

Mercedes Benz ABC Active Body Control

Information Sheet

www.abcspecialist.nl

Active Body Control, or ABC, is the Mercedes-Benz fully-active suspension system, that in real time controls the vehicle body motions and virtually eliminates body rol and vibrations in many driving situations including cornering, accelerating, and braking.

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The ABC system in general

Mercedes Benz installed a special active suspension in their top model cars, starting with the 1st generation ABC systems in 1999 with the C215 CL-Class, W220 S-Class top models S500, S55 and S600 and R230 SL-Class. The hydraulic driven variant of this active suspension is called ABC or Active Body Control. It works very different then Airmatic suspension which is a type of air suspension. If ABC suspension is installed can easily be checked under the bonnet and examining the top of the struts. ABC struts will have black plugs for electronic signals attached to the strut as in an Airmatic system a transparent air line is connected.

ABC is designed to control body vibrations in the frequency range up to 5 Hz – the kind of vibrations typically caused by uneven road surfaces or by braking and cornering.

To control the higher-frequency wheel vibrations, passive gas-pressure shock absorbers and coil springs are used in the shock absorbers.

ABC virtually eliminates body movements when moving off from rest, when cornering and when braking. There are also safety advantages in high-speed evasive manoeuvres compared with cars with conventional suspension systems. Furthermore the ABC system is able to correct body movements for side winds when travelling with speeds above 80 km/h.

The ABC system also features a self-levelling suspension, which raises or lowers the vehicle in response to changing load (for example loading or unloading of passengers or cargo).

The ABC system features a height adjustable suspension, which lowers the vehicle up to eleven millimeters between the speeds of 60 km/h and 160 km/h for better aerodynamics, fuel consumption, and handling.

Also the driver is able to raise the suspension in 2 steps by 45 millimetres at the touch of a button, for example when travelling on poor roads which make a higher ground clearance advisable.

With the “ABC Sport” button the driver is able to adjust the suspension for different driving style preferences.

When travelling at high speed in Sport mode, ABC automatically lowers the suspension by up to another ten millimetres to reduce aerodynamic drag and lower the fuel consumption.

Components of the ABC system

The ABC system is a complex system consisting of different components. Furthermore the ABC system is closely connected to the hydraulic steering mechanism by its tandem pump. We will guide you through the different parts of the ABC system.

While the locations of the components is generally the same within a series (CL, S, SL), there tends to be variation among the models (500, 600, 55 AMG, 65 AMG, etc.) within a series in how the components are positioned in terms of brackets, orientation, and so forth.

There are two generations of the ABC system. The 1st generation is from 1999 – 2006, the 2nd generation was introduced in 2007. The main differences between the two generations are the valve blocks being improved and the pulsation dampener being relocated directly on top of the pump. The locations of other components remain essentially the same but there are variations on mounting positions, brackets, and so forth.

In the ABC system, the ABC ECU computer module reads data for the cars body movement from the sensors located throughout the vehicle every ten milliseconds, and sends electrical signals to the different components that control the action of the active suspension. Four shock level sensors, one at each wheel measure the ride level of the vehicle, 3 accelerometers measure the vertical body acceleration, two acceleration sensors measure the longitudinal and transverse body acceleration. All data can be read out and all active components can be controlled with Mercedes Benz diagnosis software called Mercedes Benz STAR SDS.

Front side of the car

The ABC system is driven by hydraulic components. First there is the ABC oil reservoir which hold the special ABC oil and also holds the steering oil for the hydraulic steering mechanism. Two lines (exit and return) leave the reservoir for the ABC system and have no pressure on them, two lines (exit and return) leave the reservoir for the steering mechanism.

The hydraulic pressure to the system is supplied by a high pressure piston ABC pump mounted on the front left side of the engine and driven by the multibelt. This pump builds a pressure of 170-180 bar. The pumps consist of two completely separated parts, the front side builds hydraulic pressure for the ABC system, the rear parts builds pressure for the steering system. For the steering system one line enters the pump and one leaves the pump under pressure. Just under the connector for the pressurized line is a steering system valve mounted inside the ABC pump.

Mounted on top of the pump is a ABC suction throttle valve that controls the oil access to the pump by opening or closing the valve. Next is an bronze colored accumulator that is connected to the line going to the ABC pressure limiting valve, which controls the maximum pressure given by the pump in the system. On the bottom of the ABC pressure limiting valve is the oil pressure sensor and on top a pulsation damper which smoothens out the pressure fluctuations of the system.

Two lines leave the pressure limiting valve, one under pressure and one return line, each running into a small distribution block that splits the line in a line going to the front of the car and to the back of the car. Such that the front and back of the car are supplied each by a pressure and return line.

On the front side of the car the pressurized line runs to the ABC distribution valve block which also holds a temperature sensor. Here two lines leave the block, one to the ABC oil cooler mounted on the radiator, and one to the front axle valve assembly block that is mounted close to the front left wheel behind the plastic dust cover.

On the front axle valve assembly block are several parts. First there is a big front valve accumulator that smoothens out fluctuations in the pressure. Then on the line from the accumulator to the valve block itself is a ABC valve block oil bleeding screw hidden behind a plastic cover. On the valve there are three more lines connected of a total of 5 lines, 2 to the two front struts and 1 return line back again to the small distribution block.

