

Technical training.
Product information.

G01 Powertrain



BMW Service

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Technical Training

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General information

Symbols used

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



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

Information status and national-market versions

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

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

Additional sources of information

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

- Owner's Handbook
- Integrated Service Technical Application.

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

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Technical training.

G01 Powertrain

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G01 Powertrain

1. Introduction

The development code for the new 3rd generation BMW X3 is G01. For the market introduction in November 2017, all models will be equipped as standard with an 8-speed automatic transmission and the xDrive all-wheel drive. A manual gearbox will not be offered.



G01 Drive

TA17-0721

1.1. Models

The newly developed B engine generation (modular strategy) will be used in all G01 models. All engines comply with the ULEV or SULEV exhaust emission standards.

- ULEV = Ultra-Low Emission Vehicle
- SULEV = Super Ultra-Low Emission Vehicle

G01 Powertrain

1. Introduction

1.1.1. Overview

Model	Engine	Exhaust emission standards	Automatic transmission	Transfer box
X3 xDrive30i	B46B20O0	SULEV	GA8HP50 Sport	ATC13-1
X3 M40i	B58B30M0	ULEV	GA8HP50 Sport	ATC13-1

1.1.2. BMW M Performance Automobiles



BMW X3 M40i



TC17-0706

The M Performance model BMW X3 M40i with B58B30M0 engine will already be available on the market at the model launch of the G01. The drive has an output power of 355hp and delivers a maximum torque of 500 Nm.

The equipment specification of the BMW X3 M40i includes the following drive-specific equipment:

- Active Sound Design ASD in combination with
 - HiFi speaker system (standard equipment) or
 - Harman Kardon Surround Sound System (OE 688)
- Steptronic sport transmission (standard equipment).

1.2. Overview of system descriptions

Many of the systems used are already familiar from the current BMW 7 Series G12 or current BMW 5 Series G30. The common features and differences are listed in the section "Comparison of G30 with G01".

The explanations of the systems already familiar from the G12/G30 are kept brief. The system descriptions can be taken from the different production information listed below.

G01 Powertrain

1. Introduction

Topic	Product information
Drive version X3 xDrive30i	ST1512 B46 Engine
Drive version X3 xDrive M40i	ST1505 B58 Engine
Air intake duct	ST1501 G12 Powertrain
Exhaust emissions regulations	ST1501 G12 Powertrain
Engine control unit	ST1501 G12 Powertrain
Automatic transmission 8HPTU	ST1501 G12 Powertrain
Four-wheel drive	ST1501 G12 Powertrain

1.3. Drive comparison of G30 with G01

A large number of systems in the G01 were already used in the G30. The following table provides an overview of the differences and common features between the two series.

Engines	G30	G01
B46 Engine (4-cylinder gasoline engine)	•	•
B58 Engine (6-cylinder gasoline engine)	•	•

Systems/components	G30	G01
Electrical exhaust flap(s)	•	•
8th generation DME	•	•
Automatic engine start-stop function connected	•	•
Active air-flap control with two servomotors	•	•
Automatic transmission 8HPTU	•	•
Transfer box ATC13-1	•	•

G01 Powertrain

1. Introduction

1.4. Engine designation

The engine designation is used to uniquely identify the various engines. The following table provides an overview of the composition of the different engine codes.

Position	Meaning	Index	Explanation
1	Engine developer	M, N, B P S W	BMW Group BMW M Sport BMW M GmbH Bought-in engines
2	Engine type	3 4 5 6 7	3-cylinder in-line engine (e.g. B38/ B36) 4-cylinder in-line engine (e.g. B48/ B46) 6-cylinder in-line engine (e.g. B58) V8 engine (e.g. N63) V12 engine (e.g. N74)
3	Change to the basic engine concept	0 1 – 9	Basic engine Changes, e.g. combustion process
4	Working method or fuel type and possibly installation position	A C C D H K	Gasoline, transverse mounted Gasoline, longitudinally mounted Diesel, transverse mounted Diesel, longitudinally mounted Hydrogen gasoline, horizontal mounting
5 + 6	Displacement in 1/10 liter	12 15 20 30 40 44 60	1,2 l 1,5 l 2.0 l 3.0 l 4.0 l 4.4 l 6.0 l
7	Performance class	K U M O T S	Lowest Lower Middle Upper Top Super
8	Revision relevant to approval	0 1 – 9	New development Redesign

G01 Powertrain

2. Engines

2.1. Overview

The gasoline engines of the G01 are already familiar from the current models.

	X3 sDrive30i	X3 M40i
Engine designation	B46B20O0	B58B30M0
Power output	185 kW / 248 hp	265 kW / 355 hp
Torque	350 Nm / 258 lb-ft	500 Nm / 369 lb-ft
Exhaust emission standards	SULEV	ULEV

2.2. B46 Engine



B46B20O0 engine

TA16-0518

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2. Engines

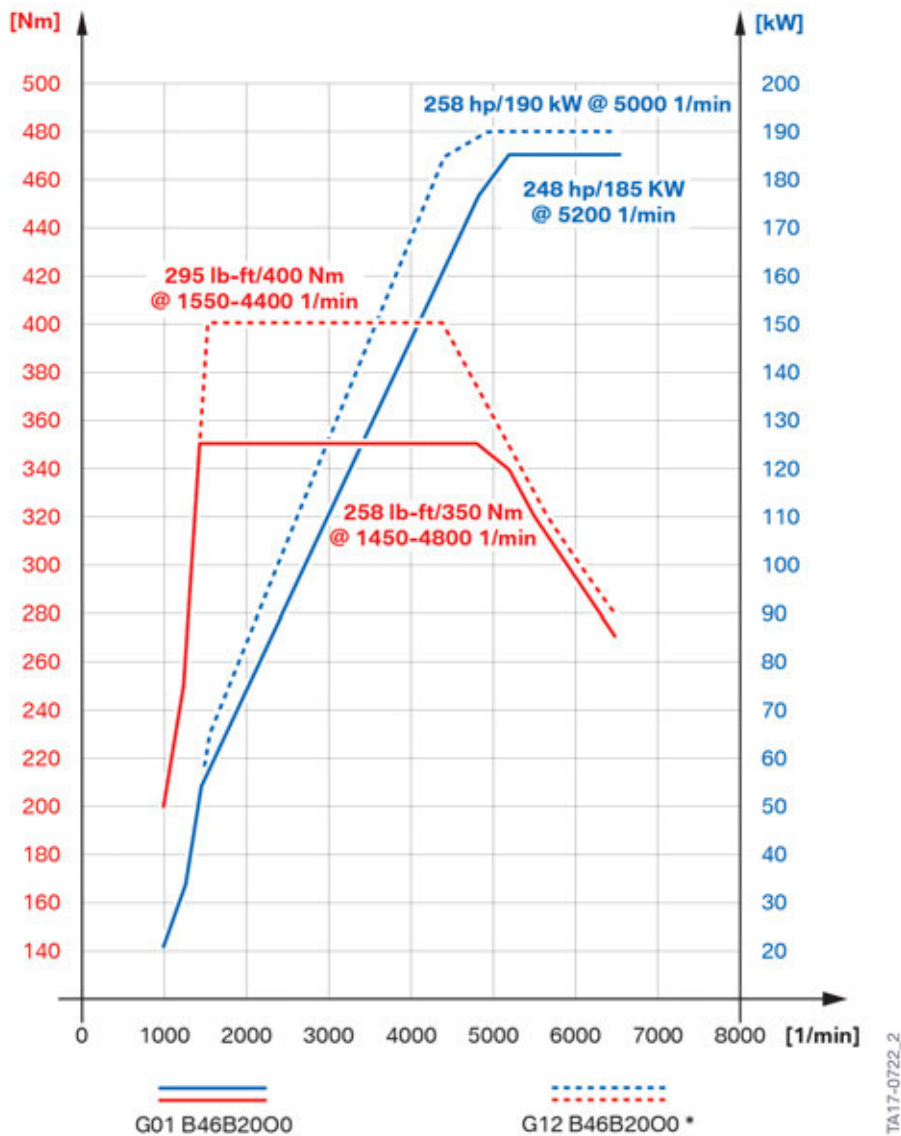
2.2.1. Technical data

Upper performance class

Parameters	Unit	B46B2000
Displacement	cm ³	1998
Cylinder layout	–	In-line
Number of cylinders	–	4
Firing order	–	1–3–4–2
Bore	mm	82
Stroke	mm	94,6
Compression ratio	ε	10
Combustion process	–	Turbo-Valvetronic direct injection
Max. output at engine speed	kW / hp rpm	185 / 248 5200 – 6500
Max. torque at engine speed	Nm / lb-ft rpm	350 / 258 1450 – 4800
Permitted fuel	RON	91–100

G01 Powertrain

2. Engines



Full load diagram B46B2000 engine

* 740e iPerformance vehicle

2.2.2. Special features

- Direct rail injection system with 200 bar pressure
- 4th generation Valvetronic
- Twin-scroll turbocharger with electrical wastegate valve controller
- Intake air system with integrated charge air cooler
- Switchable coolant pump

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2. Engines

- Heat management module
- Characteristic map-controlled oil pump with integrated vacuum pump
- 8th generation Digital Motor Electronics (DME).

