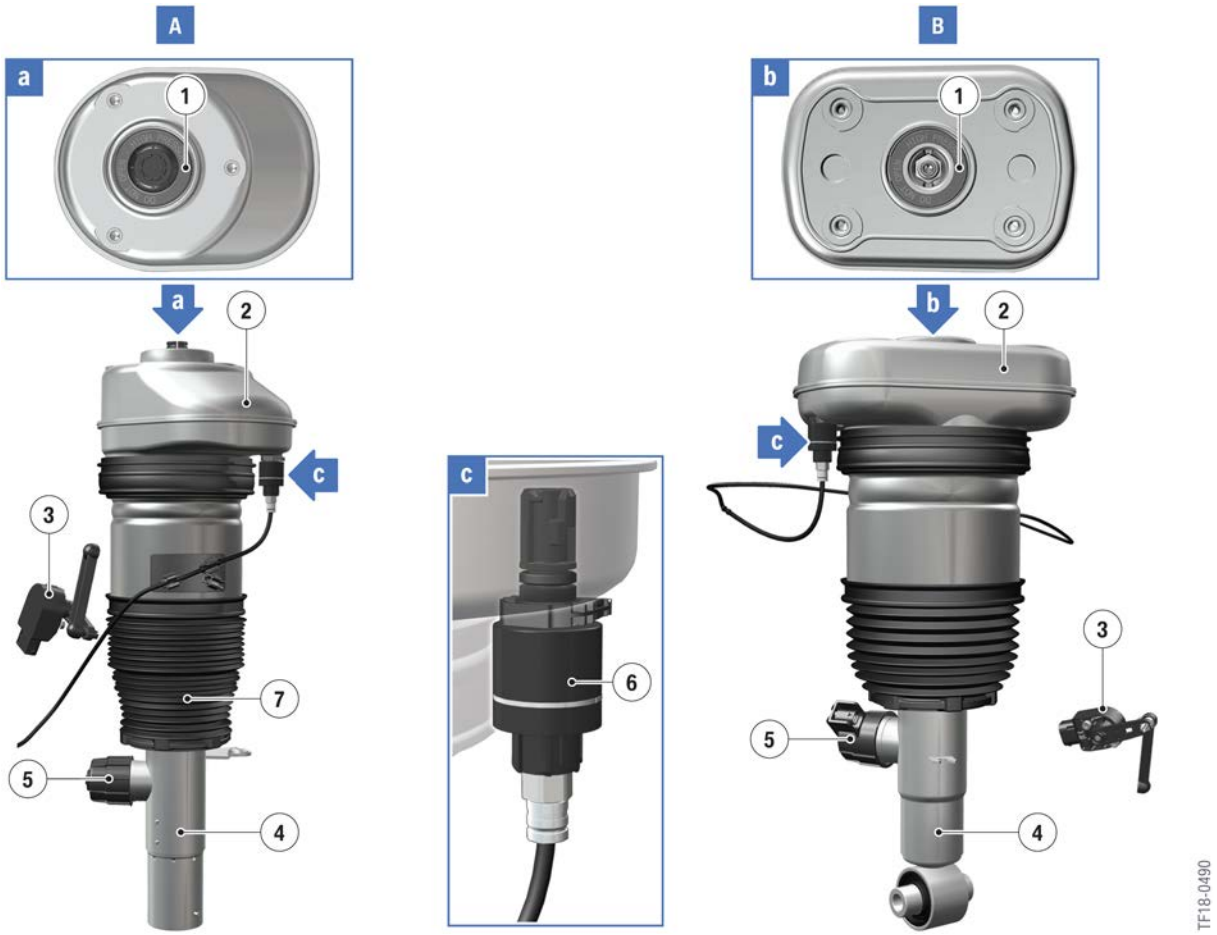
### 11.3.4. Air suspension strut

The air suspension strut contains the shock absorber with U-type bellows. The U-type bellows or the shock absorber cannot be replaced separately. All shock absorbers in the G05 are equipped as standard with an Electronic Damper Control (EDC) with expansion stage High. A special feature of the EDC High compared to EDC Basic is continuous damper control which is adapted to the road conditions. The EDC Basic on the other hand does not offer continuous control and instead a manual adjustment of the damper characteristic via the Driving Experience Control.

**The EDC High is available in the following 2 expansion stages:**

- EDC High two-stage (separate rebound and compression stage control G12/G30)
- EDC High single-stage (shared rebound and compression stage control G01/G05).

In contrast to the G12, the G05 is equipped with an EDC High with a single-stage control. In this case, the rebound and compression stages are controlled via a shared controller.




Air suspension strut of the front and rear axle in the G05

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

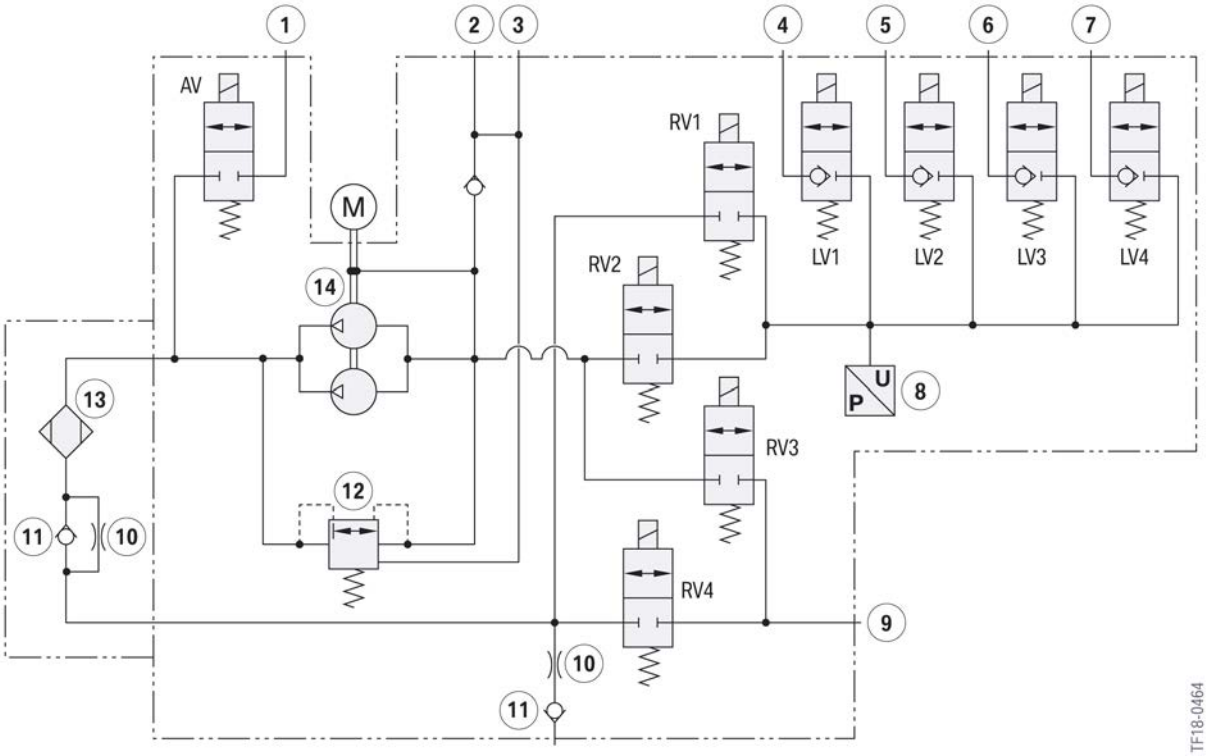
| Index | Explanation |
|---|---|
| A | Front axle |
| B | Rear axle |
| 1 | Sealing cap |
| 2 | Pot |
| 3 | Ride height sensor |
| 4 | Shock absorber |
| 5 | Control valve of the Electronic Damper Control (EDC) |
| 6 | Pneumatic connection with integrated residual pressure retaining valve |
| 7 | Dust boot |

To prevent a complete loss of pressure in the air suspension strut, a residual pressure retention valve is installed internally in the pneumatic connections. A residual pressure of 2.2 to 3.2 bar is thus held when the compressed air lines are undone.

The pneumatic connections with integrated residual holding valve on the air suspension strut cannot be replaced separately. If an attempt is made to remove these, damage will occur. The entire air suspension strut will subsequently have to be replaced.

| Air suspension strut | Front axle | Rear axle |
|---|---|---|
| Air volume in normal position | 2.1 L | 2.3 L |
| Compression travel | 66 mm | 60 mm |
| Rebound travel | 67 mm | 75 mm |
| Filling pressure on delivery | 2.2 to 3.2 bar | 2.2 to 3.2 bar |

### 11.3.5. Pneumatic circuit diagram

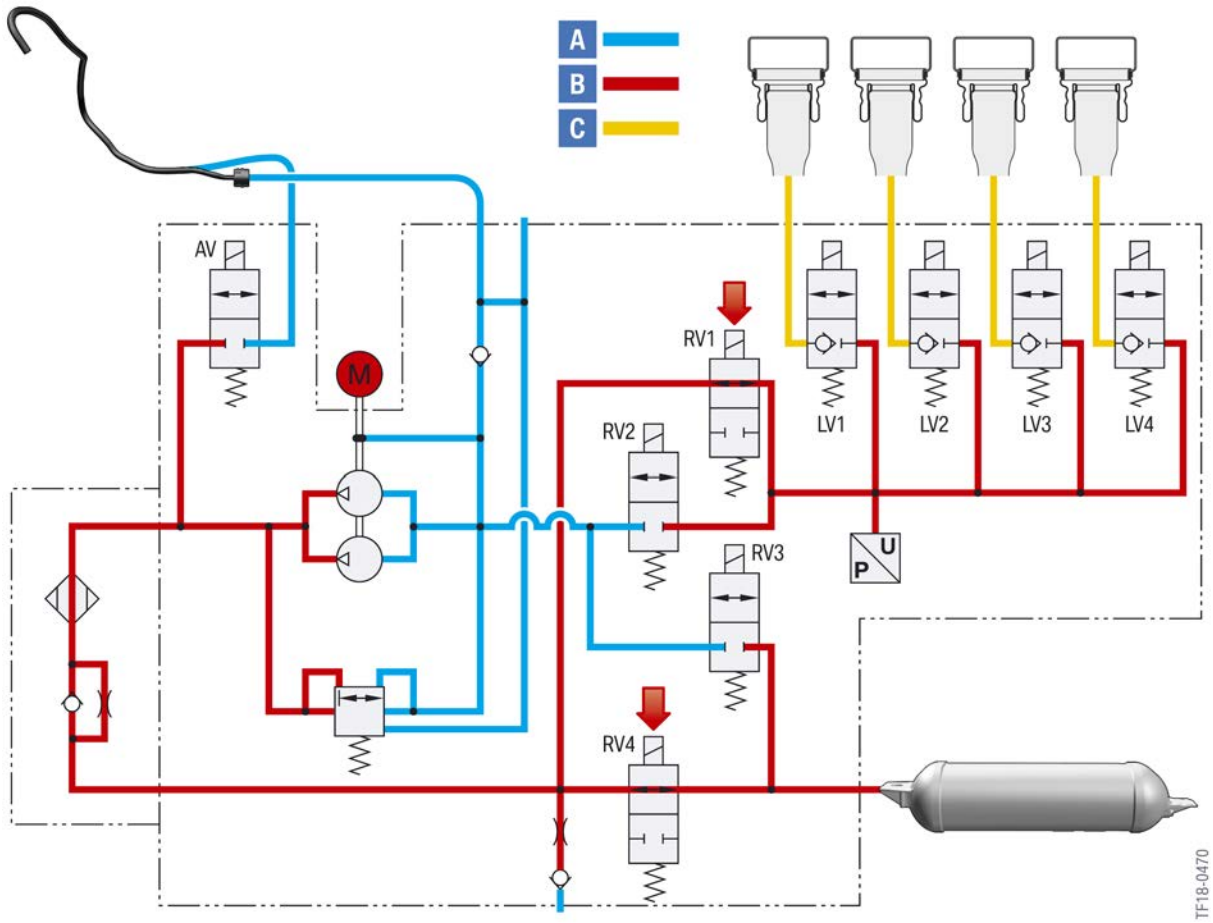



Pneumatic circuit diagram of the air supply unit in the G05

| Index | Explanation |
|---|---|
| AV | Discharge valve |
| RV1 | Control valve 1 |
| RV2 | Control valve 2 |
| RV3 | Control valve 3 |
| RV4 | Control valve 4 |
| LV1 | Air suspension strut, valve 1 |
| LV2 | Air suspension strut, valve 2 |
| LV3 | Air suspension strut, valve 3 |
| LV4 | Air suspension strut, valve 4 |
| M | Electric motor |
| 1 | Connection for air discharge hose |
| 2 | Connection for air intake hose |
| 3 | Ventilation control unit |
| 4 | Connection for air suspension strut, rear left |
| 5 | Connection for air suspension strut, front left |
| 6 | Connection for air suspension strut, rear right |

| Index | Explanation |
|---|---|
| 7 | Connection for air suspension strut, front right |
| 8 | Pressure sensor |
| 9 | Connection for pressure accumulator |
| 10 | Throttle |
| 11 | Non-return valve |
| 12 | Pressure-limiting valve |
| 13 | Air drier |
| 14 | Electrical compressor (2 pistons) |

**Filling the pressure accumulator via the compressor**




Filling the pressure accumulator in the G05

If the quantity of air in the system falls below the minimum, the pressure accumulator is filled with the assistance of the electrical compressor. To do this the EHC control unit puts the components of the air supply unit listed below into the corresponding states as specified in the table.