The valve itself consists of 4 solenoid driven elektromagnetic hydraulic modules that control the front struts height. 2 Modules control the ride height of the front struts in 1 of the 3 available positions of the car, controlled by the button on the dashbord of the car. 2 Modules control the height of the front struts when the car is parked.

Back side of the car

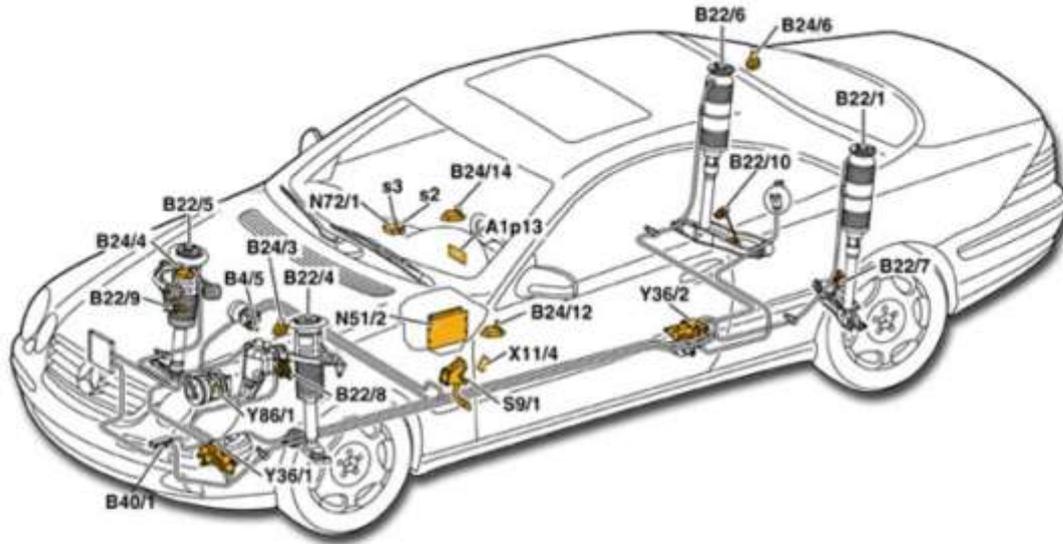
On the back side of the car the pressurized line running from the second small distribution block runs to the rear axle valve assembly that is mounted near the left rear wheel below the car.

On the rear axle valve assembly first there is a small rear valve accumulator that smoothens out fluctuations in the pressure. Then on the line from the accumulator to the valve block itself is a ABC valve block oil bleeding screw hidden behind a plastic cover. On the valve there are three more lines connected of a total of 5 lines, 2 to the two rear struts and 1 that returns the oil back to the small distribution block while first passing trough the return flow pressure resevoir / accumulator that is mounted between the rear wheels.