2.3. B58 engine



TA15-0553

B58B30M0 engine

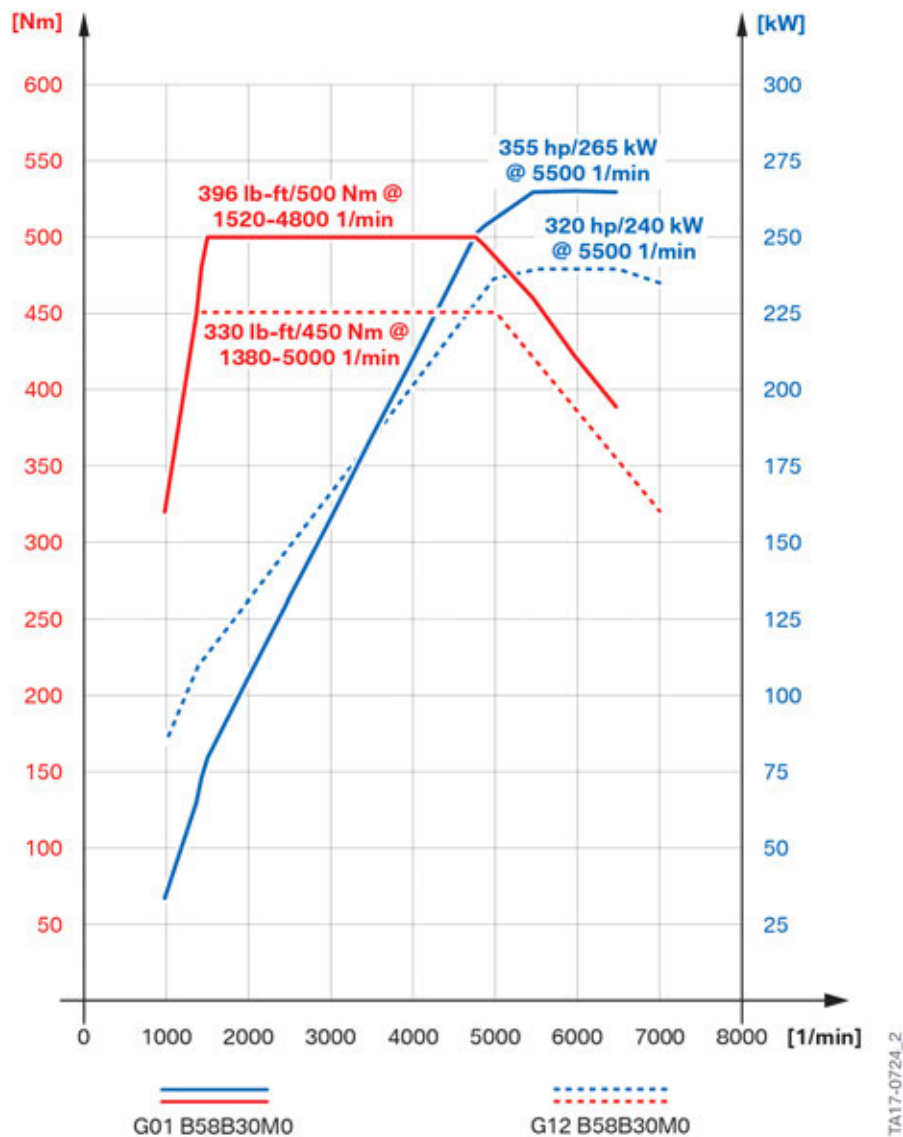
2.3.1. Technical data

Parameters	Unit	B58B30M0
Displacement	cm ³	2998
Cylinder layout	–	In-line
Number of cylinders	–	6
Firing order	–	1–5–3–6–2–4
Bore	mm	82
Stroke	mm	94,6
Compression ratio	ε	11
Combustion method	–	Turbo-Valvetronic direct injection

G01 Powertrain

2. Engines

Parameters	Unit	B58B30M0
Max. output at engine speed	kW / hp rpm	265 / 355 5500 – 6500
Max. torque at engine speed	Nm / lb-ft rpm	500 / 369 1520 – 4800
Permitted fuel	RON	91–100



Full load diagram B58B30M0 engine

G01 Powertrain

2. Engines

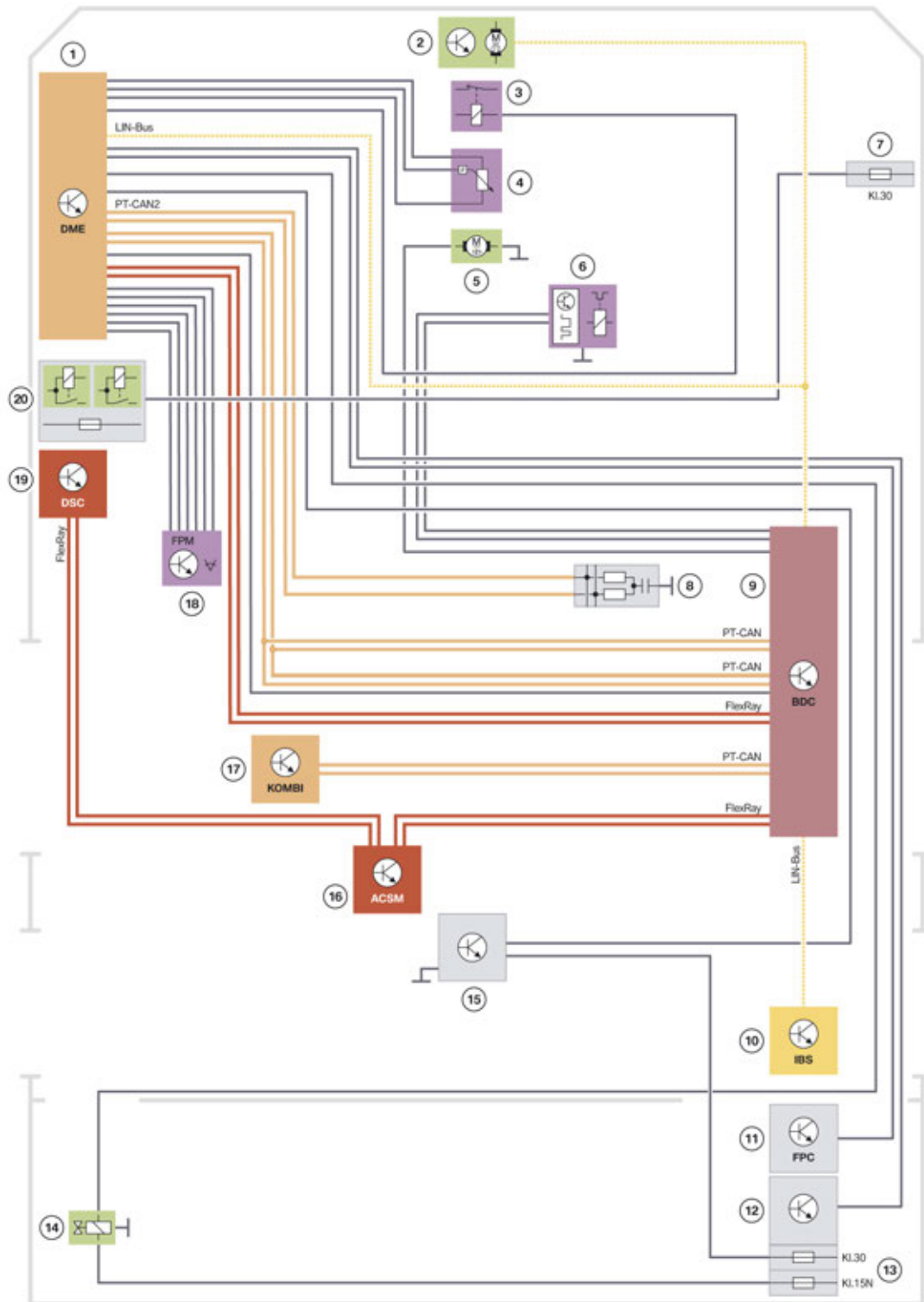
2.3.2. Special features

- Direct rail injection system with 200 bar pressure
- 4th generation Valvetronic
- Twin-scroll turbocharger with electrical wastegate valve controller
- Exhaust manifold with expansion compensation elements
- Intake air system with integrated charge air cooler
- Heat management module
- Characteristic map-controlled oil pump with integrated vacuum pump
- 8th generation Digital Motor Electronics (DME)