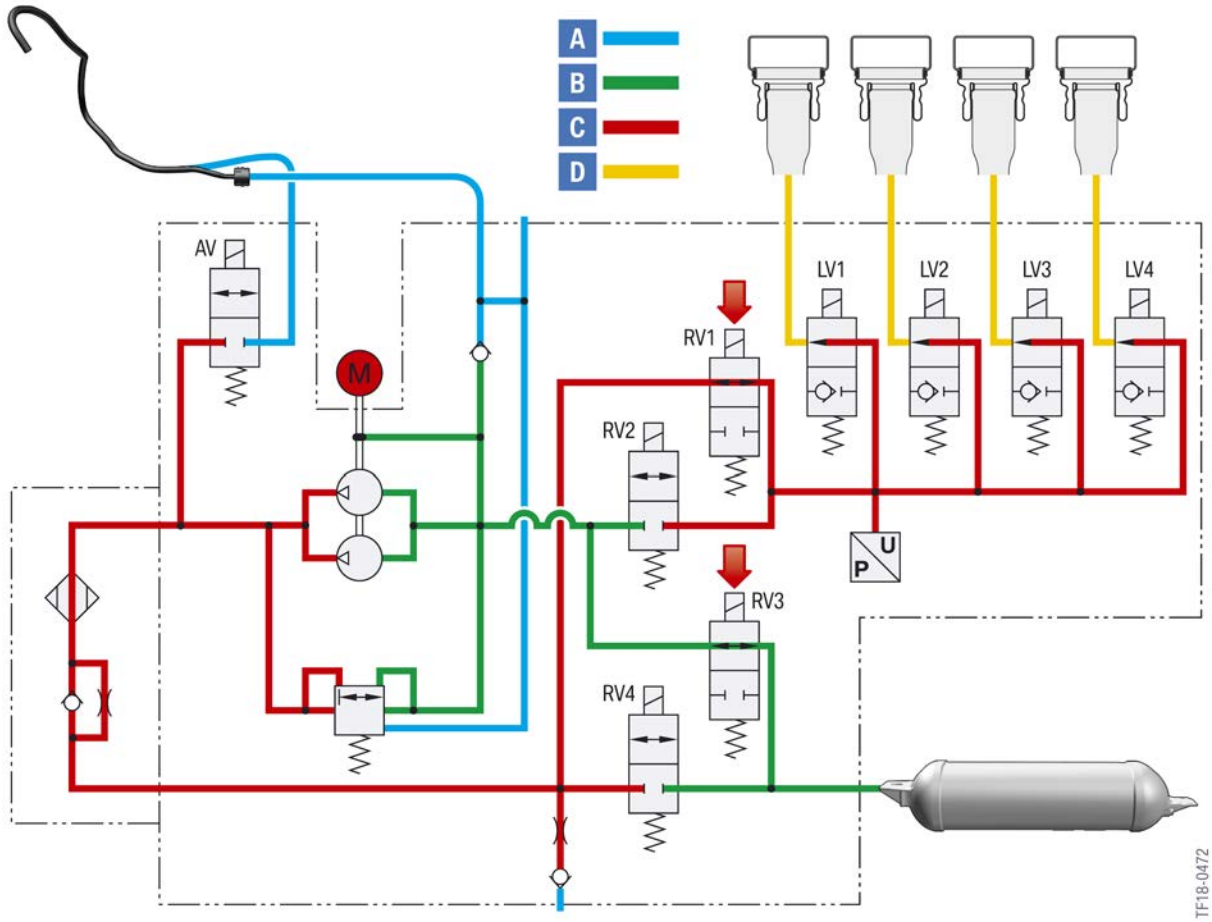
# 11. Two-axle Ride Level Control

| Index | Explanation | Active | Inactive |
|---|---|---|---|
| A | Intake pressure | – | – |
| B | Filling pressure | – | – |
| C | Air suspension pressure | – | – |
| M | Compressor | ● | |
| AV | Discharge valve | | ● |
| RV1 | Control valve 1 | ● | |
| RV2 | Control valve 2 | | ● |
| RV3 | Control valve 3 | | ● |
| RV4 | Control valve 4 | ● | |
| LV1–LV4 | Air suspension strut valves 1–4 | | ● |

When the control valves 1 and 4 are activated, the filling pressure of the pressure accumulator is admitted to the pressure sensor. Regulation of the pressure in the electrical compressor is therefore possible. When the corresponding system air quantity is reached, valves 1 and 4 are closed and the electrical compressor is switched off.

If a very large quantity of air is fed in, the pressure accumulator may be filled in stages. This is required in order to regenerate the dryer at regular intervals.

**Raising via pressure accumulator and compressor**




Raising via pressure accumulator and compressor in the G05

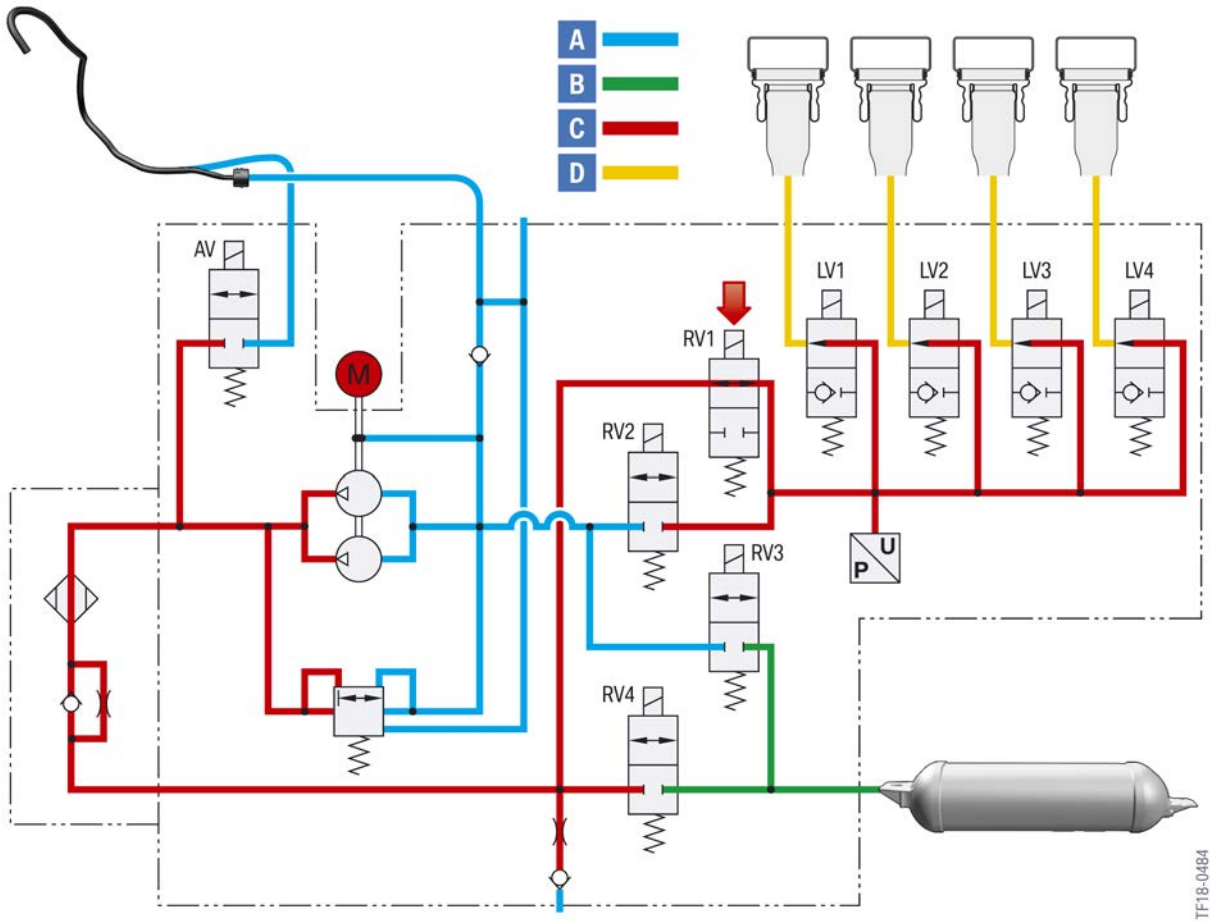
| Index | Explanation | Active | Inactive |
|---|---|---|---|
| A | Atmospheric pressure | – | – |
| B | Accumulator pressure | – | – |
| C | Filling pressure | – | – |
| D | Air suspension pressure | – | – |
| M | Compressor | ● | |
| AV | Discharge valve | | ● |
| RV1 | Control valve 1 | ● | |
| RV2 | Control valve 2 | | ● |
| RV3 | Control valve 3 | ● | |
| RV4 | Control valve 4 | | ● |
| LV1–LV4 | Air suspension strut valves 1–4 | ● | |

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

During actual operation, the air suspension strut valves 1–4 are activated for each axle in turn. The vehicle is not raised/lowered via all 4 air suspension struts at the same time, as shown in the previous graphic.

**Raising via mechanical compressor**



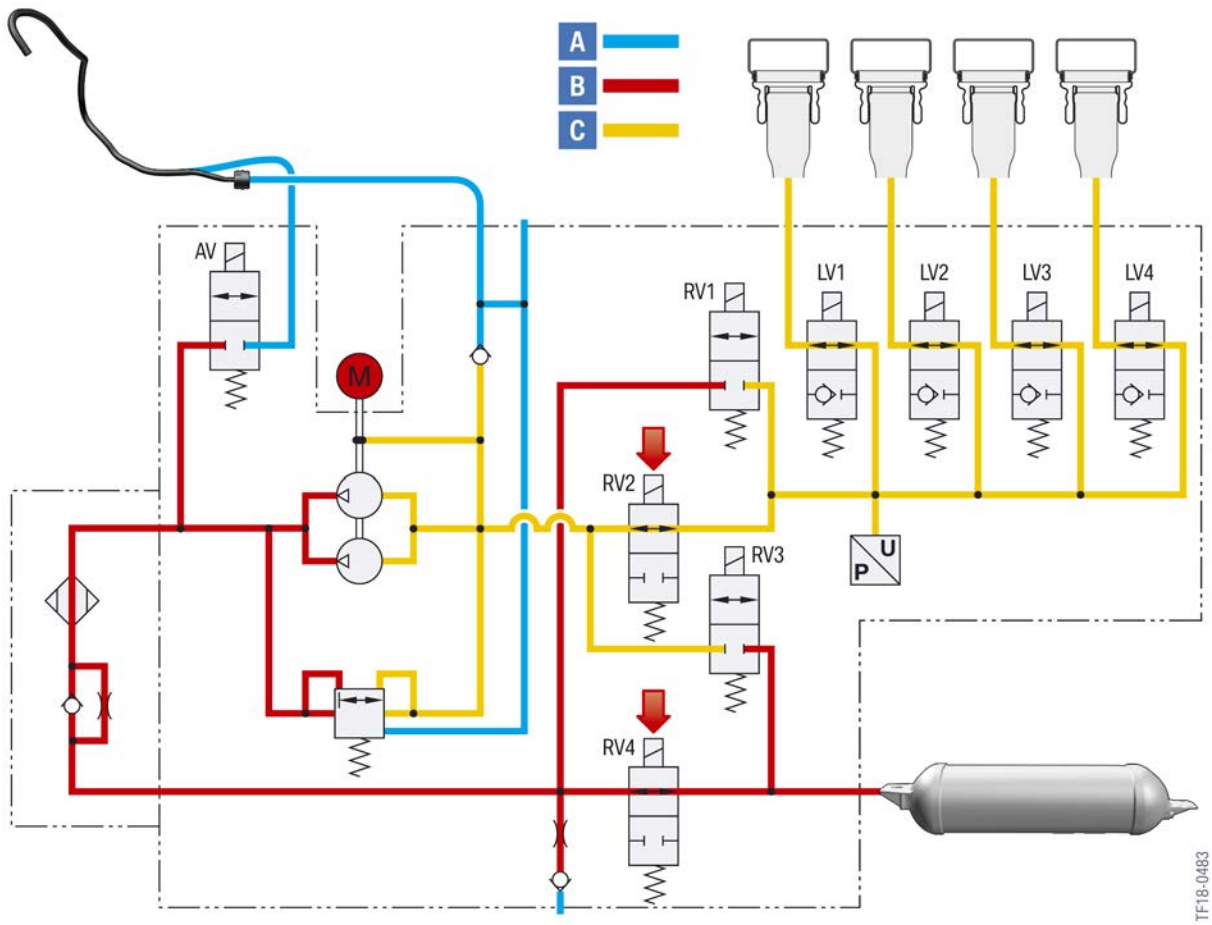

Raising via mechanical compressor in the G05

| Index | Explanation | Active | Inactive |
|---|---|---|---|
| A | Intake pressure | – | – |
| B | Accumulator pressure | – | – |
| C | Filling pressure | – | – |
| D | Air suspension pressure | – | – |
| M | Compressor | ● | |
| AV | Discharge valve | | ● |
| RV1 | Control valve 1 | ● | |
| RV2 | Control valve 2 | | ● |

| Index | Explanation | Active | Inactive |
|---|---|---|---|
| RV3 | Control valve 3 | | ● |
| RV4 | Control valve 4 | | ● |
| LV1–LV4 | Air suspension strut valves 1–4 | ● | |

During actual operation, the air suspension strut valves 1–4 are activated for each axle in turn. Raising/lowering of the vehicle does not take place via all 4 air suspension struts at the same time, as shown in the previous graphic.