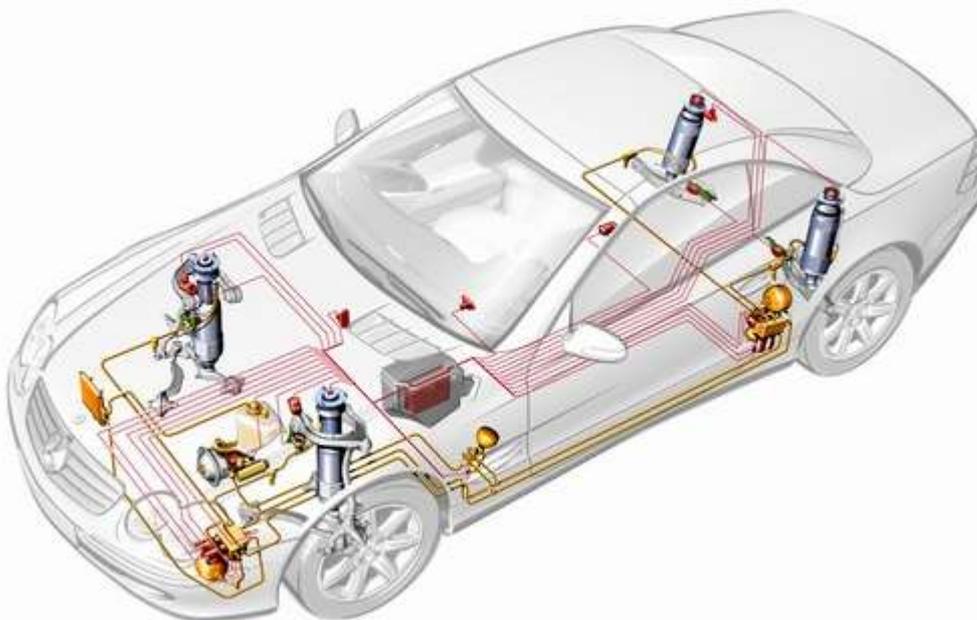
Summary of components of the ABC system

ABC Component	Function
Control Module Computer (ECU)	Controlling the system
Pump	Hydraulic pressure for the system
Suction throttle valve	Open/closes oil flow to pump
Bronze colored accumulator	Accumulator
Pulsation Damper / accumulator on pump	Smooths out the pressure fluctuations of the pump pressure (only after 2006)
Pressure Control Valve	Bleeds off any pressure above 200 bars
Oil pressure sensor	Reads system pressure and reports to control unit
Distribution block (2x)	Split line into front/back system
Temperature sensor	Reads system temperature and reports to control unit
Oil cooler	A small radiator that cools the hydraulic fluid
Front Axle Valve Block	Controls oil flow and pressure to/from front shocks when driving or parked
Rear Axle Valve Block	Controls oil flow and pressure to/from shocks when driving or parked
Front Axle valve Accumulator (big)	Stores fluid and pressure for the front shocks, assisting the pump
Rear Axle valve Accumulator (small)	Stores fluid and pressure for the front shocks, assisting the pump
Shocks	Absorbing vibrations between wheels and the chassis as well as raising/lowering the car.
Return Accumulator	Smoothing fluctuations on the return side of the system
Return Pressure Check Valve / Temperature Sensor	Maintains a minimum return side pressure of 10 bars, and reports the oil temperature to the control module
Reservoir	Stores extra fluid for raising the ride height and pressurizing the accumulators and replacing any leaked fluid.
Strut position sensors	Reports to the control module the expansion of each shock
Ride height sensors	Reports to the control module the position of each shock,
Motion sensors	Reports to the control module the motions of the car

32.50 Active body control (ABC), Location of electrical/electronic components



A1p13	Multifunction indicator	B24/6	Right rear body acceleration sensor
B4/5	ABC pressure sensor	B24/12	ABC lateral acceleration sensor
B22/1	Left rear suspension strut motion sensor	B24/14	ABC longitudinal acceleration sensor
B22/4	Left front suspension strut motion sensor	B40/1	ABC oil temperature sensor
B22/5	Right front suspension strut motion sensor	N51/2	ABC control module
B22/6	Right rear suspension strut motion sensor	N72/1s2	Level control system switch
B22/7	Left rear level sensor	N72/1s3	Comfort and sport switch
B22/8	Left front level sensor	S9/1	Stop lamp switch
B22/9	Right front level sensor	X11/4	Data link connector (DTC readout)
B22/10	Right rear level sensor	Y36/1	ABC front axle valve assembly
624/3	Left front body acceleration sensor	Y36/2	ABC rear axle valve assembly
824/4	Right front body acceleration sensor	Y86/1	Active Body Control (ABC) suction throttle valve



Disadvantages of the ABC system

The partially made of rubber and partially made of metal hydraulic lines will last about 10 years, after this time they will become porous and oil loss is to be expected. High oil loss or dirty oil leads to the destruction of the ABC components.

To renew the hydraulic lines you might have to intervene clearly in the engine compartment and space above the automatic transmission. The (CL) C215 W215 and (S) W220 models were not originally designed for ABC suspension and therefore there are numerous intersections and complications with other components of the engine compartment. Another disadvantage of the active suspension is an occurring feedback of the suspension with vibrations of the roadway (bridges) and auxiliary vehicles at low frequencies at low speeds, which are clearly noticeable in the passenger compartment.

Finding a Mercedes Benz Workshop and correct ABC issue or defect diagnosis

The ABC system is a complex system and the first step fixing an ABC issue is to obtain the correct diagnosis and finding the failing component or malfunction. Finding a workshop experienced with the ABC system and with the correct Mercedes Benz STAR diagnosis software tools is therefore recommended when diagnosing or fixing an ABC issue.

The diagnosis of a ABC issue does usually start by connecting SDS and retrieve the error codes. Finding a workshop with SDS is in most cases necessary.

Advice: diagnosing an ABC issue doesn't end by retrieving a list of error codes, but takes experienced mechanics to examine the status of sensor values, follow diagnostic routines and test components in order to find the malfunction.

Advice: It is recommended finding a workshop that is often visited by Mercedes Benz CL, S600 and SL-class drivers, that is experienced with the ABC system, and uses SDS for diagnosis. This are often smaller specialized workshops in high end vehicles. Please contact us if you would like to receive a list of recommended workshops in your region. Usually the 'repair' of cars with ABC issues visiting a random Mercedes Benz workshop start by random replacing ABC components by new ones, starting with the ABC pressure pump, the 4 shocks, etc. Often we are contacted by desperate Mercedes drivers that have spent more then \$5.000-\$10.000 on repairs without solving the ABC issue on their car.

Advice: Driving a high end car required certain investments to be made. Saving on maintenance, proper parts or a good and qualified installation for such car is not recommended and could end in more problems.

Installation of ABC components – general information

Please follow always strictly the installation procedures as described by Mercedes Benz when making any adjustments, installing or removing the product, otherwise components might be irreparably damaged. Please note the advices for correct installation which come with each ordered product of www.abcspecialist.nl.

Check the functioning of all other components of the ABC system (control valves, pressure limiting valve, pressure sensor, pulsation damper, accumulator, ABC control computer, shocks, pump, suction valve). Replacing a component while an other component is defect might result in irreversible damage.