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2. Engines

2.4. System wiring diagram



G01 System wiring diagram for gasoline engine

TE17-0647

G01 Powertrain

2. Engines

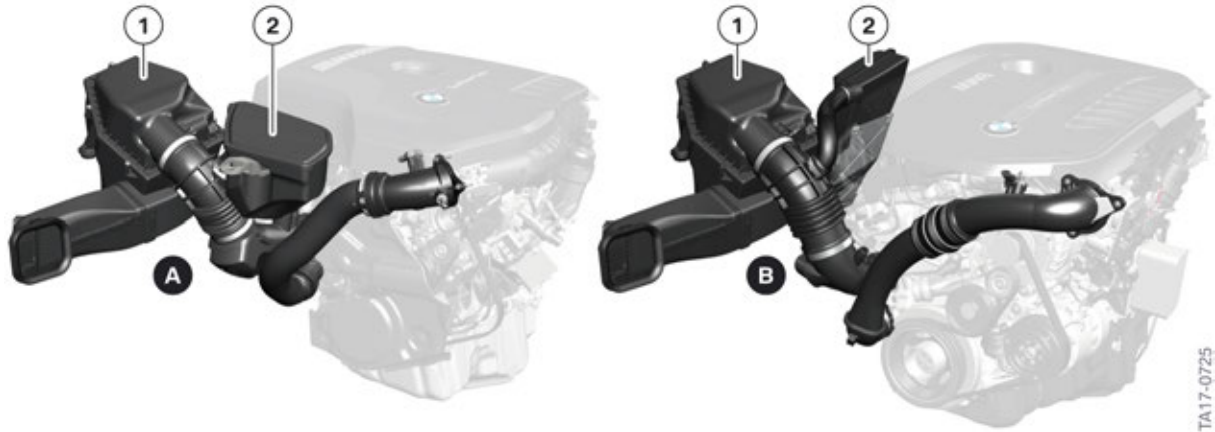
Index	Explanation
1	Digital Motor Electronics (DME)
2	Electric fan
3	Relay for electric fan
4	Differential pressure sensor (for gasoline particulate filter) (Not for the US)
5	Pinion starter
6	Air conditioning compressor
7	Power distribution box, engine compartment
8	CAN terminator 5
9	Body Domain Controller (BDC)
10	Intelligent Battery Sensor (IBS)
11	Fuel Pump Control (FPC)
12	LIN interface
13	Rear right power distribution box
14	Electrical exhaust flap
15	Tank leak diagnosis (NVLD)
16	Advanced Crash Safety Module (ACSM)
17	Instrument cluster (KOMBI)
18	Accelerator pedal module
19	Dynamic Stability Control (DSC)
20	Integrated supply module

G01 Powertrain

2. Engines

2.5. Intake air system

2.5.1. Air intake duct



G01 Air intake ducts of gasoline engine

Index	Explanation
A	B46 engine
B	B58 engine
1	Intake silencer
2	Resonator

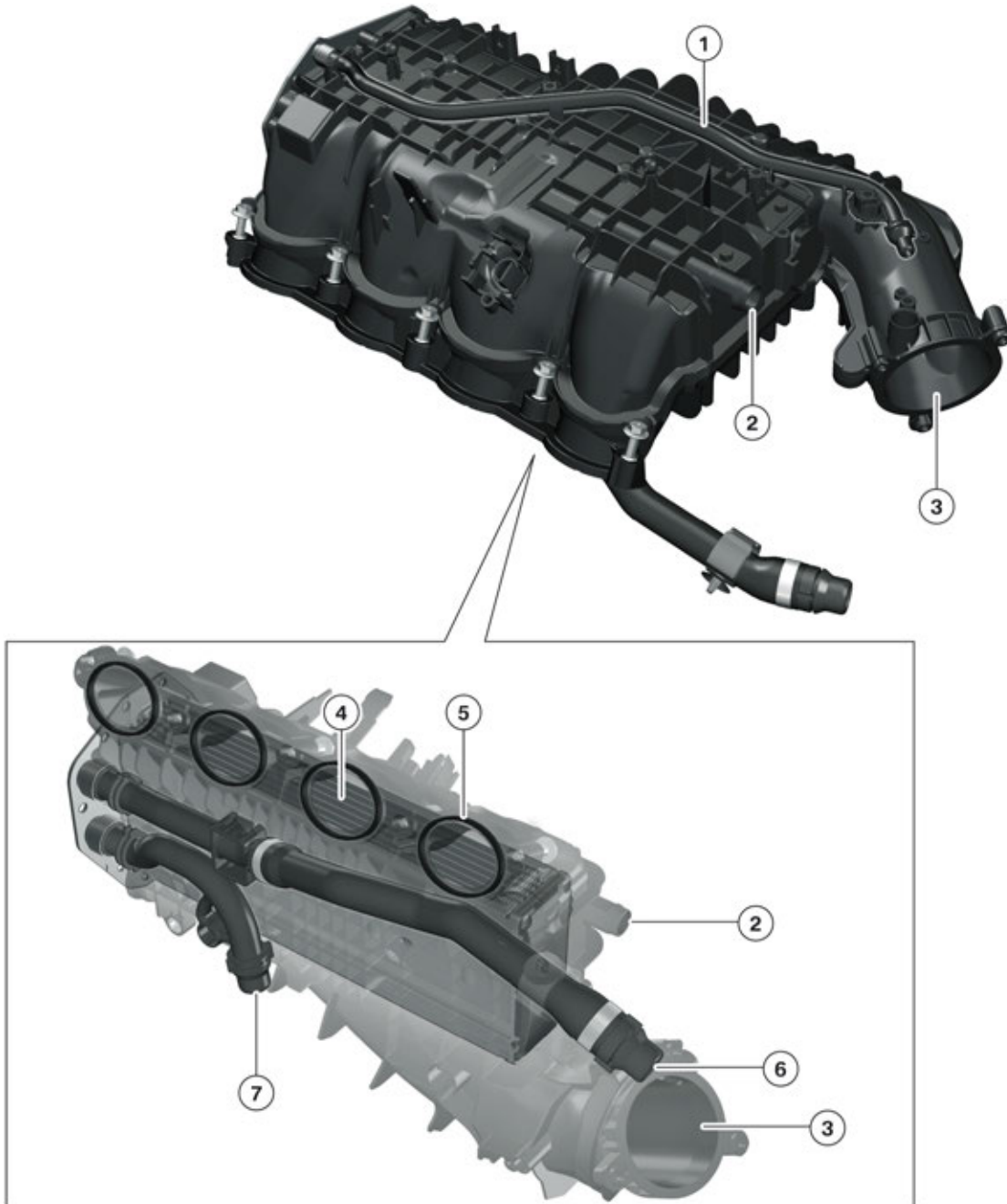
Resonator

The pulsating gas exchange noise of the reciprocating engine is damped in the air intake duct. Resonators are technical solutions for achieving vehicle-specific damping specifications with the maximum air duct cross-sections and minimum packaging space volume.