**Lowering in the pressure accumulator with mechanical compressor**




Lowering in the pressure accumulator with mechanical compressor

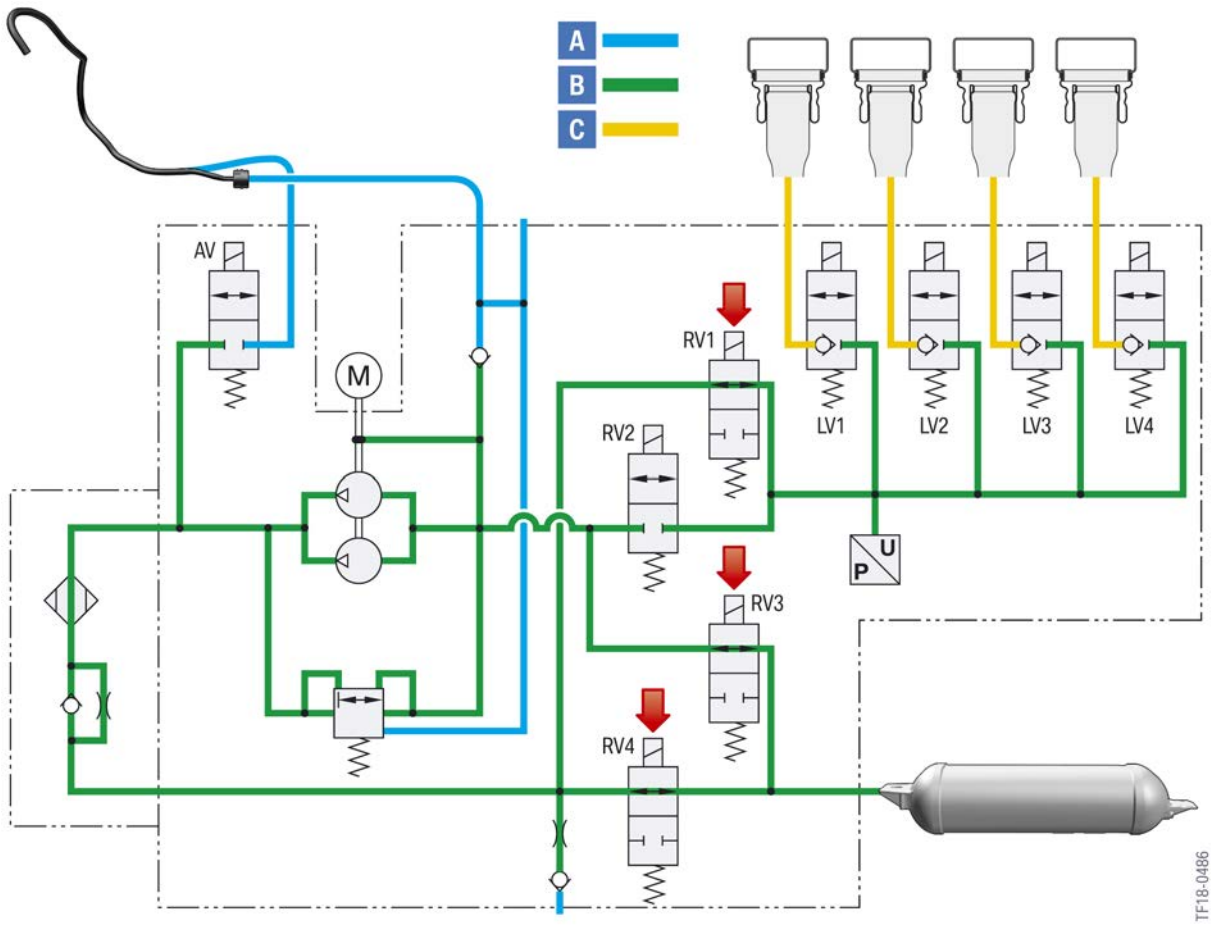
| Index | Explanation | Active | Inactive |
|---|---|---|---|
| A | Atmospheric pressure | – | – |
| B | Filling pressure | – | – |
| C | Air suspension pressure | – | – |
| M | Compressor | ● | |
| AV | Discharge valve | | ● |

| Index | Explanation | Active | Inactive |
|---|---|---|---|
| RV1 | Control valve 1 | | ● |
| RV2 | Control valve 2 | ● | |
| RV3 | Control valve 3 | | ● |
| RV4 | Control valve 4 | ● | |
| LV1–LV4 | Air suspension strut valves 1–4 | ● | |

To ensure the vehicle is lowered quickly, the mechanical compressor is activated when lowering in the pressure accumulator.

During actual operation, the air suspension strut valves 1–4 are activated for each axle in turn. Raising/lowering of the vehicle does not take place via all 4 air suspension struts at the same time, as shown in the previous graphic.

**Pressure measurement of the pressure accumulator**



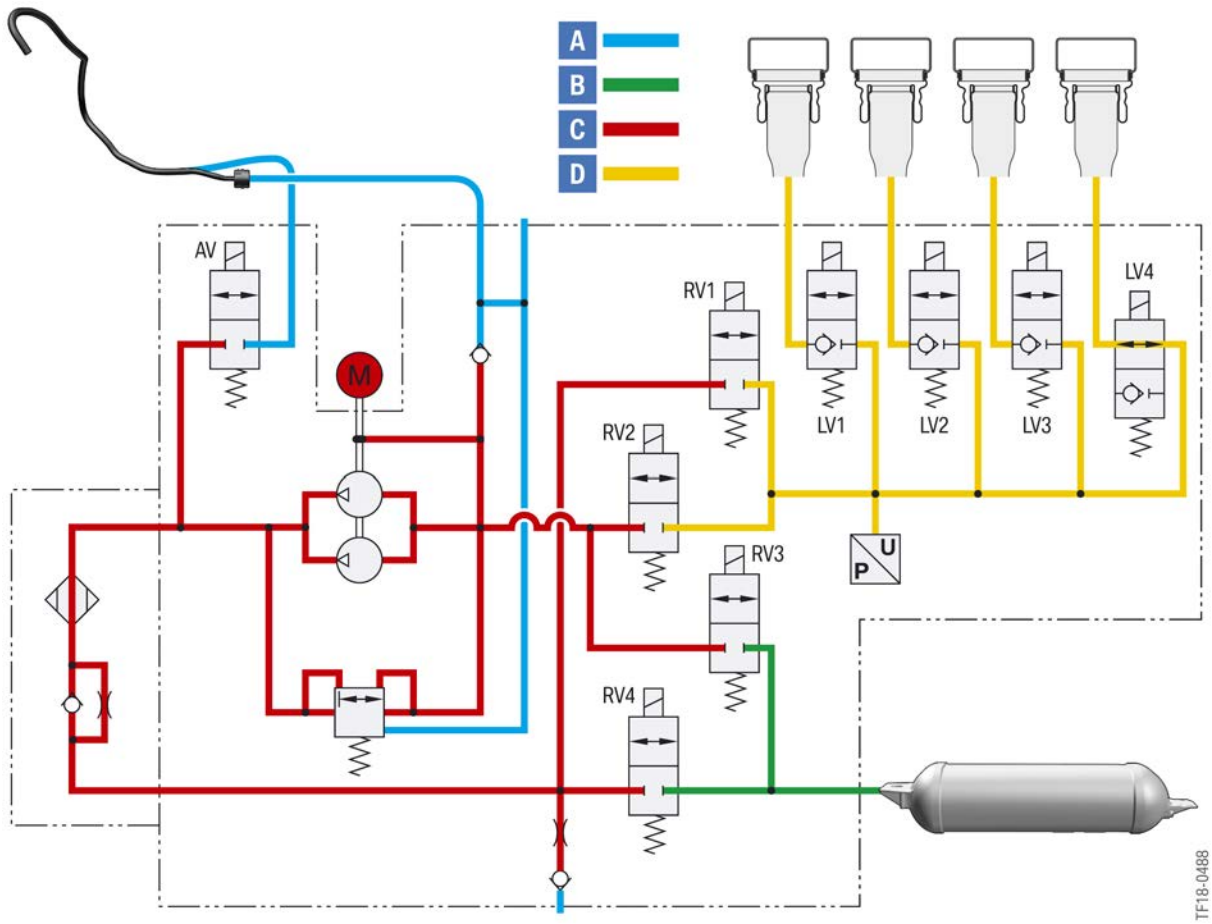

Pressure measurement of the pressure accumulator in the G05

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

| Index | Explanation | Active | Inactive |
|---|---|---|---|
| A | Atmospheric pressure | – | – |
| B | Accumulator pressure | – | – |
| C | Air suspension pressure | – | – |
| M | Compressor | | ● |
| AV | Discharge valve | | ● |
| RV1 | Control valve 1 | ● | |
| RV2 | Control valve 2 | | ● |
| RV3 | Control valve 3 | ● | |
| RV4 | Control valve 4 | ● | |
| LV1–LV4 | Air suspension strut valves 1–4 | | ● |

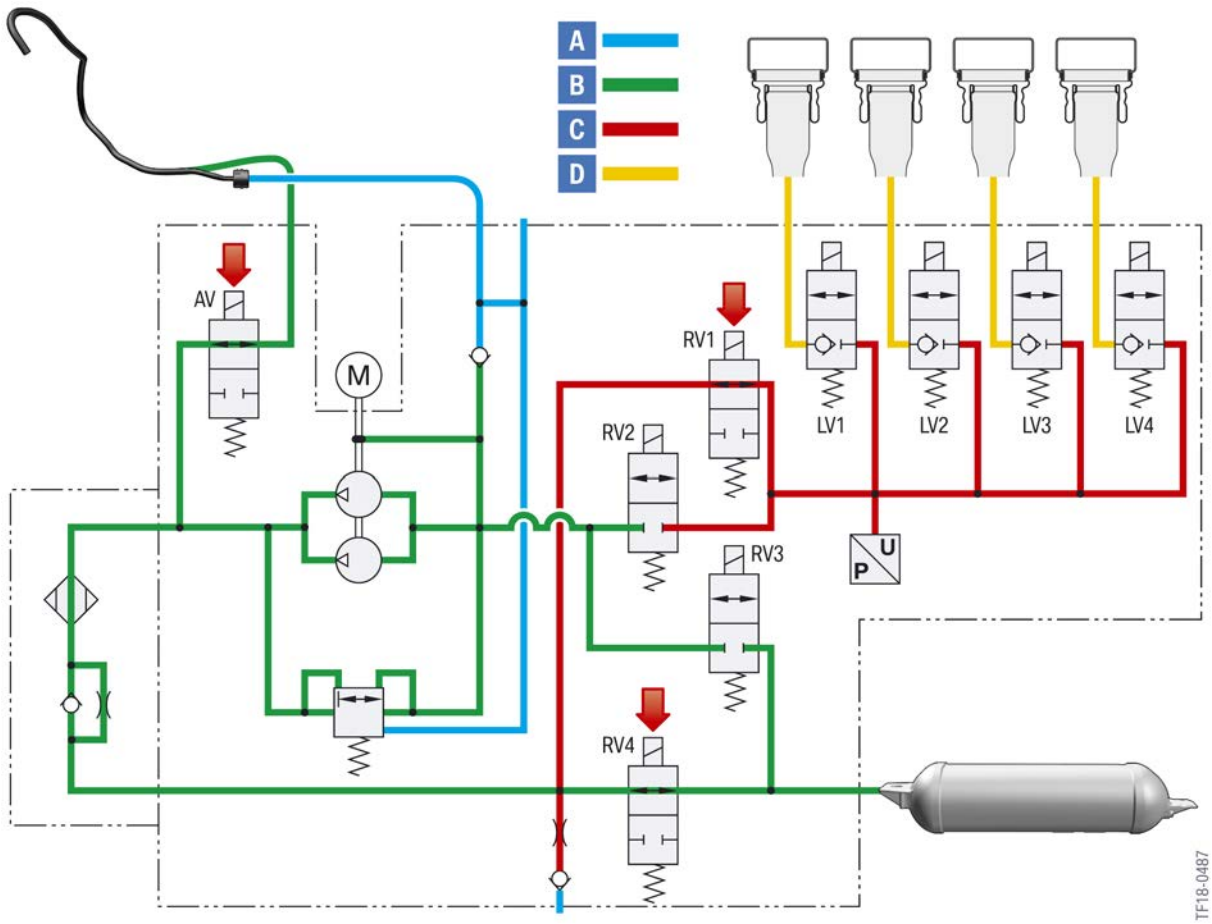
**Pressure measurement, air suspension strut**




Pressure measurement of the air suspension strut in the G05

| Index | Explanation | Active | Inactive |
|---|---|---|---|
| A | Atmospheric pressure | – | – |
| B | Accumulator pressure | – | – |
| C | Filling pressure | – | – |
| D | Air suspension pressure | – | – |
| M | Compressor | | ● |
| AV | Discharge valve | | ● |
| RV1 | Control valve 1 | | ● |
| RV2 | Control valve 2 | | ● |
| RV3 | Control valve 3 | | ● |
| RV4 | Control valve 4 | | ● |
| LV1 | Air suspension strut, valve 1 | ● | |
| LV2–LV4 | Air suspension strut valves 2–4 | | ● |

**Regeneration, air drier**




Regeneration of the air drier in the G05

| Index | Explanation | Active | Inactive |
|---|---|---|---|
| A | Atmospheric pressure | – | – |
| B | Accumulator pressure | – | – |
| C | Filling pressure | – | – |
| D | Air suspension pressure | – | – |
| M | Compressor | | ● |
| AV | Discharge valve | ● | |
| RV1 | Control valve 1 | ● | |
| RV2 | Control valve 2 | | ● |
| RV3 | Control valve 3 | | ● |
| RV4 | Control valve 4 | ● | |
| LV1–LV4 | Air suspension strut valves 1–4 | | ● |

The intake air is cleaned by the air filter upstream of the compressor and dried by the air drier downstream of the compressor. Cleaning is necessary so that the valves are protected against soiling. Water is extracted from the air to prevent the valves from icing up at low outside temperatures. If the valves were to freeze due to excessively high air humidity in the air supply system, the air suspension would no longer be able to perform the self-levelling operation. To avoid this, the air drier is permanently cleaned or dewatered.

The granulate in the air drier absorbs air humidity at high pressure and releases it at low pressure. If the compressed air flows through the granulate when filling the system, moisture is removed from it. To regenerate the air drier, air is routed via a throttle from the pressure accumulator to the air drier. The air flowing through the air drier at low pressure removes moisture from the granulate and releases it into the atmosphere.

This permanent regeneration of the air drier ensures fault-free operation of the system without the need for maintenance work.

## 11.4. Operating strategy

It has been possible to increase the maximum control range in the G05 to 80 mm. Starting from the normal position, the customer can adjust the ride height to between –40 mm and +40 mm, to adapt to external conditions.

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

### 11.4.1. Control options


Control options for air suspension in the G05

| Index | Explanation |
|---|---|
| 1 | Driving experience switch |
| 2 | Offroad button (Driving Experience Control for optional equipment xOffroad) |
| 3 | Ride height rocker button (optional equipment 2–axle air suspension) |
| 4 | Load level button |
| 5 | Display Key optional equipment 3DS (self-levelling suspension function available from 12/18) |

To make it as easy as possible for the customer to adjust the ride heights, several control options have been implemented in the G05.

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

**Overview of the various ride heights**

| Level | Height in | Speed | Operation |
|---|---|---|---|
| Offroad level | +40 | Activation range:<br>0 to 30 km/h (0–18 mph) |  |
| High level | +20 | Activation range:<br>0 to 60 km/h (0–27 mph) |  |
| **Normal level** | **+/–0** | **Vehicle level without button actuation:<br>0 to 140 km/h (0–87 mph)** |  |
| Dynamic level | –10 | Vehicle level, automatic lowering:<br>140 to 200 km/h<br>(87–124 mph) | – |
| Sport level | –20 | Activation via SPORT button:<br>0 up to maximum speed<br>Automatic lowering without button actuation:<br>200 km/h (124 mph) up to maximum speed |  |
| Load level | –40 | Activation range:<br>Only at standstill |  |

### 11.4.2. Control inhibitors

**The following vehicle conditions prevent a change in ride height:**

- Brake test stand
- Transport mode
- Stored speed thresholds
- Increased lateral or longitudinal dynamics
- Flat tire

- Non-availability due to component protection (component temperatures or pneumatic pressures exceeded)
- Low vehicle voltage in the residing condition (protection against starter operation if insufficient energy is available)
- Doors open
- Electrical connector of trailer tow hitch inserted.