Check the volume and condition of the ABC oil and if needed refresh all ABC oil in the ABC system. (see section ABC oil)

Install the components according to the procedure in a very clean environment, dirt on tools, lines, etc. can easily get into the ABC system. (see section of each component)

Bleed the system, possibly several times, until all the air is removed from the system. The smallest air bubble already causes problems in the ABC system. (see section air bleeding)

Follow the instructions in the Mercedes Diagnostic Equipment to calibrate and bleed the ABC system. (see section calibration, rodeo test)

Mercedes Benz STAR diagnosis software (SDS)

All data from the ECU and all active components can be controlled from Mercedes Benz diagnostic software. STAR software version C3 or C4 is used with a Multiplexer control unit to connect to the various control units on the car (like the ABC system), and retrieve error codes, examine the current values of sensors, execute diagnostic routines, calibrate sensors, view the error history logs, etc. Since the ABC system is so complex fixing an ABC issue will often requires SDS and furthermore installation of most components requires assistance of the SDS system to follow the right procedure.

Advice: Local workshops may have other diagnosis software tools, but this software doesn't have all the functions as Mercedes STAR diagnosis software has. These general software utilities mostly don't retrieve all error codes. Furthermore this software usually does not has the ability to examine sensor values, execute diagnostic routines, follow installation procedures etc. Finding a workshop with experience and SDS is highly recommended.

ABC ECU computer module N51/2



Location: near the driver footwell on the left side beneath the dashboard.

Part number: 0325455432, 0225450832, A2305404345 (before 2007) (left)

Part number: A2215450532, A2215406762 (W216 / W221 after 2007) (right)

Part number: A2309000200, 2305404345, 2305404645, 2305405545 (R230 >2007)

ABCspecialist.nl price +- €259

Installation: +- 30 min.

Function: reads the data from the following sensors;

- 3 Vertical sensors B24/3 front left, B24/4 right, B24/5 rear left
- 4 Niveausensors: B22/8 front left, B22/9 front right, B22/7 rear left, B22/10 rear right
- 4 Plungersensors (in shock): B22/4 front left, B22/5 front right, B22/1 rear left, B22/6 rear right
- Oil pressure sensor B4/5
- Oil temperature sensor B40/1
- Sensor B24/12 (in automatic gearbox tunnel footwell left)
- Sensor B24/14
- SAM Control unit driver side N10/6

Often due humidity corrosion builds on the connectors giving rise to failures. Cleaning the contact points may help.

Bad sensors or loose connections will often result in an error code with "fault in component" as description. Values of "255" from a sensor generally mean no reading or no input.

ABC interior switch N72/1

When the sport setting is activated the car responds firmer and steering is more direct.

With the ABC switch the ride height of the car can be set higher in 2 steps when the engine is running. When the engine is then turned off, the height remains constant.



Between 60km/h and 100km/h the car lowers its height automatically. Also the level of the front of the car compared to the back of the car is corrected automatically for different speeds.

ABC oil reservoir, measuring oil level, and oil flush



Location: On the left side of the engine is a black oil reservoir.

Part number: 0019892403

Function: The reservoir stores ABC fluid and power steering fluid when not in use.

ABCspecialist price: +-€100

There are 2 reservoirs, the one more to the front is the ABC oil reservoir. The small reservoir mounted more backwards is the reservoir for the steering system. Please note that they use a different oil, both run to the same pump (more information in the section about oil and the pressure pump).

The green arrow points to the dipstick location. The dipstick has two marks, for the oil level at the highest and lowest car position. After the engine is turned off, oil will bleed out of the accumulators. Therefore ABC oil measurements should take place 10min after turning off the engine.

The ABC system is a closed system and if there are no leaks there is no need to add oil to the reservoir. If the fluid level drops it indicates a leak in the ABC system or a broken accumulator.

When the reservoir overflows usually there could be two issues;

1. Dipstick marks "minimum" and "maximum" are often confused to be minimum and maximum fluid levels. It is the position for the oil level for minimum and maximum ride height. When the fluid is filled to the top mark by mistake with a running car, after shutting the engine off the system depressurizes and fluid returns to the reservoir.

2. If an accumulator membrane has blown the reservoir will overflow as well. When turning the engine off the system depressurizes and the gas inside the accumulator expands, pushing fluid into the reservoir and overflowing it. Eventually the gas gets out of the system, and fluid replaces the air in the accumulator. As a result you will see a drop in the fluid level in the reservoir.

The fact that the dipstick mark for when the car is running is lower than the one for when the car is off indicates it is normal for some fluid to flow from the ABC system back to the reservoir when the car is shut off and the system depressurizes. From physics we know fluids do not compress but gas does. Therefore the nitrogen in the accumulators will compress. The accumulators hold the fluid when the system is under pressure, and the amount of fluid returned is proportional to the amount of fluid being held there during operation. It can take 5-10 minutes for the system to depressurize, so be patient before taking measurements or beginning repairs.

Note: It is important to check the fluid levels regularly in order to check the accumulator or for any leaks in the system. Also if the fluid level gets too low, air will get into the system leading to pressure loss, warnings in the dashboard and logged error codes and damage to components of the ABC system.

Important: It is extremely important to keep contaminants out of the ABC fluid when making repairs, checking the oil level, etc. Wipe the area around the dipstick clean before checking the fluids. Any contaminants that get into the reservoir will run first through the ABC system before encountering the filter.