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2. Engines

2.5.2. Charge air cooling



B46 engine intake system with integrated indirect charge air cooler

TA17-0726

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2. Engines

Index	Explanation
1	Ventilation line to the expansion tank
2	Tank ventilation
3	Throttle valve fixture
4	Charge air cooler
5	Cylinder head connection
6	Coolant supply
7	Coolant return

All gasoline engines are equipped with indirect charge air cooling.

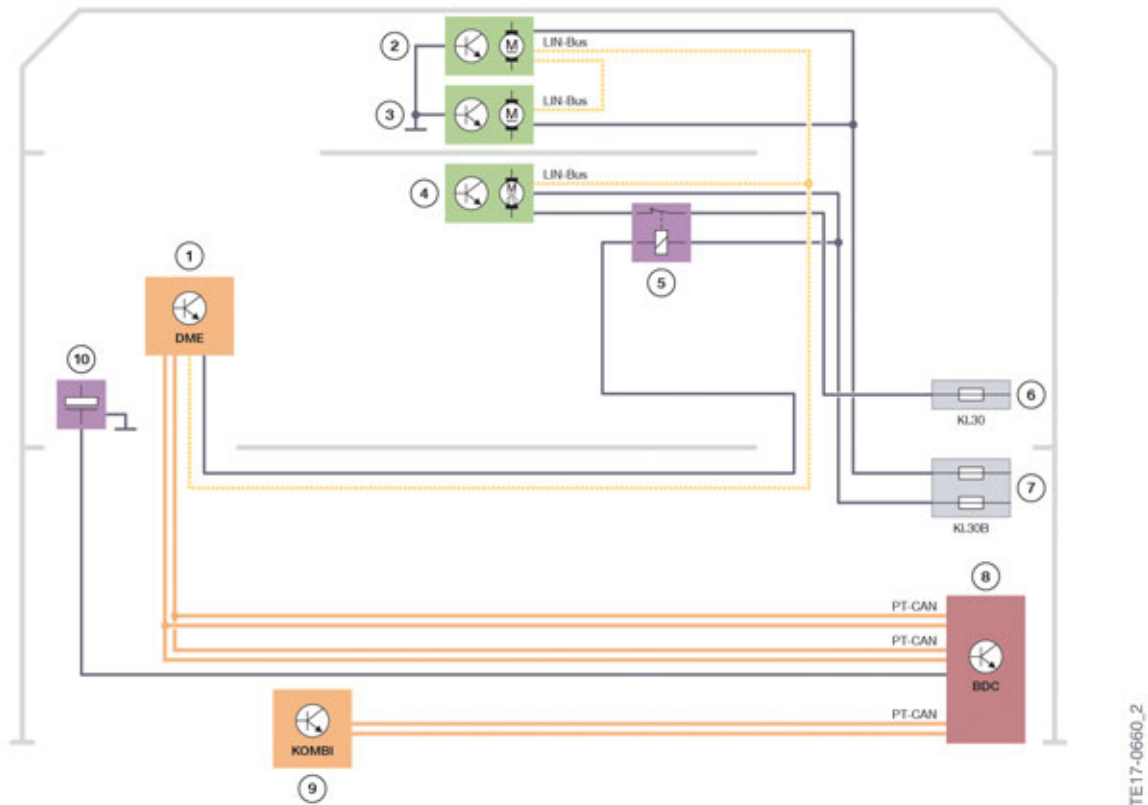
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3. Cooling

3.1. Active air flap control

It was possible to adopt the active air-flap control from the G12/G30. The cooling surfaces at the front of the vehicle can be closed by means of two separate air flaps. This reduces the drag coefficient and thus saves fuel. A further advantage is faster heating up of the engine after a cold start.

3.1.1. System wiring diagram



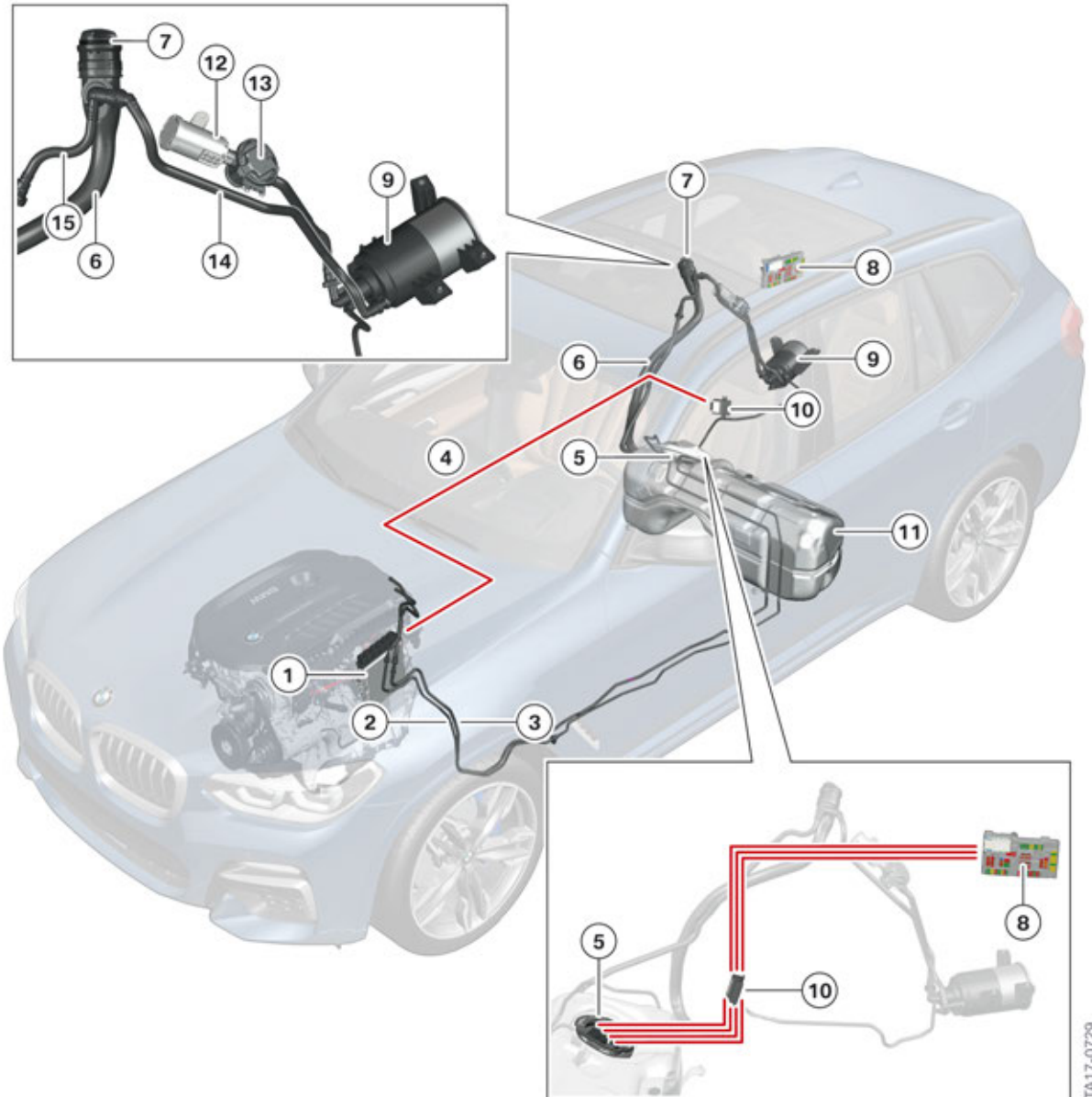
G01 System wiring diagram for air flap control

Index	Explanation
1	Engine control unit (DME)
2	Active air-flap control, top
3	Active air-flap control, bottom
4	Electric fan
5	Relay for electric fan
6	Power distribution box, engine compartment
7	Power distribution box, front right
8	Body Domain Controller (BDC)
9	KOMBI
10	Coolant level sensor

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4. Fuel Supply

4.1. Gasoline engine



G01 System overview for gasoline engine fuel supply

Index	Explanation
1	Digital Motor Electronics (DME)
2	Fuel feed (from the fuel tank)
3	Purge air line, carbon canister
4	Data line to fuel pump control module
5	Delivery unit
6	Fuel filler neck