The control inhibitors prevent damage to the vehicle, among other things, due to incorrect operation.

At higher payloads with air suspension strut pressures of more than 9 bar, the high level is not available due to component protection.

### 11.4.3. Speed-dependent ride heights

When driving without a preset program, the vehicle level is adapted automatically, depending on the speed. This reduces drag and increases the driving dynamics of the G05. If the various driving speeds are undercut, the previous ride height is set.

**Dynamic level**

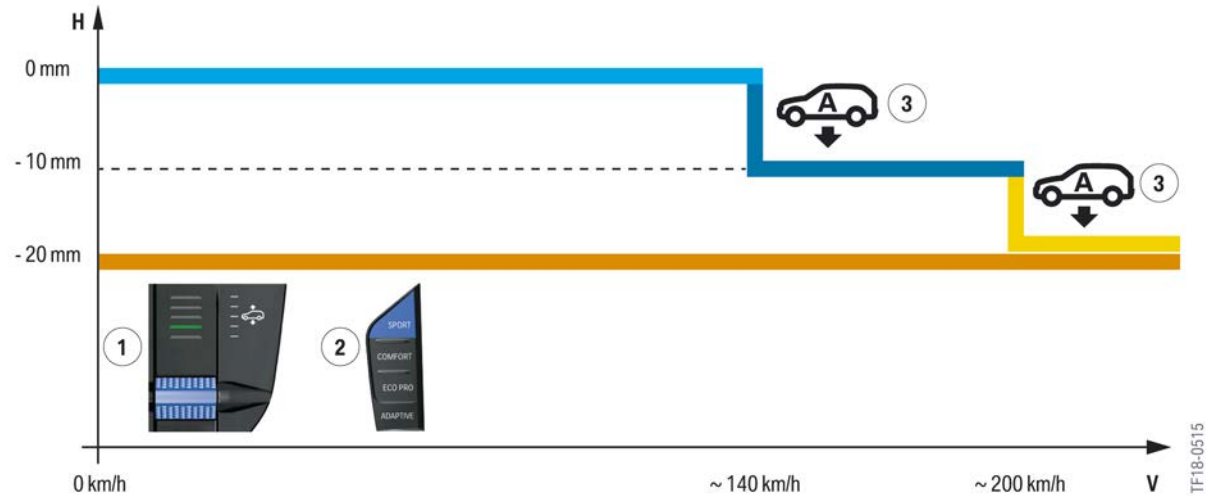
If a driving speed of roughly 140 km/h (87 mph) is exceeded, the "Dynamic level" (–10 mm) is set. The "Dynamic level" cannot be approached manually and the driver is not notified about this ride height.

The following table shows the control strategy (hysteresis) of the dynamic level.

| Speed | Time | Driving level |
|---|---|---|
| > 160 km/h (>100 mph) | Direct lowering | Dynamic level (–10 mm) |
| 140 – 160 km/h (87–100 mph) | > 170 s | Dynamic level (–10 mm) |
| < 100 km/h (<62 mph) | Direct raising | Normal level (+/–0 mm) |
| 100 – 120 km/h (62–75 mph) | > 20 s | Normal level (+/–0 mm) |

**Sport level**

The "Sport level" is set above a driving speed of 200 km/h (124 mph). The Sport level can also be set manually by pressing the SPORT Driving Experience Control switch or the ride height rocker button, irrespective of the speed (from 0 to maximum speed). The LED on the ride height rocker button indicates which sport level is activated.




Speed-dependent ride heights in the G05

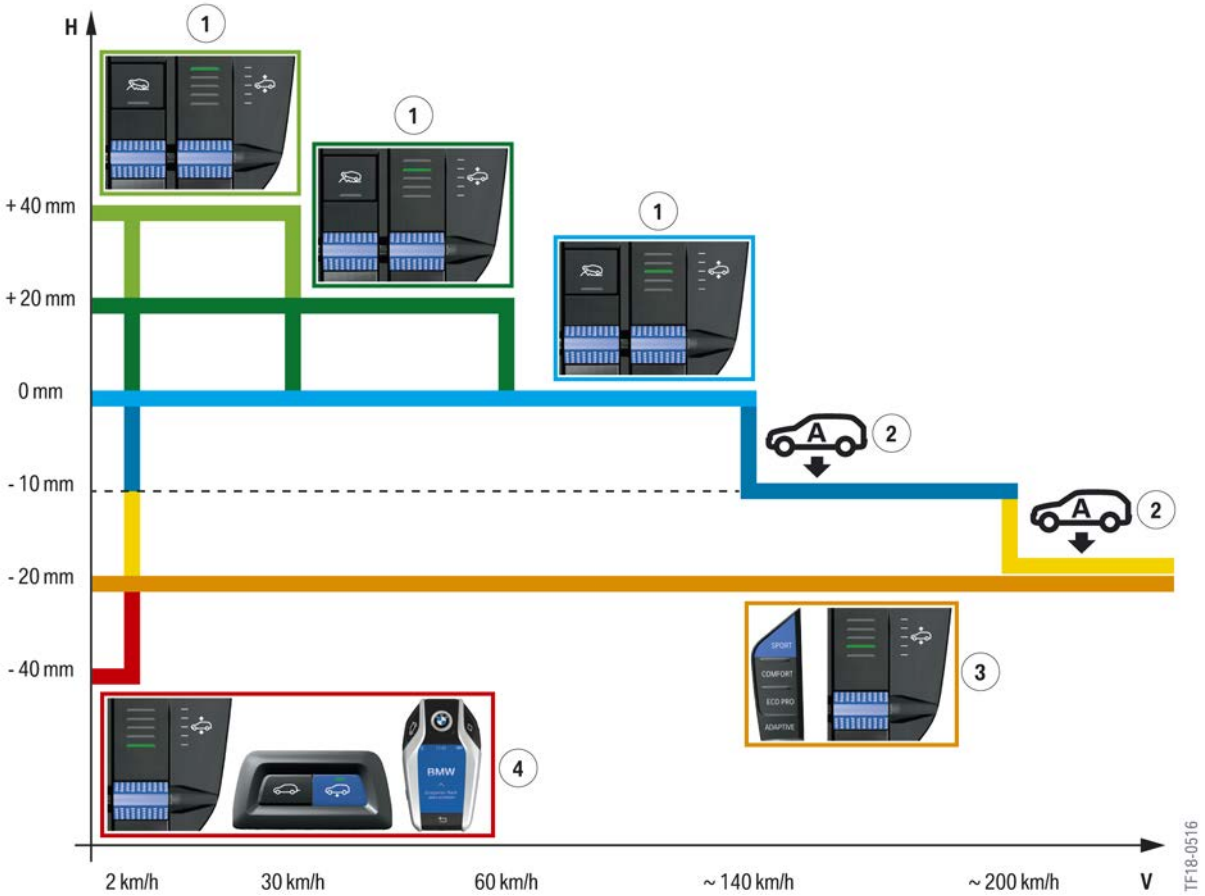
| Index | Explanation |
|---|---|
| H | Ride height |
| V | Speed |
| 1 | Ride height rocker button at Sport level |
| 2 | Driving Experience Control in SPORT position |
| 3 | Automatic lowering |
| 0 mm | Normal level |
| -10 mm | Dynamic level |
| –20 mm | Sport level |

### 11.4.4. Manually selectable ride heights

The G05 has 6 different ride heights, 5 of which can be selected manually. Only the "Dynamic level" **cannot** be selected manually by the driver. In addition to changing the ride heights, activation of the "High and Offroad level" affects the power transmission of the vehicle (see description of xOffroad chassis and suspension package). For this reason the offroad button should only be operated when driving in suitable offroad conditions. If the ride height of the vehicle is to be adapted to local conditions, this can be requested with the assistance of the ride height rocker button.

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control




Ride heights of air suspension in the G05

| Index | Explanation |
|---|---|
| H | Ride height |
| V | Speed |
| 1 | Offroad rocker button + ride height rocker button |
| 2 | Automatic lowering |
| 3 | Ride height rocker button + SPORT Driving Experience Control |
| 4 | Ride height rocker button + Load level button + Display Key |
| 40 mm | Offroad level |
| 20 mm | High level |
| +/–0 mm | Normal level |
| -10 mm | Dynamic level |
| –20 mm | Sport level |
| –40 mm | Load level |

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

### Load level

The load level offers convenient assistance when loading the vehicle. The load level can be activated via the following operating elements:

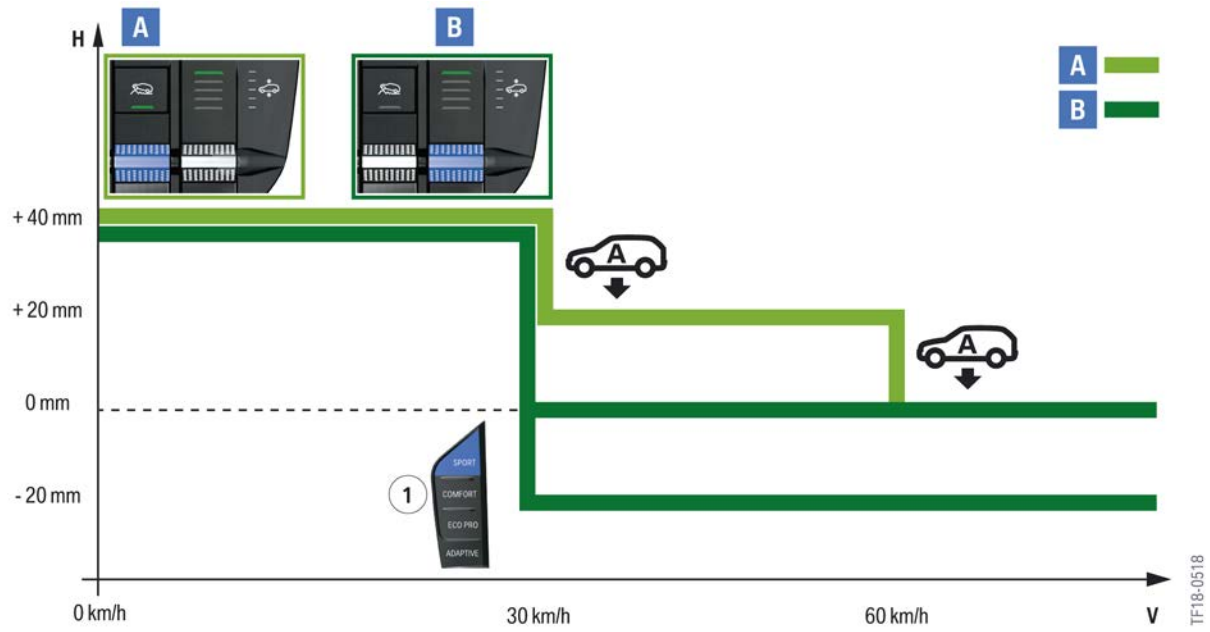
- Level change rocker button
- Display Key
- Load level button.

The load level is only active when the vehicle is stationary.

### Exiting the speed range

If the driving level activated via the ride height rocker button (e.g. offroad level 40 mm) is exited due to speed, the vehicle level is automatically adjusted according to the setting of the Driving Experience Control (normal level with COMFORT and sport level with SPORT). When the speed threshold is undercut, the height is not raised again automatically.

If the driving level activated via the offroad button (e.g. offroad level 40 mm) is exited due to speed, the next driving level down (high level 20 mm) is automatically set. When the speed falls below the defined threshold again, the vehicle is automatically raised.



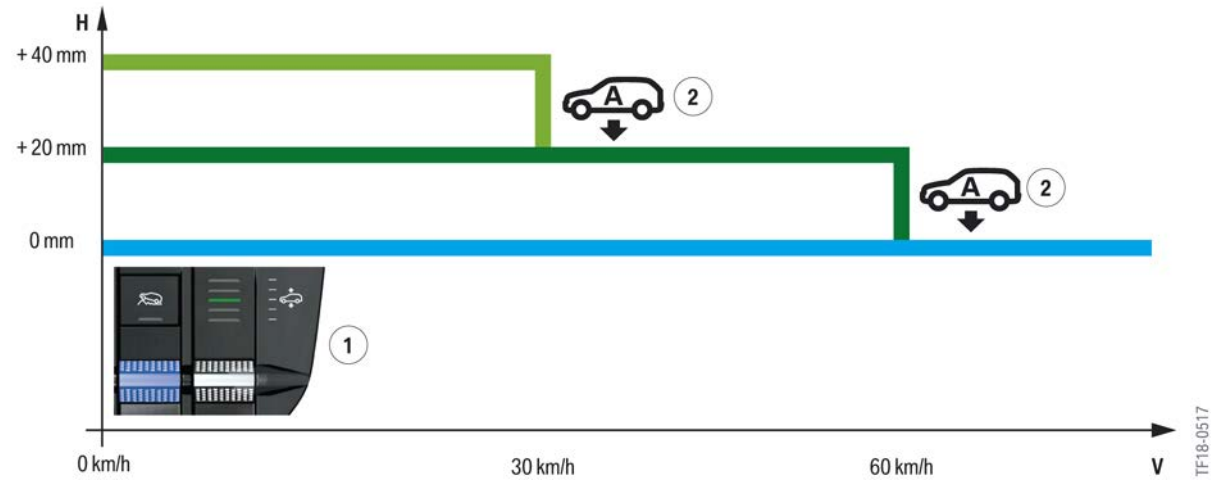

Operating strategy when exiting the speed range in the G05

| Index | Explanation |
|---|---|
| A | Characteristic of the ride height when activated via offroad button |
| B | Characteristic of the ride height when activated via ride height rocker button |
| H | Ride height |
| V | Speed |

| Index | Explanation |
|---|---|
| 1 | Driving experience switch |
| 40 mm | Offroad level |
| 20 mm | High level |
| +/–0 mm | Normal level |
| –20 mm | Sport level |

### 11.4.5. Offroad ride heights

Two different ride heights can be activated in offroad mode. When the stored driving speeds are exceeded, the next driving level down is set. When the speed falls below the defined threshold again, the vehicle is automatically raised.