Important: Fluid lifetime. As time goes by, the o-rings, seals, hoses, accumulator membranes, struts, and other rubber components shed microscopic debris into the fluid. This debris shortens the life of the components in the system, especially the valve blocks, shocks and pumps. Microscopic metal shavings will also accumulate in the fluid, acting like sandpaper for vital components of the ABC system. There exist aftermarket filters with magnets, intended to pick up small debris in the fluid, however most debris comes from aluminium or plastic parts and won't be sensitive to the magnet. However some debris will be picked up by a magnetic filter so it might still be an improvement. Furthermore there exist aftermarket filters of higher quality than the original Mercedes Benz filters, and it makes sense these will stop the debris better. You can check the condition of the fluid by bleeding of fluid on the bleeding valves, or checking the condition of the ABC filter.

Important: We recommend to change or better flush the ABC fluid every 20.000-30.000 km. Furthermore if the mileage at which the fluid was refreshed last time is unknown, we advise to change the fluid. Some owners have been able to extend the lifetime of ABC components up to more than 100.000 km by changing the fluid on regular basis.

The ABC oil reservoir has a small well at the lower side, where debris builds up. We advice to pick up debris from this area before making a oil change.

ABC Oil Filter 2A

Part number: A0031846101 for 1st and 2nd generation ABC systems.

Function: filter the oil. Change every 2 year or 20.000km

www.abcspecialist.nl price +€45

On later second generation ABC systems as in the C216, W221 and R230 >2007 models no filter system is present. However WIS might ask you to check the filter, and in documentation from Mercedes Benz the filter is still mentioned, it is not present in the car.



ABC oil, ABC oil, Power steering oil



Hydraulic Steering Oil ATF A0009898803-10 code 236.3

Hydraulic Pentosin Oil: A0019892403-10 code 345.0

Hydraulic Oil: A0019892003-12 code 344.0

Change every 2 year or 20.000km.

www.abcspecialist.nl €19,90 / Liter

Topping off fluid after replacing a part requires about 4 liters for the W215/W220, R230 about 3.5 liters. Replacing/flushing all oil requires about 12 liters, and 1 liter extra as spare.

ABC oil should always be green or red. Dirty ABC oil with a black color, and/or containing debris and/or metal is burnt and/or contaminated and should be replaced immediately to prevent further damage to components of the ABC system.

Important: When ABC oil level is too low, the engine should be shut off directly. Components of the ABC system will run dry without oil and damage. Metal wear will damage other ABC components.

Advice: Always try to avoid the cars standing unused for a long time (longer than 2-3 weeks, especially in cold weather), as ABC oil attracts water. Water in the oil will form a condensate that starts sitting in certain parts of the ABC system, and oxidize the metal components.

Advice: all pentosin based hydraulic fluids have a max lifespan of about 6-8 years. Furthermore they are hydrostatic and the fluid will get contaminated over time. Since most users don't change the ABC oil, and the ABC system is present in cars since 1999, it's highly recommended to check and/or replace the ABC oil when it's old or in bad condition.

ABC oil flush

Dirty ABC oil contaminations can get stuck in several components of the ABC system after years. Often 1 flush of the ABC system is not enough to get all the debris out of the system. Using a rodeo test for a flush puts the struts through their travel ranges and components under loads that are not typically seen in normal driving. Sometimes a component may break down during the test or small pieces of metal may break loose and end up in the abc oil. However one could argue a faulty component was about to fail anyway. When after a rodeo test more debris ends up in the oil, this will damage the various components of the ABC system. Some flushes are necessary to get all the dirty oil and debris out of the system. In some cases where the oil of the system has not been renewed for a long period, replacing the various parts of the ABC system, shocks, pump, valves, is necessary.

Oil flush: open the return line to the reservoir to catch dirty oil, while a second person fills the reservoir with new oil, while the engine is running. Please be careful always enough oil is in the system, else components may be damaged. This method is not recommended while if one fails to provide new oil quickly enough in the system, it will run dry.

Advice oil change: With the engine off, and car in lowest position, remove all oil from the reservoir, you can use pressurized air or a tube to get the last bits out. Fill the reservoir with oil as prescribed. Start the engine, drive a bit, let the car go up and down a few times. Repeat procedure several times.

Advice oil change and filter: when the oil is very contaminated or black, first change the oil change the filter after the short drive or performing a rodeo test.

Oil flush + rodeo: performing the rodeo test while opening the return line from the filter (connect to a line to catch up the old oil, about 12-15 Liter) while topping of new oil. Please be careful always enough oil is in the system else components may be damaged. This procedure is not recommended.

ABC pressure pump, steering pump, hydraulic tandem pump, radial piston pump 1



Location: front left side of the engine

Part numbers:

A0024666001, A003466xxxx (model year 1999-2006) 1st generation ABC system

A004466xxxx, A005466xxxx (model year 2006-2012) 2nd generation ABC system

New price: €1400 - €1700.

www.abcspecialist.nl €559

Installation: +- 4 - 6 hours

Function: builds the pressure of the ABC system and steering system

General information: The pressure for the ABC system and for the power steering are provided by one unit, inside the ABC pump 2 pump systems are integrated into one unit, referred to as a Tandem Pump. Although the two pumps share the same housing, they are separate components and it is possible for the ABC part of the pump to fail but the power steering portion of the pump to be completely functional and vice versa. However if one part fails, the complete pump has to be replaced since it is one unit.