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4. Fuel Supply

Index	Explanation
7	Fuel filler cap
8	Rear right power distribution box
9	Carbon canister
10	Fuel Pump Control (FPC)
11	Fuel tank
12	Fresh-air filter
13	Tank leak diagnosis (NVLD)
14	Ventilation line, carbon canister
15	Tank ventilation line

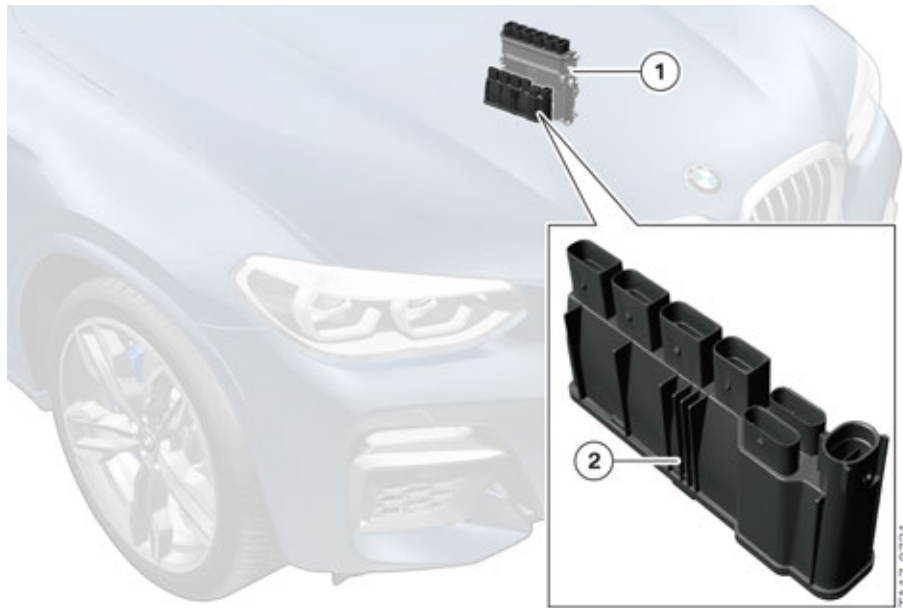
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5. Engine Electrical System

5.1. Engine control unit

The new 8th generation of Bosch engine control units already used in the G12 is used in the G01.

The integrated supply module is attached to the engine control unit. It supplies the engine control unit, sensors and actuators with the required supply voltage.



G01 Integrated supply module

Index	Explanation
1	Engine control unit (DME)
2	Integrated supply module

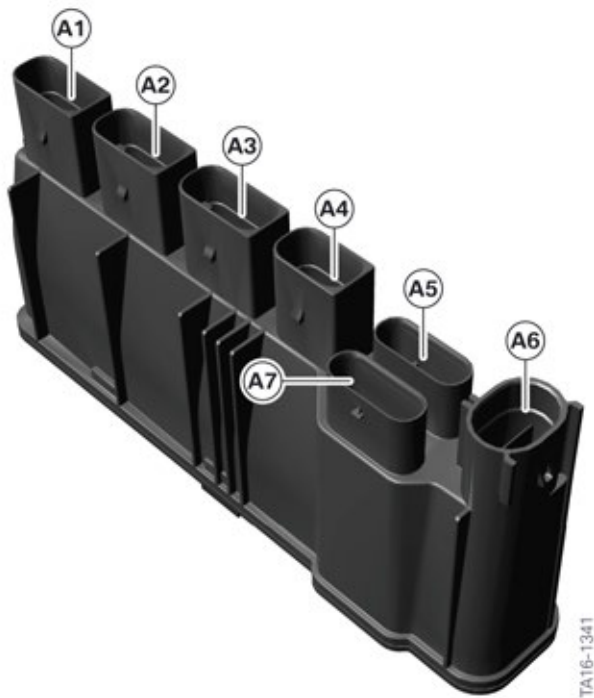
5.2. Integrated supply module

The integrated supply module supplies the engine control unit and some sensors and actuators with voltage.

Different integrated supply modules are used depending on the operating principle of the combustion engine (gasoline/diesel).

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5. Engine Electrical System



Integrated supply module in the G30

Index	Explanation
A1	Voltage supply for actuators and sensors
A2	Voltage supply for actuators and sensors
A3	Actuation of relay for integrated supply module
A4	–
A5	DME voltage supply
A6	Voltage supply for power distribution box in engine compartment
A7	–

5.3. MSA Connected 1.0

The official name for MSA Connected 1.0 is “**Intelligent automatic start-stop function**”.

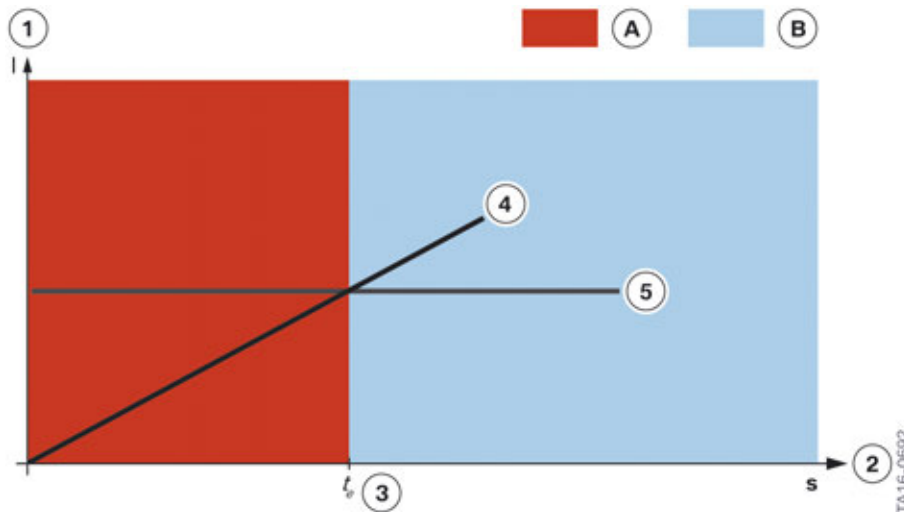
The MSA Connected 1.0 enables information from the navigation system and/or the camera- and radar-based assistance systems to be used to predict how long a stop might last. The automatic engine start-stop function responds differently depending on the length of the stop:

- **Short vehicle stop**
Example: Crossing where the driver needs to “give way to the right”
The effort required to start the engine is larger than the fuel economy improvement from stopping the engine → Prevent the engine from the stopping → Engine idling.

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5. Engine Electrical System

- **Long vehicle stop**
Example: Stop at traffic lights
The improvement to the fuel economy as a result of the engine shutdown is larger than the effort generated by the engine start → Stop the engine.



MSA Connected 1.0, stop strategy

Index	Explanation
A	Inefficient engine shutdown
B	Efficient engine shutdown
1	Fuel saving in liters
2	Time in seconds
3	Efficient time
4	Consumption benefit due to engine start-stop function
5	Effort needed for engine start

With MSA Connected 1.0, the frequency of inefficient engine start-stop operations is reduced by predicting engine shutdowns and starts according to various situations.

MSA Connected 1.0 accesses the camera- and radar-based assistance systems and navigation data.

5.3.1. Advantages

The use of MSA Connected 1.0 results in the following advantages for the automatic engine start-stop function in the areas of "efficiency" and "dynamics".

Efficiency

- Short, inefficient engine shutdowns are avoided.

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5. Engine Electrical System

Dynamic

- The drive-off response is improved by preventing the automatic engine start-stop function from starting and stopping in MSA Connected 1.0 situations.
- Drive-off reminder “Vehicle in front is driving off”.
- The number “reflex starts due to the driver changing their mind” is reduced.

5.3.2. MSA Connected 1.0 situations

The following MSA Connected 1.0 situation is available provided that the vehicle is equipped with the necessary sensors and systems described, depending on the equipment and/or country.