Offroad ride heights in the G05

| Index | Explanation |
|---|---|
| H | Ride height |
| V | Speed |
| 1 | Offroad button |
| 2 | Automatic lowering |
| 40 mm | Offroad level |
| 20 mm | High level |
| 0 mm | Normal level |

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

### 11.4.6. Water crossing detection

The water crossing detection is primarily required by the engine control unit DME. If a water crossing is detected, the engine control unit DME closes the air flaps. This reduces the danger of water ingress in the intake area. As fluids cannot be compressed, intake of water would lead to engine damage.

A water crossing is detected via the signal shape of the 4 ride height sensors. By analyzing the characteristic current and voltage curve, conclusions can be drawn regarding a passage through stretch of water.

To avoid incorrect adjustments to the air suspension during a water crossing, this is deactivated when a water crossing is detected.


Water crossing detection in the G05

| Index | Explanation |
|---|---|
| 1 | Ride height sensor |
| 2 | Vertical Dynamic Platform (VDP) |
| 3 | DME engine control unit |
| 4 | Air damper control |
| 5 | Electronic ride height control (EHC) |
| 6 | Air suspension strut |

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

When driving through a body of water, a small bow wave forms in the front section. This causes the vehicle to float slightly. As the wheels drop down when this happens, the ride heights of the corresponding axle change. Without the water crossing detection, the air suspension would release pressure in the air suspension strut in order to adjust the ride height. This would cause the vehicle to sink even lower.

The engine control unit DME sends the information regarding a water crossing to the electronic ride height control (EHC). The control of the air suspension is subsequently deactivated for the duration of the water crossing.

### 11.4.7. Touchdown detection

The air suspension is equipped with a touchdown detection for driving offroad. This counteracts the reduced traction which occurs when several wheels lose contact with the ground.

If touchdown is detected via the ride heights accompanied by wheel slip, the level changes to a maximum ride height of +70 mm. This can lead to an improved wheel load distribution and allow free travel. This is not a driving level. When the touchdown detection is active, the vehicle level cannot be controlled manually. When a driving speed of 10 km/h (6 mph)is exceeded, the vehicle is lowered automatically. The driver can then access the control of the various vehicle levels manually.


Touchdown detection of the two-axle ride level control in the G05

| Index | Explanation |
|---|---|
| 1 | Air suspension strut |
| 2 | Wheel without traction |

### 11.4.8. Tire load removal function

When a flat tire is detected, the DSC control unit transfers this information to the EHC control unit. The EHC control unit then attempts to relieve the load on the relevant wheel. This can extend the remaining mileage of the defective run-flat tire. To achieve this, a tire load removal of +20 mm and –20 mm is set at the rear axle. This results in a total value of 40 mm for the differential level at the rear axle.

When a tire load removal function is active, the vehicle is always at the normal level. If this is not selected when the tire goes flat, it is automatically set. When the tire unloading function is active, the driver cannot gain manual access in order to change the vehicle level.


Tire unloading function in the G05

**Control of the tire unloading function**

| Puncture | Rear left wheel | Rear right wheel |
|---|---|---|
| Front left wheel | +20 mm | –20 mm |
| Front right wheel | –20 mm | +20 mm |
| Rear left wheel | –20 mm | +20 mm |
| Rear right wheel | +20 mm | –20 mm |

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

### 11.4.9. Trailer towing

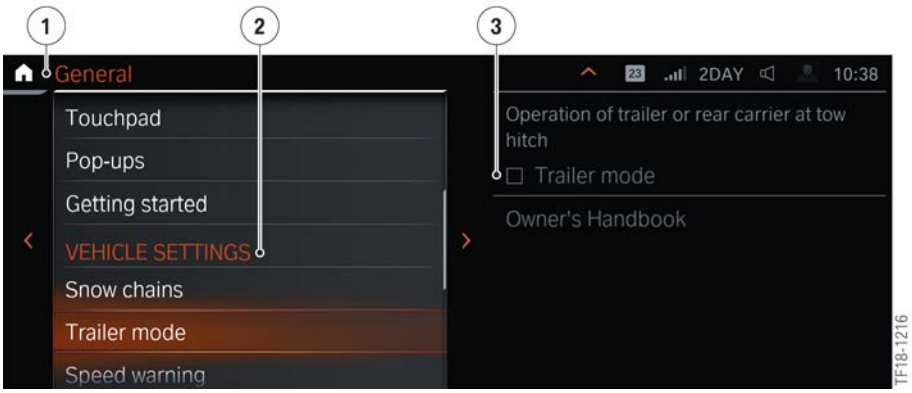

Trailer operation with G05

#### Trailer towing

As soon as a trailer is connected to the vehicle via the trailer socket, the air suspension can no longer be operated, e.g. via the ride height rocker button. During trailer operation, the control of the air suspension is limited exclusively to adjusting the load statuses at the normal level.

#### Activating the trailer operation manually

When connecting a trailer to the vehicle using a trailer without a light connection to the vehicle, the trailer mode needs to be activated manually in the
Central Information Display (CID).




Vehicle settings for trailer operation in the G05

| Index | Explanation |
|---|---|
| 1 | General settings |
| 2 | Vehicle settings |
| 3 | Trailer towing |

**System limitations when trailer operation is activated**

When trailer mode operation is activated manually or automatically when the trailer connection is connected to the vehicle, the following system limitations exist:

- Opening of the tailgate via the ID transmitter or button in the driver's door is disabled
- Park Distance Control (PDC) rear deactivated
- Emergency braking function with Active PDC deactivated
- Level change of air suspension disabled
- Lane change warning
- Blind spot detection

## 11.5. Notes for Service

### 11.5.1. Transport mode

The air suspension is in transport mode when new vehicles are delivered. A change in the ride height is not possible. Transport mode must be deleted using the workshop information system ISTA during the pre-delivery check. The different ride heights of the air suspension can be selected only after successful start-up of the air suspension (transport mode deleted).

### 11.5.2. Vehicle lift mode

The air suspension is equipped with a vehicle lift detection system. This prevents control action of the air suspension when the vehicle is lifted in the workshop. To activate the control of the air suspension after exiting the vehicle lift, the vehicle must be moved faster than 6 km/h (4 mph).

**Vehicle lift detection**

The vehicle lift detection is evaluated via the following signals:

- Driving speed
- Height level, ride height sensor.

When supporting the vehicle, e.g. on a vehicle lift, make sure that the components and lines of the air suspension system are not crushed or damaged.

### 11.5.3. Jack

Before using a jack, it is advisable to deactivate the self-levelling suspension (see Owner's Handbook).

### 11.5.4. Workshop mode

**Activating the workshop mode**

The control of the air suspension can be deactivated manually in workshop mode. This can be activated by pressing the ride level rocker button for longer than 7 s. When doing so, whether the ride level rocker button is pushed forwards or backwards is irrelevant. The LED on the ride level rocker button goes out to confirm workshop mode.

The workshop mode is required for example when performing a wheel alignment in order to prevent adjustments by the air suspension. BMW Group vehicles equipped with a rear axle air suspension do not feature a ride height selection switch. To prevent control actions in these vehicle models, the vehicle battery must be disconnected for example.

**Exiting workshop mode**

To activate the control of the air suspension, the workshop mode must be deactivated.
This can be done as follows:

- Driving speed higher than 6 km/h (4 mph)
- Hold ride height rocker button pressed for longer than 7 s.

### 11.5.5. Swapping of air lines

If the compressed air lines are swapped round, the vehicle will tilt permanently as a result. It will no longer be possible to adjust the system when the lines are swapped. To prevent confusion during installation work in service, the compressed air lines are color coded.

| Colour code | Component |
|---|---|
| Yellow | Pressure accumulator |
| Black | Air suspension strut, front right |
| Green | Air suspension strut, front left |
| Blue | Air suspension strut, rear right |
| Red | Air suspension strut, rear left |

### 11.5.6. Servicing of the pneumatic system

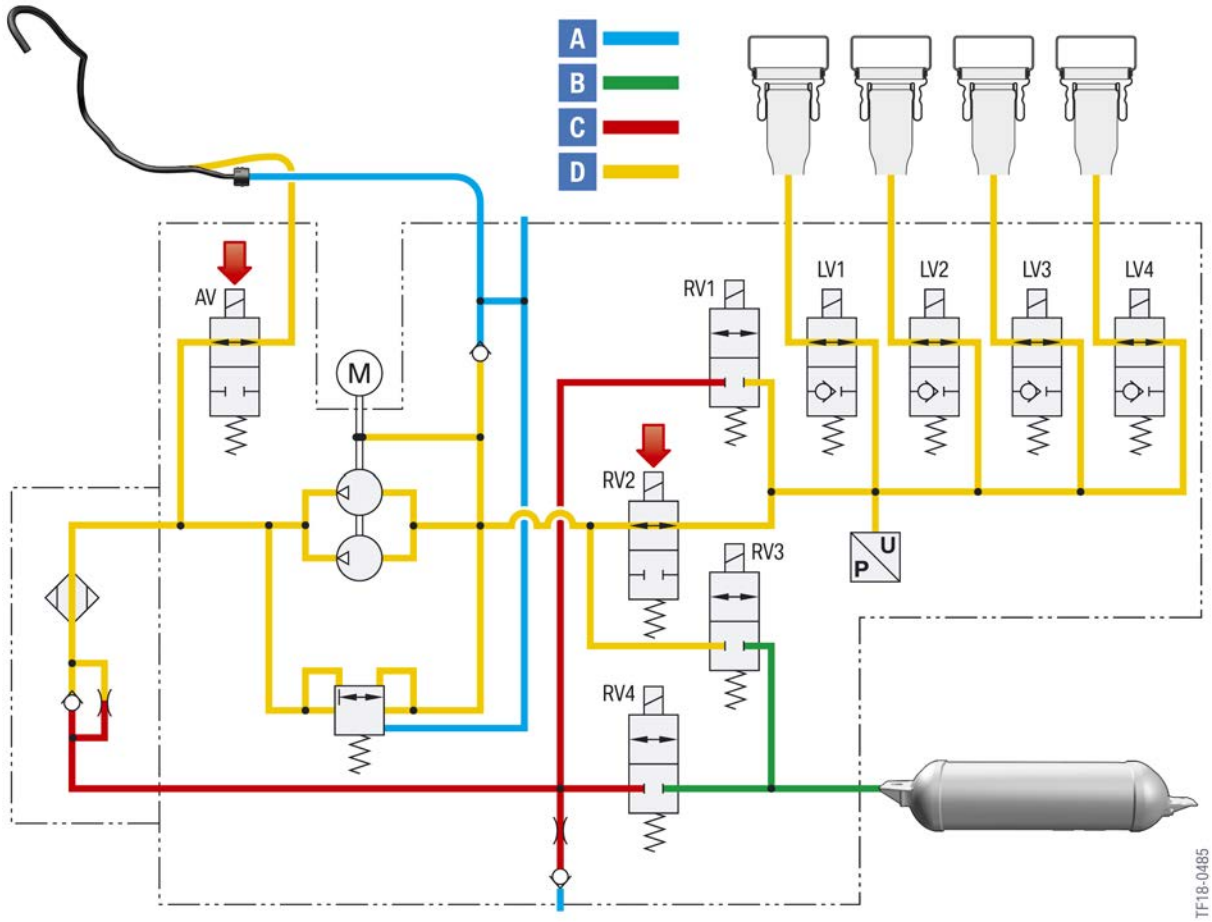
Ensure strict cleanliness around the air spring connections during disassembly and installation work. Minor contamination within the lines may already cause air suspension faults.

Before opening the compressed air lines, the air spring system must be depressurised with the assistance of the workshop information system ISTA.

# G05 Powertrain/Chassis

## 11. Two-axle Ride Level Control

**Service function for releasing the compressed air to the surroundings**




Releasing the compressed air from the air suspension struts to the surroundings in the G05

| Index | Explanation | Active | Inactive |
|---|---|---|---|
| A | Atmospheric pressure | — | — |
| B | Accumulator pressure | — | — |
| C | Filling pressure | — | — |
| D | Air suspension pressure | — | — |
| M | Compressor | | ● |
| AV | Discharge valve | ● | |
| RV1 | Control valve 1 | | ● |
| RV2 | Control valve 2 | ● | |
| RV3 | Control valve 3 | | ● |
| RV4 | Control valve 4 | | ● |
| LV1–LV4 | Air suspension strut valves 1–4 | ● | |

When exchanging the air supply unit, the entire system must be depressurized. This is performed using a service function in the workshop information system ISTA. To prevent damage to the air suspension, a slight pressure of roughly 2 bar is maintained in the air suspension struts via the residual pressure maintaining valves.

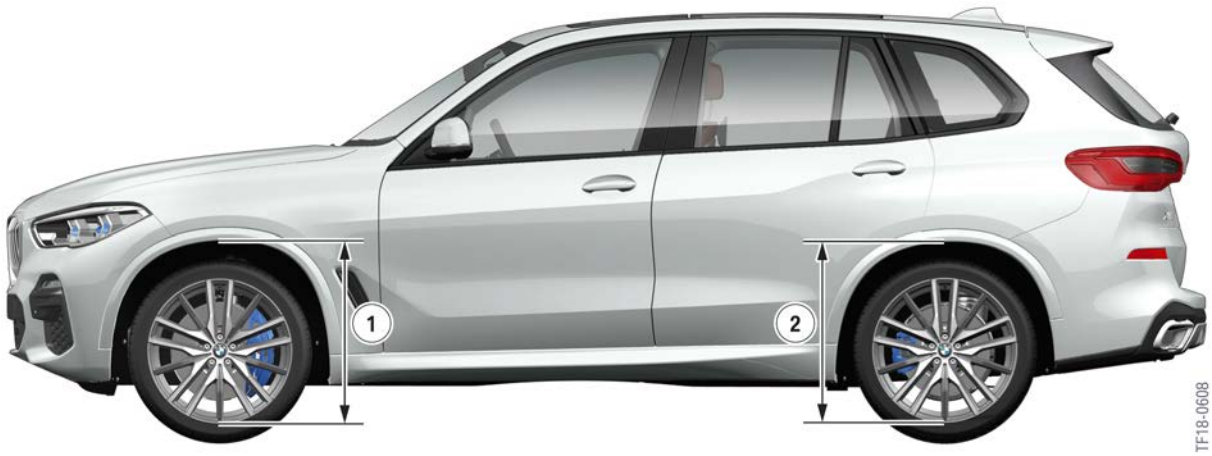
The graphic above only shows the release of compressed air from the air suspension struts. The pressure in the pressure accumulator is also dumped via the service function.

For the valid procedure for exchanging the various components of the air suspension, refer to the current repair instructions.