The average lifetime of a new pump is around 50.000km – 75.000km. The wear of the pump depends on the driving style, quality of the ABC oil and purity of the ABC system, operation temperatures etc. etc. Installation of an ABC pumps takes at least 3 hours for experienced mechanics, but can take a day on models with little working space like SL600, S600 etc. Workshops usually charge for replacement around € 600/700 + oil.

A complete pump is always sold without the black pulley wheel (ABCspecialist sells the pulley separately for spare parts). The pulley is attached with three Torx screws and can easily be transferred from the current pump. There are several pulleys in circulation (cone shaped, right, flange), but it is mainly important to control the correct part number of the pump.

Common failures:

The pump may fail due to;

1. The components of the pump are starting to wear and the pump cannot maintain steady pressure. The problems get worse with time, resulting in more frequent error messages on the dashboard.
2. One or more of the internal components of the pump are completely worn or broken and the pump cannot generate any pressure.
3. The pump has a leakage and oil leaks out of the pump.
4. The pump makes noise due to bad accumulator(s) or broken metal parts inside.

Leakage of the pump usually results in leaking ABC fluid on the front left side of the car on the spot where the car is parked. Sometimes oil lines can wear and become porous, and start leaking without any visible damage. It is often difficult to diagnose if the oil leakage comes from a leaking oil line of the pressure pump.

Complete failure of the pump is straightforward to diagnose. The ABC "visit workshop" or "drive carefully" message will appear shortly after the car is started, and remain displayed. The car will not raise on command, SDS error codes will indicate inadequate or no pressure.

If the pump is weak, you should also get ABC "Drive Carefully" and "Visit Workshop" messages, but they will be intermittent or temporarily. In many cases you can restart the car and the system will pressurize successfully, error message will clear and the car may function normally for a while. Pressure related error codes might be logged.

In some cases the ABC system operates without errors when the car is cold, but error messages start appearing after the engine has warmed up or vice versa. Temperature of the pump and the oil does seem to be a factor.

In some cases a grinding sound can be heard when the pump is worn. First it is difficult to diagnose if any noise comes from the pump. In some cases the pulley is not mounted straight and starts to wear the belt, furthermore the pulley of the airconditioning pump and radiator fan can make similar noise. A pump that makes noise at idle but gets quiet under load (pressing the ride height button) is also a sign of a worn pump.

The best way to know for sure if the pump is bad is to monitor the pressure while doing a rodeo test. The rodeo will stress the system, and even a good pump will see about a 1/3 pressure drop at times (from 180 bar to around 100 bar).

Pumps in which the small springs are broken, usually give a good pressure, but take longer time to move the car from lowest to highest position. This can only be found by using SDS in comparison with a car with a good working pump.

Note: In some cases when a sound can be heard from the pump, usually on 2nd generation ABC systems, the accumulator is worn. Installing a new accumulator fixes the issue

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Note: Low pressure codes do not necessarily mean the pump is worn. Accumulators can be worn leading to intermittent low pressures (when hitting bumps). The suction restrictor valve could be malfunctioning. The pressure limiting valve could be malfunctioning. The pressure sensor itself could be malfunctioning.

Note: 0-1-2 bar pressure readout usually means either the suction valve on the pump is closed, or an air bubble is trapped in the line, such that no oil is flowing towards the pump, Another possibility is an electronic defect, like the pressure sensor. Even a very worn pump will still build a pressure of around 10 bars.

Installation:

Make sure the battery is disconnected, the car is in lowest position and the car is lifted. Remove the left air manifold and if needed the ABC oil reservoir. Mercedes Benz advises to remove the radiator fan casing but it isn't needed. Remove multi belt and pulley wheel.

Fill the pump with ABC oil and turn the pulley wheel slowly. Fill the pump further such that all 7 chambers inside the pump are filled with oil. Using this recommended method fewer air will get into the ABC system, which is important as air is difficult to remove out of the system with the bleeding procedure. Installation of the pump is the reverse of installation.

Important: the ABC pump uses ABC oil as lubricant for its moving components. When insufficient ABC oil flow is provided to the ABC pump, it will run dry and the pump will be damaged.

Important: Air in the ABC system often gives rise to problems as air bubbles get trapped in components like the chambers of the pump, oil lines, shocks, etc. Air bubbles will stop the flow of the ABC oil and/or insufficient ABC oil flow will let ABC components run dry and be damaged.

Important: To provide the pump with oil at first start, it is needed to put +- 1 bar air pressure on the ABC reservoir. This is needed as the oil line running from the ABC reservoir to the pump is normally not under pressure and air bubbles can prevent the oil to start flowing. The opening of the ABC dipstick reservoir can be used a normal air pressure hose will fit the opening when pressed firmly.

Important: Don't exceed the pressure of +-1 bar, as the pump is not build to withstand pressure from the opposite side, gaskets inside the pump can be damaged or blown.

Advice: One can open carefully the pressure line connecting from the pump to the pressure control valve, on the side of the pump or better on the side of the valve, a few turns and wait until all air has come out. After the connection has been tight again, air should no longer be present in the oil line.