Situation	MSA Connected 1.0 action
	<p>Vehicle ahead drives off</p> <p>If the vehicle detects that the vehicle in front is moving, the engine is not stopped. If the vehicle detects that the vehicle in front is driving off when the engine is switched off, the engine is then started.</p>
	<p>Traffic circle/roundabout</p> <p>The engine is not stopped when the vehicle is approaching, is on or has just left a traffic circle. Exception: The vehicle in front is stationary on the approach to a traffic circle.</p>
	<p>Residential crossing</p> <p>The engine is not switched off if the vehicle is right in front of a residential crossing. Exception: The vehicle in front is stationary on the approach to a crossroads in a residential crossing.</p>
	<p>Intention to turn</p> <p>The engine is not switched off if the vehicle is at a intersection and the system detects that driver is about to turn (turn indicator switched on).</p>

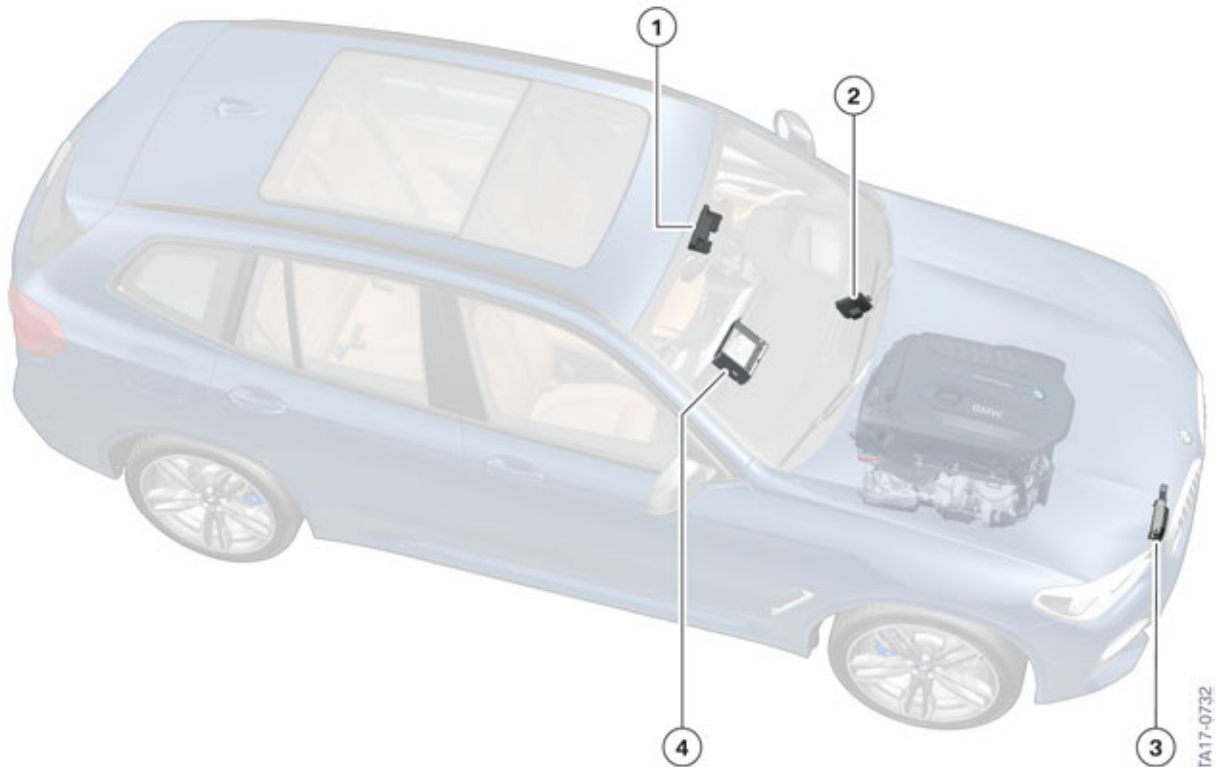
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5. Engine Electrical System

5.3.3. Sensors

The following sensors and systems are required to detect the MSA Connected 1.0 situations:

Situation	Navigation/head unit	Camera/KAFAS	Radar/ACC
Vehicle ahead drives off	Not mandatory, increases the reliability by plausibility check, e.g. crossing traffic at junctions	Mandatory, prerequisite for enabling	Not mandatory, increases accuracy
Traffic circle/roundabout	Mandatory, prerequisite for enabling	Not mandatory, increases the reliability by plausibility check, e.g. for deactivation in the case of traffic	Optional
Residential crossing	Mandatory, prerequisite for enabling	Not mandatory, increases the reliability by plausibility check, e.g. for deactivation in the case of traffic	Optional
Intention to turn	Mandatory, prerequisite for enabling	Not mandatory, increases the reliability by plausibility check, e.g. for deactivation in the case of traffic	Optional



G01 MSA Connected 1.0, system components

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5. Engine Electrical System

Index	Explanation
1	Camera-based driver support systems (KAFAS)
2	SAS optional equipment system
3	ACC sensor
4	Head unit (HU)

5.3.4. Dependent optional equipment

The following optional equipment and relevant sensors are required for the functions in MSA Connected 1.0.

Navigation:

- Navigation system Professional (OE 609)

Camera:

- Active Driving Assistant (OE 5AS)
- Driving Assistant Plus Package (OE ZDB)
- Active cruise control with Stop&Go function (OE 5DF)

Radar:

- Driving Assistant Plus (OE 5AT)
- Active cruise control with Stop&Go function (OE 5DF)

5.3.5. Notes for Service



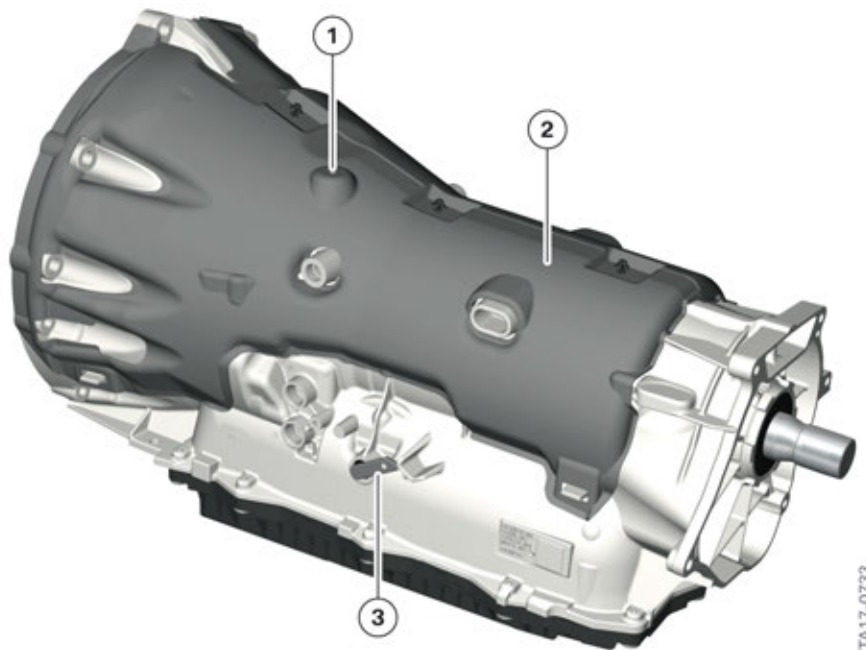
Due to the navigation maps no longer being up-to-date, there may be limitations in the MSA Connected 1.0 functions. It is therefore important to make sure that the navigation map material in the head unit is always up-to-date.



Before diagnosis for any complaint related to MSA Connected 1.0, a check must be carried out to see if the problem could have been caused by a system-related restriction. In this case, a repair measure would not be constructive.

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6. Automatic Transmission



8HPTU automatic transmission with acoustic encapsulation for all-wheel drive vehicles

Index	Explanation
1	Transmission breather
2	Acoustic capsule
3	Mechanism for emergency release

The G01 uses the modified 8HPTU automatic transmission, which is already known from the F23 (BMW 2 Series convertible), the F85/F86 (BMW X5 M, BMW X6 M), the G12 (BMW 7 Series) and the G30 (BMW 5 Series).

The special features of the automatic transmission in the G01 are described in this document.

6.1. Transmission variant

The following transmission is installed in the G01.