Once an air line has been detached, all openings must be closed immediately. If dirt enters the pneumatic system, this can lead to faults or a system failure the cause of which can only be diagnosed with difficulty.

### 11.5.7. Ride height adjustment

After renewing or programming the Vertical Dynamic Platform (VDP) control unit, the ride heights of the two-axle ride level control must be taught in again. This is performed via the "ride height adjustment" service function. To do this, the distance between the wheel arch and rim flange must be measured with a tape measure and entered in the workshop information system ISTA.




Ride height adjustment in the G05

| Index | Explanation |
|---|---|
| 1 | Ride height of front axle |
| 2 | Ride height of rear axle |

### 11.5.8. Leakages

After longer stationary periods, the vehicle may reach a low level due to leakage. To prevent damage due to reduced underbody clearance, the driver receives a corresponding Check Control message.

Leakages are equalized as effectively as possible within 32 h via the wake-up control. For this, the vehicle wakes up at various time intervals and adjusts the ride height if necessary.

**Troubleshooting procedure if a leakage is suspected:**

- Adjust and note maximum storage pressure of the pressure accumulator with assistance of workshop information system ISTA
- Deactivate air suspension (workshop mode)
- Search for leak (check components using leak detection spray)
- Determine storage pressure again after some time and check plausibility.

### 11.5.9. Display Key

The Display Key in the G05 contains various display menus, which depend on the vehicle equipment. When ordering a Display Key using the vehicle identification number, this is preconfigured in the BMW central warehouse according to the vehicle equipment. Every vehicle is therefore equipped with a user menu which is adapted to the equipment specification. The customer can use this kind of menu to change the vehicle level of his air suspension, for example. This kind of menu is on the other hand not displayed in vehicles without air suspension.

Lowering to the load level via the Display Key is only possible from the normal level.

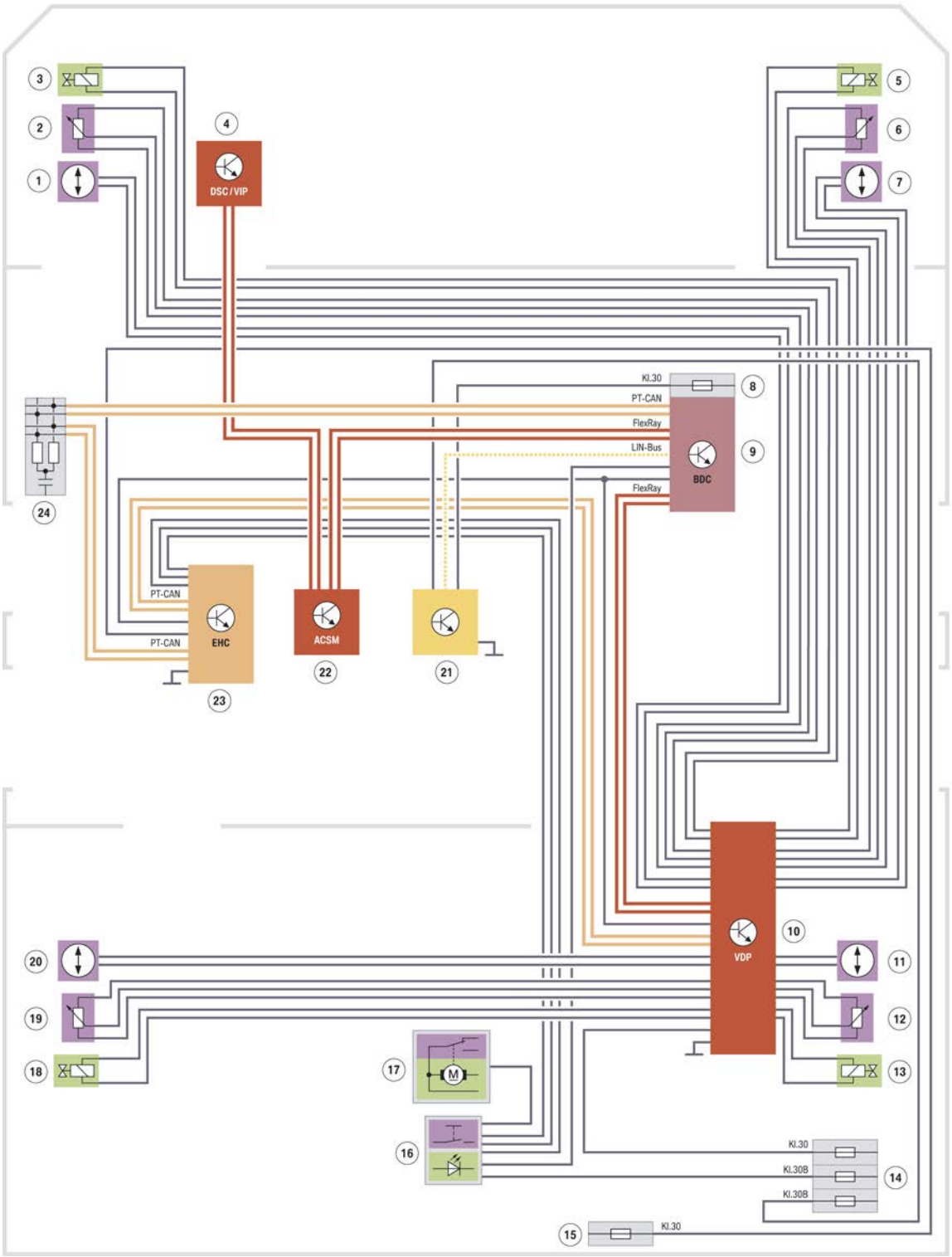
The function Change vehicle level via Display Key will be available from December 2018.


Display Key in the G05

⚠

Raising or lowering to a different driving level cannot be interrupted. Be careful to avoid injury/damage due to entrapment/pinching.

### 11.6. System wiring diagram




System wiring diagram of the two-axle ride level control in the G05

# G05 Powertrain/Chassis

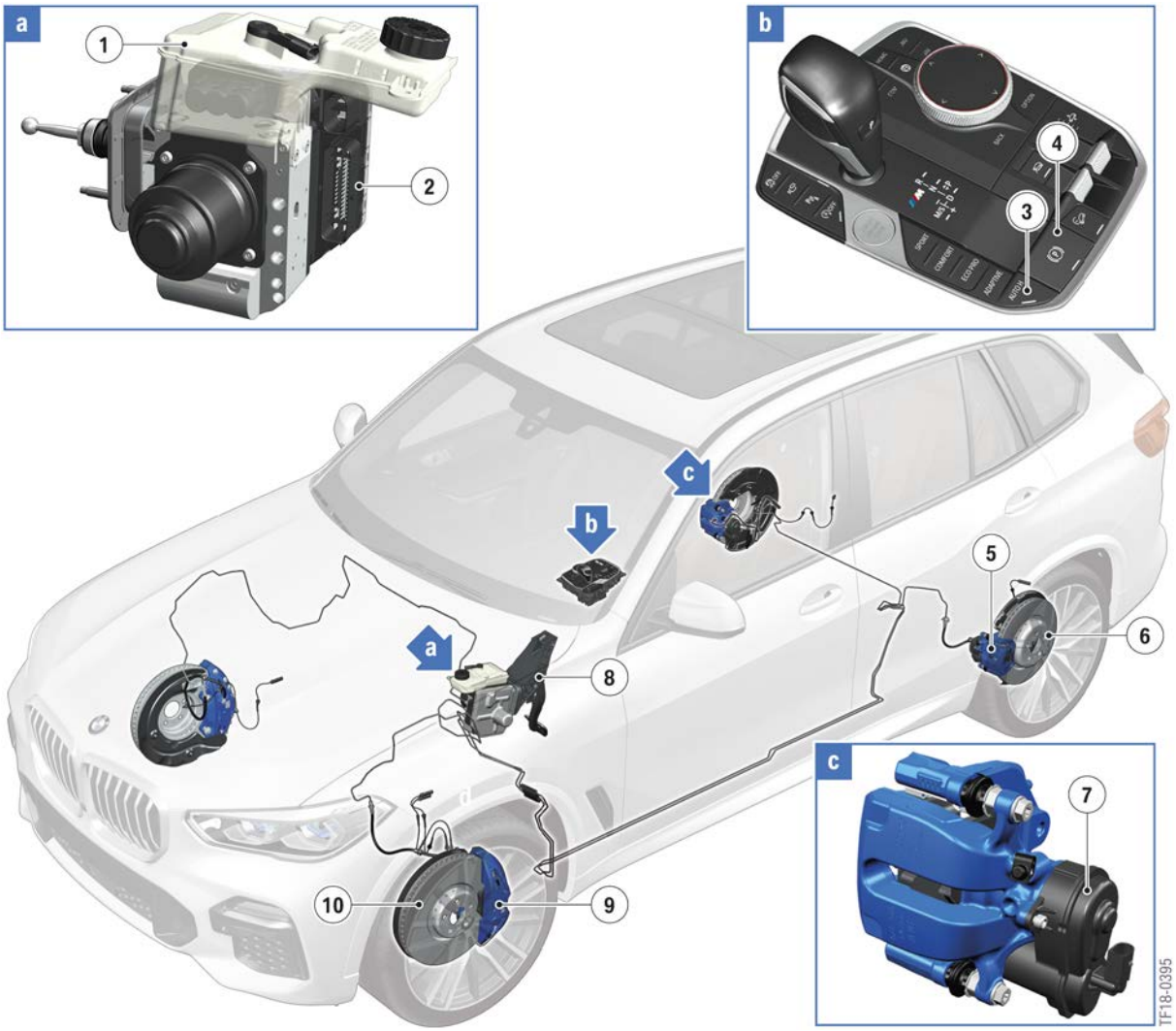
## 11. Two-axle Ride Level Control

| Index | Explanation |
|---|---|
| 1 | Vertical acceleration sensor, front left (only in combination with EARS) |
| 2 | Ride height sensor, front left |
| 3 | Control valve for Electronic Damper Control (EDC) front left |
| 4 | Dynamic Stability Control integrated (DSCi) |
| 5 | Control valve for Electronic Damper Control (EDC) front right |
| 6 | Ride height sensor, front right |
| 7 | Vertical acceleration sensor, front right (only in combination with EARS) |
| 8 | Power distribution box, front |
| 9 | Body Domain Controller (BDC) |
| 10 | Vertical Dynamic Platform (VDP) |
| 11 | Vertical acceleration sensor, rear right (only in combination with EARS) |
| 12 | Ride height sensor, rear right |
| 13 | Control valve for Electronic Damper Control (EDC) rear right |
| 14 | Power distribution box, rear |
| 15 | Power distribution box, rear |
| 16 | Load level button |
| 17 | Tailgate release button |
| 18 | Control valve for Electronic Damper Control (EDC) rear left |
| 19 | Ride-height sensor, rear left |
| 20 | Vertical acceleration sensor, rear left (only in combination with EARS) |
| 21 | Center Operation Unit |
| 22 | Advanced Crash Safety Module (ACSM) |
| 23 | Electronic ride height control (EHC) |
| 24 | CAN terminator |

# G05 Powertrain/Chassis

## 12. Brakes

The G05 is the first BMW Group vehicle to be equipped with a newly developed integrated brake system. The core element of the brake is the Dynamic Stability Control integrated DSCi. What sets this brake system apart from the others is the omission of vacuum supply and brake servo. This is an electro-hydraulic brake-by-wire brake system which determines the braking requirement of the driver and adjusts the hydraulic brake pressure accordingly. During normal operation the driver has no direct connection in the brake hydraulics to the wheel brakes. A brake force simulator generates a familiar brake pedal feel. Feedback from the brake hydraulics that typically occurs during ABS or DSC control operations, are not perceived by the driver.




Overview of integrated brake system in the G05/

| Index | Explanation |
|---|---|
| 1 | Brake fluid expansion tank |
| 2 | Dynamic Stability Control integrated (DSCi) |
| 3 | Automatic Hold |
| 4 | Parking brake button |

| Index | Explanation |
|---|---|
| 5 | Combined brake caliper |
| 6 | Rear brakes |
| 7 | Electromechanical parking brake actuator |
| 8 | Pedal bracket |
| 9 | Brake caliper, front |
| 10 | Front brake |

## 12.1. Service brake

### 12.1.1. Variants

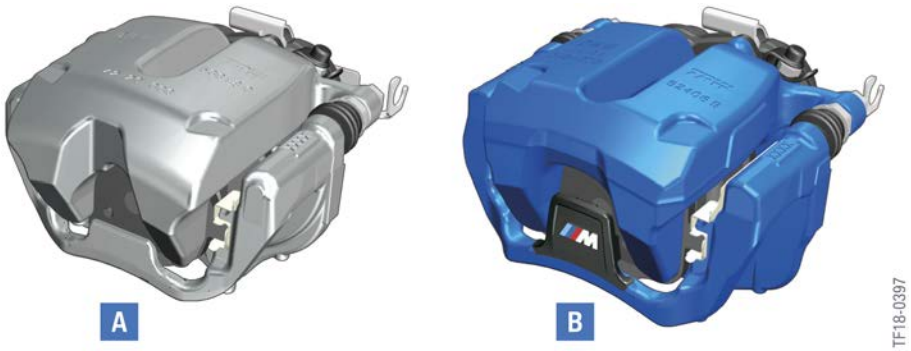
Depending on the engine size and vehicle equipment, various brake calipers are used at the front and rear axle. In the area of the 19" brake, the blue painted sport brake is only available in combination with the optional equipment M Sprt Brakes (OE 2NH).