Important: Open suction control valve Y86/1 or sometimes coded Y86/2 with SDS to make sure the oil can flow freely to the pump! Be careful applying 12V directly to the valve as this voltage is too high and can damage the valve. Without voltage the suction

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valve is closed, and if the control valve is closed when starting the engine, the pump will run dry immediately and will be damaged!

Note: Connect SDS to the car, start the engine and check pressure sensor values. The engine should run in lowest position first several minutes with sufficient oil flow, and be bled, before trying height levels 1 or 2.

Important: after installation of the pump, air needs to be bled from the system using the bleeding screws and SDS. Please check the section “air bleeding”.

If removing of the air in the system fails, another option for pre 2007 models is to remove the pulsation dampener to eliminate any flow resistance, then start the car and wait for fluid to stream out the opening. Then stop the engine and replace the dampener. On 2007+ models with the updated ABC design, the pulsation dampener is attached to the pump instead. Replacing is a little more difficult than on older models. The MB workshop instructions say to remove the pump first, but other owners have reported that loosening the bolts that attach the pump to the engine will create enough clearance to get the dampener off.

Power steering unit

On the back side of the pump is the steering unit that provides pressure for the steering system. Inside the connector for the pressurized line leaving the backside of the pump is a valve. This valve provides a steady pressure for the steering system independent of the rpm of the engine and limits the pressure at 120 bars. When turning the steering wheels fully left or right, the valve opens and the pump can be heard (this is normal).

Important: after installation of the pump air needs to be bled from the steering system too. Mercedes Benz recommends to turn the steering wheel alternating fully left and right and keep it in its maximum position for a few seconds, repeating for +- 30 times. Also good results were reported with clients that used brake fluid air bleeding pumps like mityvac. Sometimes it is needed to open the valve that is mounted right behind the connection for the steering oil line, manually, in order for it to start working again.

ABC saugdrosselventil Y86/1, suction restrictor or throttle valve



Location: On the ABC pump

Part number: TM4390 (<2007), LH2112615 (>2007)

Function: controlling the oil flow to the ABC pump

New price: not sold separately

www.abcspecialist.nl price: +- €99

The valve is mounted on the pump with 2 small torx bolts and controls the oil flow to the pump. The valve is closed when no voltage is applied. When voltage is applied (~5V) it is opened and an average 2L/min oil passes the valve.

The valve can be controlled by finding part no Y86/1 in Group 46 Steering 70.

The valve can be tested by SDS, resistance should be 4 – 5 Ohm. When fully opened current should be 1000mA at 4,4 V.

There is an inverse relationship between the voltage from the pressure sensor and the voltage supplied to the pump suction valve. When the voltage from the pressure sensor is low (the system needs more pressure), the voltage to the suction valve will be high (opening up the valve).

ABC accumulator / pulsation damper on ABC pump (models 2006+).

On top of ABC pumps starting with part number A0044 or A0054 is a black ABC accumulator mounted. See section accumulators. Part no. A000660010 A0004660310 A0004660400 A000466040080.



For changing the dampener the workshop instructions say to remove the pump first, but other owners have reported that loosening the bolts that attach the pump to the engine will create enough clearance to get the dampener off.

ABC expansion line with dampfer / valve

This expansion line runs from pump to the distribution block. Part numbers; A2203204372, A2303200853. After years the line can become poreous and start to leak. The exact point where it is leaking is sometimes hardly visible.



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ABC oil cooler 9

Location: On the front radiator

Part number: A2155000000

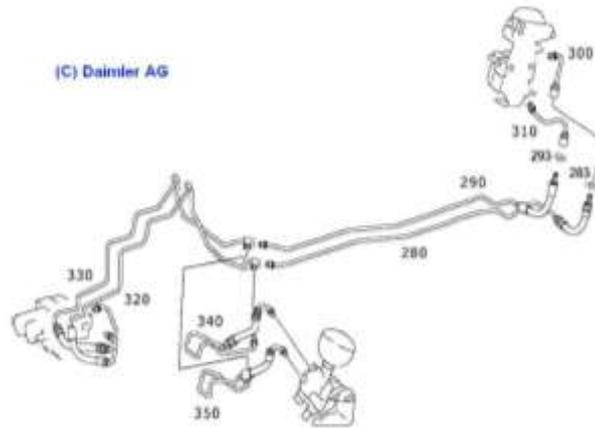
Fuction: cooling the ABC oil

www.abcspecialist.nl price: +- €99



A small cooler is located near the front radiator. It can only be changed when the lines are fully bled. On the cooler two lines run containing the oil from the steering mechanism.

Pressure control valve (pressure limiting valve) 52 52B



For the pre-facelift models, 1st generation ABC systems, there exist 2 models easily recognizable by the color of the lower pressure sensor;

Part number: A2203200558 / A2203270131 with black sensor A0125429217

Part number: A2203200858 / A2203270231 with grey sensor A0035422018

Function: The maximum pressure valve limits the pressure to about 200 bars. On the valve the pulsation damper and pressure sensor are bolted (see below). The 2 models have different sensors with different treat, the sensors can't be interchanged. The accumulator and main module are equal however.