Model	Engine	OE 2TB Steptronic sport automatic 8HP50
X3 xDrive30i	B46B2000	GA8HP50Z
X3 M40i	B58B30M0	GA8HP50Z Sport

G01 Powertrain

6. Automatic Transmission

6.2. Special features

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

- Improved driving comfort through hot-end decoupling of the rotational imbalance of the engine by means of a centrifugal pendulum.
- Improved shifting comfort through slightly increased gear steps (2 modified planetary gear sets).
- Increased efficiency through optimum gear spread and gear stepping.
- Reduction of vehicle-specific insulation measures due to acoustic encapsulation on the transmission.
- Functional enhancements in the area of ConnectedShift.
- Enhanced customer experience due to new operating possibilities with the driving experience switch or shift paddles.

6.3. Designation

The following table provides an overview of the composition of the different transmission codes:

Position	Meaning	Index	Explanation
1	Designation	G	Transmission
2	Type of transmission	A	Automatic transmission
3	Number of gears	6 8	6 forward gears 8 forward gears

G01 Powertrain

6. Automatic Transmission

Position	Meaning	Index	Explanation
4	Type of transmission	HP	Hydraulic planetary gear train
5 + 6	Transferable torque	19 26 32 45 (General Motors Powertrain) 45 (Zahnradfabrik Friedrichshafen) 50 70 75 90 95	300 Nm 600 Nm 720 Nm 350 Nm 450 Nm 500 Nm 700 Nm 750 Nm 900Nm 950 Nm
7	Manufacturer	G J R Z H	Getrag Jatco General Motors Powertrain Zahnradfabrik Friedrichshafen In-house part

6.4. Sport automatic transmission

With the Steptronic sport transmission, the customer receives 2 shift paddles on the steering wheel and additional functions such as:

- Launch Control
- Manual activation of coasting
- Driving into the speed limiter

6.5. ConnectedShift

ConnectedShift uses the navigation data for a forward-thinking shift strategy. With the introduction of the G12, the information from the radar sensors is also used for this.

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6. Automatic Transmission

6.6. Configuration options

6.6.1. Influence of the driving experience switch

Many drive variants have a SPORT PLUS mode in order to support sporty driving with more powerful engines. The shift characteristics are adapted as follows in the SPORT PLUS mode:

- Sharper design of downshifts on braking
- Further increase of the engine speed in the direction of maximum power.

Mode	X3 xDrive30i X3 M40i
SPORT PLUS	•
SPORT	•
COMFORT	•
ECO PRO	•

6.7. Transmission emergency release

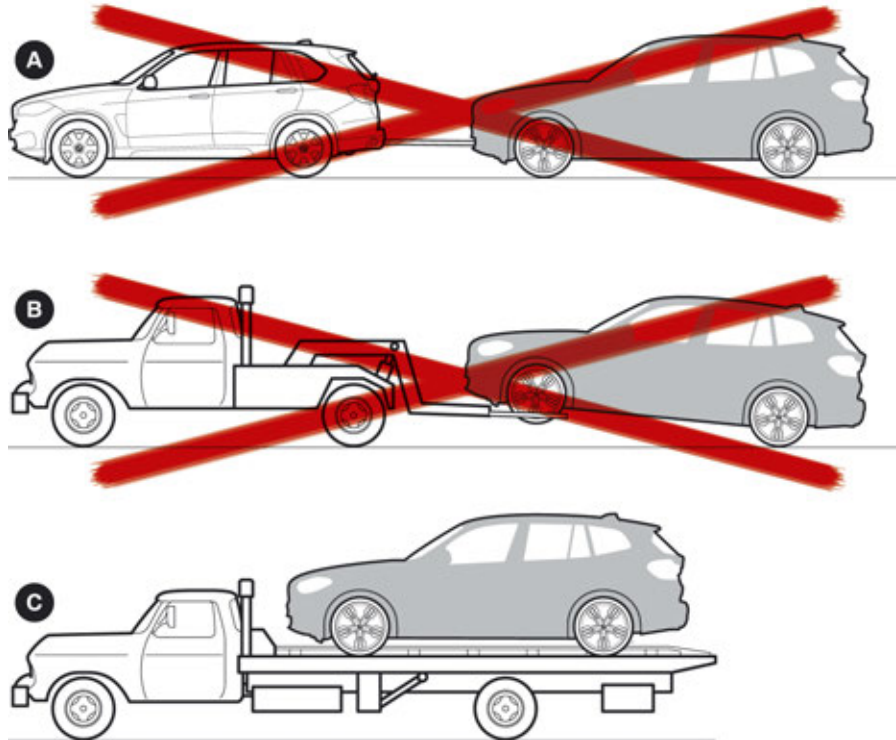
In the event of a breakdown, emergency release of the automatic transmission is possible in 2 different ways.

- Mechanical transmission emergency release.
- Electronic transmission emergency release.

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6. Automatic Transmission

6.8. Towing



G01 Towing

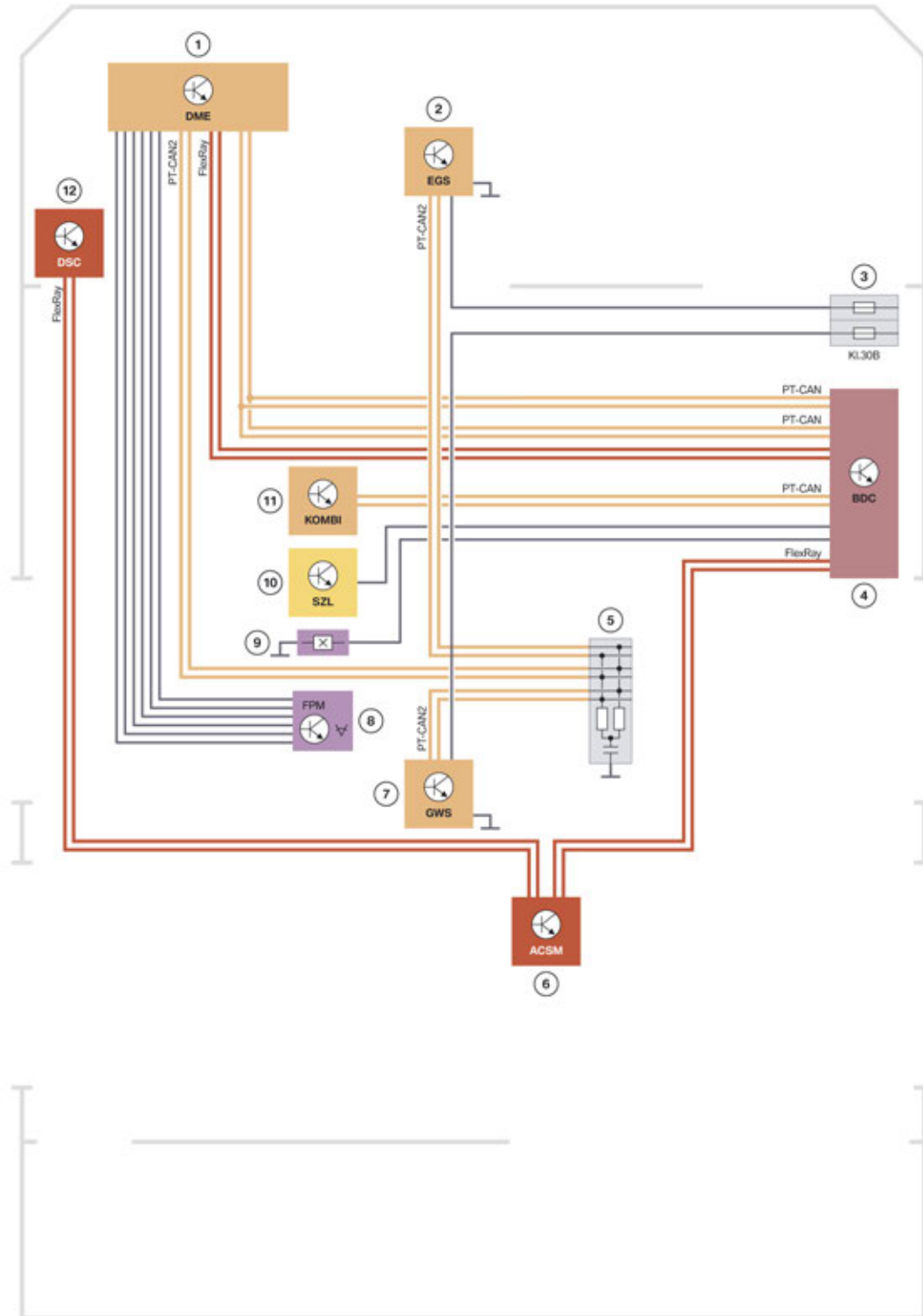
Index	Explanation
A	Towing on both vehicle axles
B	Towing on the rear vehicle axle
C	Recovery on a transport deck

Towing of the G01 with automatic transmission on the driven vehicle axle is **not** permitted. Limited time- and speed-dependent towing would not technically damage the automatic transmission, but permanent release of the parking lock cannot be guaranteed due to the changed mechanical and electronic transmission emergency release. Sudden engagement of the parking lock during a towing operation on the driven vehicle axle can lead to damage to the vehicle and to serious accidents.