**Front axle**


Brake caliper variants for front axle in the G05

| Index | Explanation | Manufacturer |
|---|---|---|
| A | Standard brake (17” disc) | Continental® |
| B | Optional brake (18” disc) | Brembo® |
| C | M Sport brake (19” disc) | Brembo® |

**Rear axle**

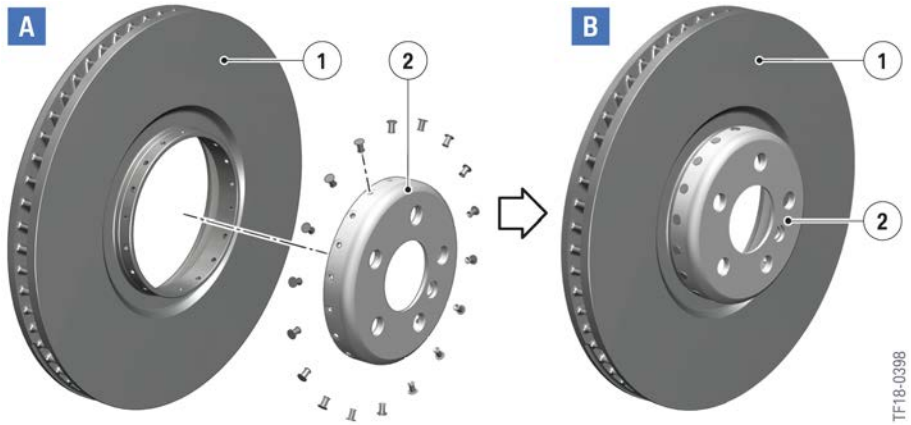



Brake caliper variants for rear axle in the G05

| Index | Explanation | Manufacturer |
|---|---|---|
| A | Standard brake (17” disc) (18” disc) | TRW® |
| B | M Sport brake (19” disc) | TRW® |

### 12.1.2. Brake discs

All G05 versions contain a riveted lightweight construction brake disc. The weight reduction is achieved by using a brake disc chamber made of aluminium.




Brake discs installed in the G05

| Index | Explanation |
|---|---|
| A | Two-part lightweight construction brake disc, dismantled view (cannot be dismantled in service) |
| B | Two-part lightweight construction brake disc, assembled view |
| 1 | Friction surface |
| 2 | Brake disc chamber |

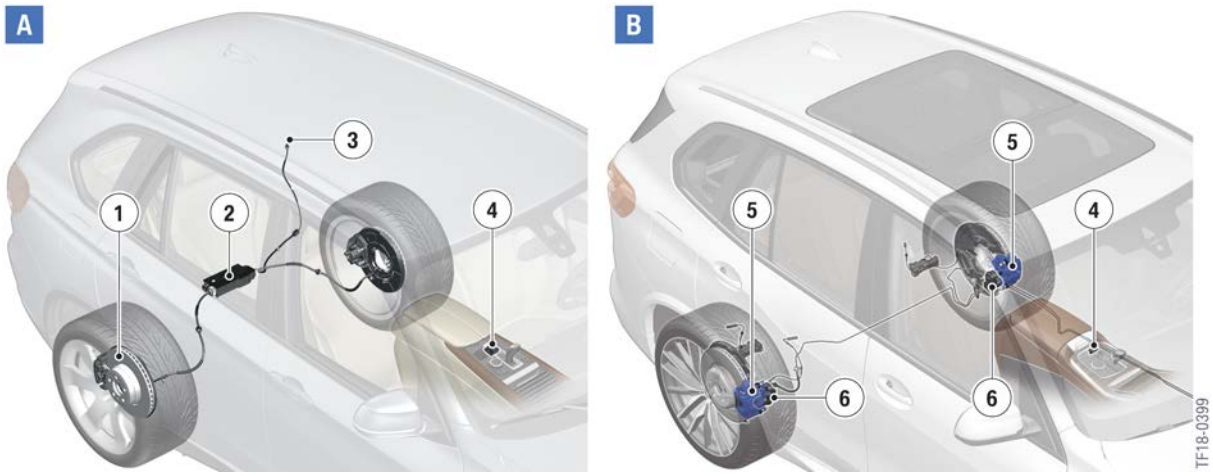
# G05 Powertrain/Chassis

## 12. Brakes

Only the complete brake disc can be renewed in service. Separation of the rivets is not permitted.

### 12.2. Parking brake

The electromechanical parking brake with external cables is used in the F15 BMW X5.
The electromechanical parking brake that is incorporated into the rear brake caliper is now installed in the G05.




Holding brake systems in the F15 and G05

| Index | Explanation |
|---|---|
| A | F15 with electromechanical parking brake |
| B | G05 with electromechanical parking brake |
| 1 | Duo-servo parking brake |
| 2 | Electromechanical parking brake actuator |
| 3 | Emergency release |
| 4 | Parking brake button |
| 5 | Electromechanical parking brake actuator |
| 6 | Combined brake caliper |

# G05 Powertrain/Chassis

# 13. Wheels and Tires

The wheel sizes of the G05 range from 19 x 9.5 with 265/50-R19 tires to 22 x 10.5 with 315/30-R22 tires. Wheel sizes 19", 20" and 21" are available with mixed tires as an option.

There should be no significant deviation between the tread depth or tire rolling circumference of the wheels of the front axle and wheels of the rear axle in vehicles equipped with the xDrive all-wheel system.

## 13.1. Run flat tire

Run-flat tires are available for the following wheel/tire combinations.

| Variable | Characteristics | Tire type | Tire size |
|---|---|---|---|
| 19" | All-season | Run flat tire | 265/50 R19 |
| 20" | All-season | Run flat tire | 275/45 R20 |
| 21" | Performance | Run flat tire | 275/40 R21<br>315/35 R21 |
| 22" | Performance | Run flat tire | 275/35 R21<br>315/30 R21 |

### 13.1.1. Puncture

Continued driving with depressurized run-flat tires with medium load is permitted up to a maximum speed of 80 km/h (50 mph) for roughly 80 km (50 miles).

#### Wheel load removal

The wheel load removal function is used in the following systems to extend the range of the run-flat tires in the event of a flat tire:

- Electric active roll stabilization EARS
- Two-axle ride level control.

A damaged run-flat tire can be also replaced in emergencies with a normal tire which should then be replaced as soon as possible with a run-flat tire.

# G05 Powertrain/Chassis

## 13. Wheels and Tires

### 13.2. Offroad tires


Offroad tires in the G05

| Index | Explanation |
|---|---|
| 1 | Offroad tires with special grabber AT3 tire tread |
| 2 | Offroad wheel rims style 748M matt black 9 x 20 |
| 1/2 | Wheel with tire |

Customers with offroad requirements can now for the first time obtain a special wheel set from BMW to increase offroad capability. The wheel set cannot be ordered from the factory but only available through Aftersales. It has the characteristics of an all-season tire and can therefore be used by the customer not only for offroad driving but also as a fully-fledged winter tire set. The special grabber AT3 tire tread offers the perfect combination of offroad capability and good drivability on the road.

#### 13.2.1. Technical data

**The grabber AT3 tire has the following identification marks:**

- Mud and Snow (M+S)
- Three-Peak-Snowflake.

It is therefore a fully-fledged winter tire.

The offroad tire has **no** star identification. Following extensive testing by the wheel and tire development division however, it has been possible to provide a marketing recommendation. The assistance systems available from BMW can also be used without restriction in combination with the offroad wheel set.

| Tire size | Speed range | Noise emission |
|---|---|---|
| 275/45 R20 | H rated (up to 130 mph) | 73 dB/2 |

### 13.2.2. Grabber AT3 tire tread

**Traction on every surface**

Due to the large number of gripping edges in the tire tread, the tire interlocks with the loose surface and effectively transmits the drive and brake forces.

The open tread shoulder ensures efficient self-cleaning and additional traction in mud.

**Protective functions**

| Sidewall lugs | Deflection ribs | Rim protection rib |
|---|---|---|
|  |  |  |

Solid blocks running from the tire shoulder into the side wall protect this area from lateral damage by stones, rocks and rubble.

The deflection ribs attached to the sides repel foreign bodies and therefore prevent foreign bodies from penetrating the upper side wall area.

The rim protection rib protects the tire and wheel rim in the bead area from damage by curbs and obstacles during offroad use.

## 13.3. Integrated RDCi tire pressure monitor

The G05 is equipped with the familiar tire pressure monitor RDCi which is integrated into the Dynamic Stability Control. The TPM wheel electronics of the RDCi in the G05 are provided by Sensata®.

# G05 Powertrain/Chassis

## 13. Wheels and Tires

| Vehicle | Wheel electronics |
|---|---|
| G12 | Schrader® |
| G30 | Schrader® |
| G05 | Sensata® |
| G15 | Sensata® |

### 13.3.1. Electronic tire pressures label

The G05 is equipped with the electronic tire pressure specification introduced in the G30 (BMW 5 Series). For the valid tire inflation pressures, check the Central Information Display (CID).

The RDC reset is omitted following adjustment of the tire inflation pressures in vehicles with activated electronic tire pressure specification.

Further information can be found in the "G30 Complete Vehicle" product information.

## 13.4. Wheel bolts


Two-part wheel bolts in the G05

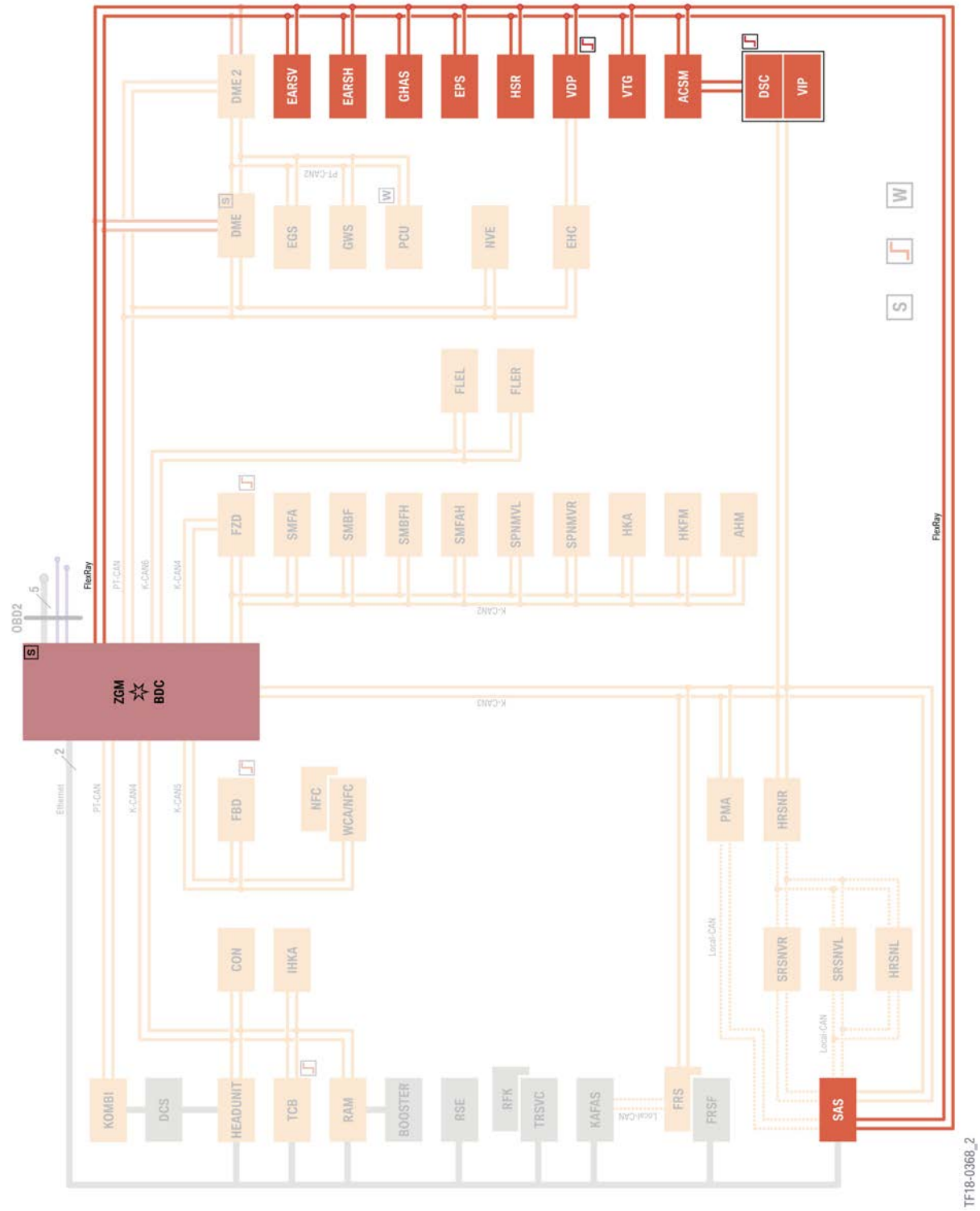
| Index | Explanation |
|---|---|
| 1 | Wheel bolt |
| 2 | Centering cone |

The two-part wheel bolts guarantee high preload forces.

# G05 Powertrain/Chassis

## 14. Driving Stability Control

### 14.1. Bus overview

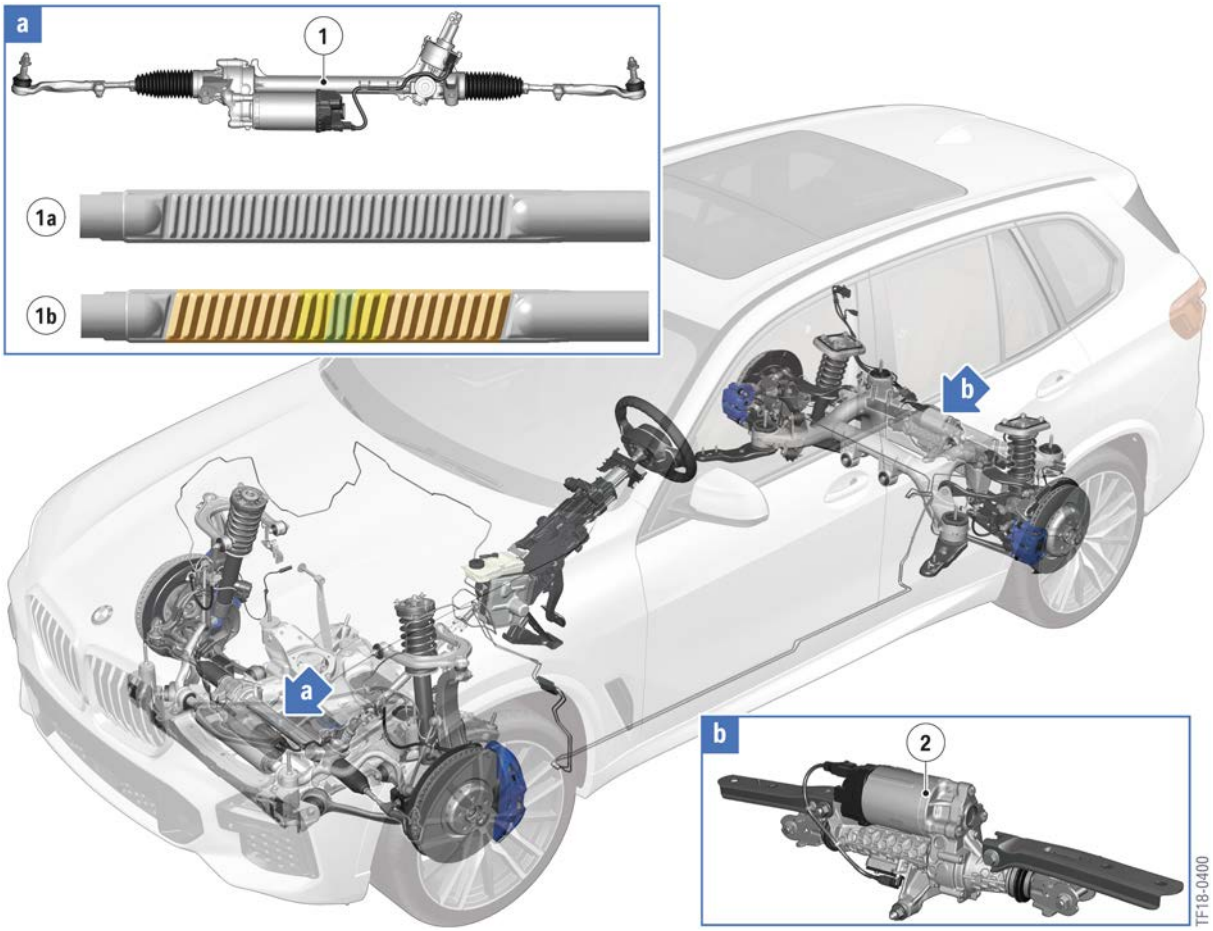



Bus overview of the driving dynamics systems in the G05

| Index | Explanation |
|---|---|
| ACSM | Advanced Crash Safety Module |
| DSCi | Dynamic Stability Control integrated |
| EARSH | Electric active roll stabilization rear |
| EARSV | Electric active roll stabilization front |
| EPS | Electromechanical Power Steering |
| GHAS | Regulated rear axle differential lock |
| HSR | Rear axle slip angle control |
| SAS | Optional equipment system |
| VDP | Vertical Dynamic Platform |
| VIP | Virtual Integration Platform |
| VTG | Transfer box |

## 14.2. Steering

An electromechanical power steering with parallel-axis arrangement (EPS-APA) is used. A rear axle steering in the equipment specification "Integral Active Steering" can now be ordered in an X model for the first time at BMW. In contrast to previous vehicles equipped with Integral Active Steering, a 24 V system is not used with the G05. All vehicles are supplied with 12 V steering.




Overview of steering in the G05

| Index | Explanation |
|---|---|
| 1 | Electromechanical Power Steering |
| 1a | Conventional rack geometry (standard steering) |
| 1b | Variable rack geometry (Integral Active Steering) |
| 2 | Rear axle slip angle control HSR (Integral Active Steering) |

### 14.2.1. Rear axle slip angle control HSR

The maximum steering angle of the rear axle slip angle control HSR in the G05 is 2.5°.

## 14.3. Dynamic Stability Control integrated DSCi

The G05 features the newly developed integrated brake system with internal designation Dynamic Stability Control integrated DSCi.

# G05 Powertrain/Chassis

## 14. Driving Stability Control

With the introduction of the DSCi, a completely new braking concept is available to BMW customers which has a significant effect on driving dynamics.

### 14.3.1. Features

**The brake system is distinguished by the following driving characteristics in particular:**

- Outstanding driving dynamics and vehicle control due to the dynamics and precision of the vehicle stabilization.
- More sporting character and feeling of safety due to a brake pedal feel short travel and effective modulation.
- Enhanced active safety thanks to shorter stopping distances in combination with assistance systems.
- Due to the fast pressure build-up, much faster and more precise interventions can be achieved compared to previous brake systems.

# G05 Powertrain/Chassis

## 14. Driving Stability Control


Dynamic Stability Control integrated DSCi in the G05

| Index | Explanation |
|---|---|
| 1 | Brake control linkage with adjustable ball head |
| 2 | Expansion tank |
| 3 | Brake fluid level sensor |
| 4 | Plug connection, power supply (DC) |
| 5 | Plug connection, electrical system |
| 6 | Control unit |

| Index | Explanation |
|---|---|
| 7 | Hydraulic unit |
| 8 | Brake pedal force simulator |
| 9 | 3-phase e-motor (AC) |
| 10 | DSCi unit |

### 14.3.2. Special features

**The new DSCi brake system in the G05 is characterized by the following special technical features:**

- Electro-hydraulic brake-by-wire braking function
- Vacuum supply omitted
- Vacuum brake servo omitted
- Integration of the tandem brake master cylinder
- Integrated brake pedal travel sensor
- Changeover from front/back to diagonal brake force distribution
- Changeover from a brake fluid level switch to a brake fluid level sensor.

**The following document provides a detailed description of the integrated brake:**

Product information DSCi.

### 14.3.3. Brake functions

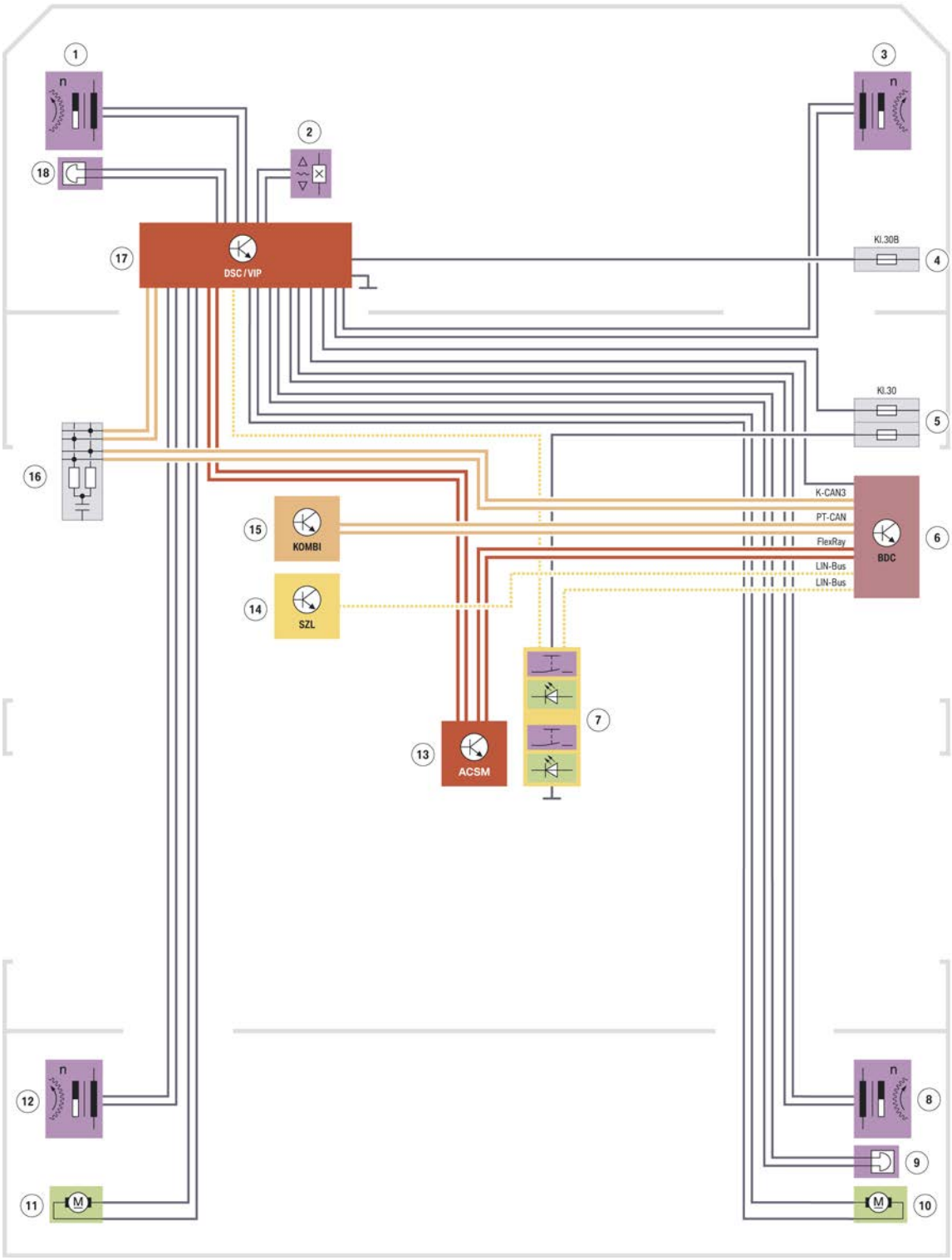
| Function | Explanation |
|---|---|
| Antilock Brake System (ABS) | Prevents locking of individual wheels when braking by means of targeted modulation of brake pressures. Vehicle steerability is maintained. |
| Cornering Brake Control (CBC) | Prevents the vehicle from turning in when braking gently and when subjected to a high degree of lateral acceleration by adjusting the control of the brake pressures. The cornering stability is improved. |
| Automatic Stability Control (ASC) | Prevents the drive wheels from spinning by targeted braking of these wheels and adaptation of the drive torque delivered by the engine. Vehicle propulsion is optimized as a result and driving stability is maintained. |
| Dynamic Brake Control (DBC) | In the event of panic braking initiated by the driver, the system supports the driver by automatically immediately applying the maximum brake pressure to ensure the best possible deceleration. |
| Dynamic Stability Control (DSC) | If the vehicle starts to understeer or oversteer, it is stabilized by targeted brake interventions at individual wheels. |

# G05 Powertrain/Chassis

## 14. Driving Stability Control

| Function | Explanation |
|---|---|
| Automatic Differential Brake (ADB-X) | Simulates the function of the differential lock. If a wheel displays a tendency to spin, this wheel is automatically braked so that forward momentum can still be achieved via the other wheel of the driven axle. |
| Dynamic Traction Control (DTC) | Represents a special mode of the Dynamic Stability Control integrated DSCi. |
| Brake standby | Builds up a moderate brake pressure in the system when the driver takes his foot off the accelerator pedal quickly. The braking effect then acts more quickly if the driver then performs panic braking. |
| Dry by applying brake | Depending on whether the wiper is switched on, applies the brake pads gently at intervals in order to clean (dry) the brake discs. The braking effect is significantly improved by this when the vehicle is braked. |
| Drive-off assistant | Holds the vehicle on inclines for roughly 1.5 seconds as soon as the driver releases the brake pedal in order to drive off. This means that the driver can drive off comfortably, without the vehicle rolling back down the hill unintentionally. |
| Automatic Hold | Automatically holds the vehicle after it has come to a standstill without it being necessary to still press the brake when the drive position is selected. The brake is automatically released when the accelerator pedal is pressed and the vehicle drives off normally. The function can be switched on and off by means of a button. |

### 14.3.4. System wiring diagram




System wiring diagram of DSCi in the G05

| Index | Explanation |
|---|---|
| 1 | Wheel-speed sensor, front left |
| 2 | Brake fluid level sensor |
| 3 | Wheel-speed sensor, front right |
| 4 | Power distribution box, engine compartment |
| 5 | Power distribution box, front |
| 6 | Body Domain Controller (BDC) |
| 7 | Center Operation Unit |
| 8 | Wheel speed sensor, rear right |
| 9 | Brake pad wear indicator, rear right |
| 10 | Parking brake actuator, right |
| 11 | Parking brake actuator, left |
| 12 | Wheel speed sensor, rear left |
| 13 | Advanced Crash Safety Module (ACSM) |
| 14 | Steering column switch cluster (SZL) |
| 15 | Instrument cluster (KOMBI) |
| 16 | CAN terminator |
| 17 | Dynamic Stability Control integrated (DSCi) with virtual integration platform (VIP) |
| 18 | Brake pad wear indicator, front left |

## 14.4. Vehicle dynamics functions

| Agility and manoeuvrability | System | Description |
|---|---|---|
| Dynamic driving rear axle steering | – HSR | Through a systematic steering wheel movement, the agility and manoeuvrability in the low speed range can be improved by countersteering the wheels of the rear axle. By aligning the rear axle wheels in the same direction at high driving speeds increases the driving stability. |
| Driving dynamic limit range response | – EPS | The limit range response influences the steering torques to be applied by the driver so that the transition from stable driving to oversteer or understeer situations is better perceived. |

# G05 Powertrain/Chassis

## 14. Driving Stability Control

| Stabilization and traction | System | Description |
|---|---|---|
| Cornering Steering Behavior | – EARS | Selective influencing of the rolling moment relationship between front and rear axles can produce a stabilizing or more dynamic characteristic in the vehicle's self-steering response. |
| Cornering Traction Control | – EARS | Influencing the rolling moment relationships between front and rear axle is used to improve the traction when cornering. |
| Yaw-rate control, rear axle | – HSR | Systematic steering wheel movements of the rear axle in oversteering and understeering situations stabilizes the vehicle. |
| Yaw moment compensation, rear axle | – HSR | The yaw movement of the vehicle arising under heavy and varying braking coefficients of friction between the left-hand and right-hand sides of the vehicle is compensated for by selective steering movements on the rear axle. |
| Yaw moment compensation, front axle | – EPS | Targeted steering moment interventions by the Electronic Power Steering EPS in the event of heavy braking with different coefficients of friction between the left and right vehicle sides provide the driver with information about the steering input required to compensate for developing yaw movement of the vehicle. |
| Performance Control | – DSCi | The tendency of the vehicle to oversteer or understeer is reduced by selective brake interventions on individual wheels. At the same time, the vehicle deceleration caused by the brake intervention is furthermore compensated for by increasing the engine torque. |
| Driving dynamic total drive torque intervention | – DME | Regulating the drive torque within limits on the basis of the estimated coefficient of friction to avoid uncomfortable jumps during ASC control. |
| Transverse torque distribution, rear axle | – DSCi<br>– GHAS | The QMVH function controls the torque shift between the drive wheels of the rear axle, depending on the driving situation, in order to improve agility and stability. |
| Longitudinal torque distribution | – DSCi<br>– VTG | The function distributes the drive torque between the front and rear axle according to requirements in order to improve driving dynamics, driving stability, agility and traction. |

# G05 Powertrain/Chassis

## 14. Driving Stability Control

### 14.4.1. Abbreviations

| Abbreviation | Explanation |
|---|---|
| DME | Digital Motor Electronics |
| DSCi | Dynamic Stability Control integrated |
| EARS | Electric active stabilizer |
| EPS | Electromechanical Power Steering |
| GHAS | Regulated rear axle differential lock |
| HSR | Rear axle slip angle control |
| VTG | Transfer box |