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6. Automatic Transmission

6.9. System wiring diagram



TE17-0661

G01 System wiring diagram for electronic transmission control (EGS)

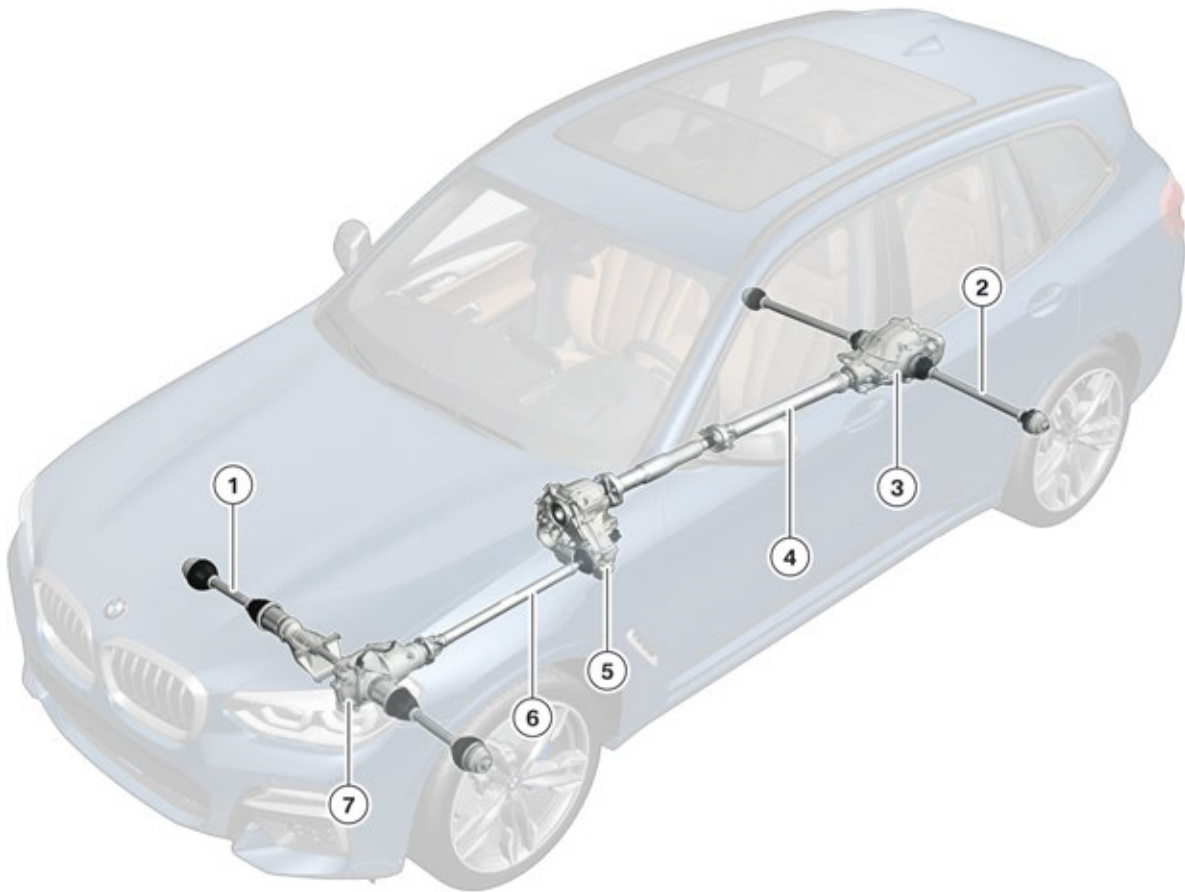
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6. Automatic Transmission

Index	Explanation
1	Digital Motor Electronics (DME)
2	Electronic transmission control (EGS)
3	Power distribution box, front right
4	Body Domain Controller (BDC)
5	CAN terminator 5
6	Advanced Crash Safety Module (ACSM)
7	Gear selector switch (GWS)
8	Accelerator pedal module
9	Brake light switch
10	Steering column switch cluster
11	Instrument cluster (KOMBI)
12	Dynamic Stability Control (DSC)

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7. Four-Wheel Drive



TA17-0735

G01 Overview of four-wheel drive

Index	Explanation
1	Output shaft, front
2	Output shaft, rear
3	Rear differential
4	Prop shaft
5	Transfer box
6	Prop shaft
7	Front axle differential

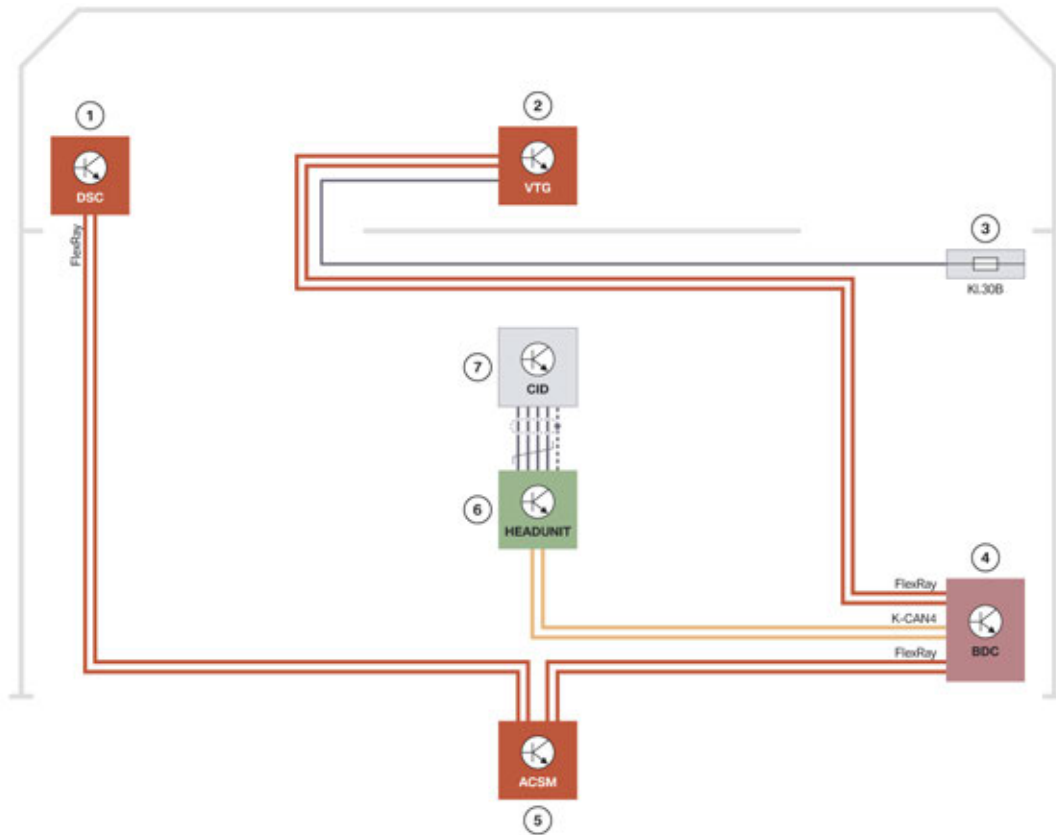
The designation of the transfer box is ATC13-1. It is a standard transfer box and was first used in the G12.

One special feature of this transfer box is the Efficiency Mode introduced in the G12, which leads to a reduction of the splash losses and thus to fuel savings. It was possible to adopt the measures introduced in G12 for the G01.

G01 Powertrain

7. Four-Wheel Drive

7.1. System wiring diagram



G01 System wiring diagram xDrive

TA15-0132

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



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