Position: W220/C215 right passenger side below the lower suspension arm

Position: R230 left front, behind the engine mounted against the chassis

2nd Generation ABC systems: This system has NO pressure control valve. The pressure limiting valves are built in the front valve block unit. The pressure sensors are built in the front and rear valve block unit. The accumulator is installed directly on the ABC pump.

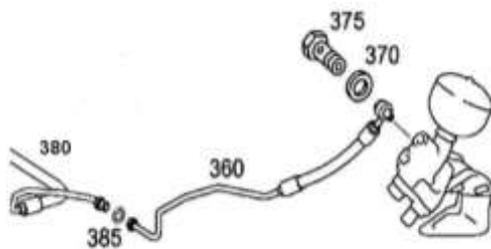
www.abcspecialist.nl price: €359 complete with sensor, accumulator and valve

Possible errors on the pressure limiting valve;

The pressure limiting valve could be opening at too high a pressure. There aren't any error codes for excess pressure, so the control module will not notice this. The control module will keep regulating pressure by controlling the intake valve (suction restrictor) to the pump, so the system will probably work fine, except for spikes in pressure at times which would add stress to the ABC components.

The pressure limiting valve could open at too low pressure. In this case the control module will sense the need for more pressure and open the suction valve on the pump, while the pressure limiting valve will constantly route all extra fluid back to the reservoir in an endless loop. If the pressure that this is occurring at is below the acceptable pressure to operate the ABC system, the control module will shutdown the ABC system and display a warning on the dash. If this endless loop is occurring at a pressure above the minimum but below the ideal, then the system will operate normally but the pump will be working extra hard. I'm guessing the control module would not notice this situation. It won't be able to tell the difference between a weak pump and a pressure limiting valve letting off pressure too soon. But a constant 5V at the suction valve would indicate the pump is working full throttle all the time.

On the pressure line or expansion line connected from the distribution block to the limiting valve (A2303208153) a special bolt is used, that contains a valve. This valve allows the oil flow to be in 1 direction only (part no. 375).



(C) Daimler AG

ABC Oil Pressure sensor (B4/5)

Partnumber: A0035422018, A000905090, A009050901

Function: read the oil pressure

Location: beneath the maximum pressure valve

www.abcspecialist.nl price: +- €159

Faceliftms 2nd generation ABC systems: The facelift ABC system has the pressure sensors are built in the front and rear valve block unit.

Typical error of the sensors: hydraulic pressure too low or Abc suspension error.

A read out pressure that is too low, for example 0-2 bar, could indicate an error in the sensor (or a malfunction in the pump, closed suction valve, etc.). A read out pressure that is way too low could let the control module think the system is below normal operating pressure and will shutdown the ABC system giving dash warnings and error codes. It could give similar issues like a pump failure. When the measured is a bit too low, it could lead to intermittent "drive carefully" messages and occasional ABC system shutdowns.

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A read out pressure of 250 or 255 bar could indicate there was some electronic disconnection. When the read out pressure that is too high the system will think it can't provide the necessary pressure and will give "too low" error messages. The car will still rise but the feel be boucy and handling poor.

Advice: Check wiring and/or use SDS to test for good connection. Check connections for corrosion.

Advice: Sometimes the o-ring that provides the seal for the pressure sensor fails, causing a fluid leak. These O-rings are not sold separately at Mercedes Benz. Don't let the workshop convince you to buy a new pressure valve, but try to find an aftermarket O-ring or contact us for possibilities.

Voltages should be in the range of 0,5V at 0 bars to 4,5V at maximum pressure.

Pulsation dampener on maximum pressure valve (52A)



Part number: A2203270215

Location: on top of the pressure control valve

Facelift 2nd generation ABC system: the pulsation dampener is mounted on top of the ABC pump for facelift models (see section ABC facelift pump).

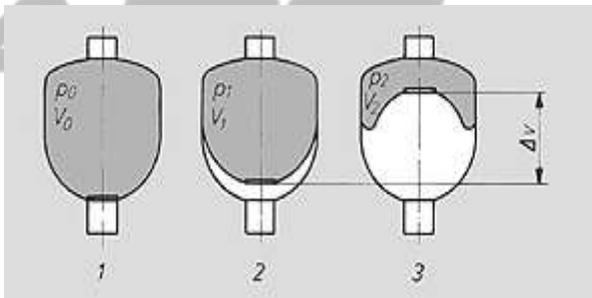
www.abcspecialist.nl price: €159

Typical errors for a defekt pulsation damper are a non constant abc oil pressure or vibration in the fluid from the pump (humming noise)

Function: smoothen peaks in oil pressure coming from the pump. The pulsation dampener fails when the rubber membrane inside breaks down, and the dampening ability is lost. You will hear a humming or whining sound below 2000rpm caused by the fluid vibration. The ABC system will function normally though, although the vibrations will stress the system. Typically there will be no error codes or warning messages, just clients tell they hear an annoying hum or whine, most noticeable with the top up and driving at slow speed around parking lots.

Advice: If the line running from the valve has less vibrations then the line to it, then the pulsation damper is probably still fine.

ABC Accumulators 4, 14, 52A, 53



1st generation ABC systems;

Part numbers for ABC systems 1999-2006 generation 1 (C215/W215/R230/W220):

Accumulator (big) on front ABC valve block (4); A2203270115

Accumulator return side (small) on rear ABC valve block (14); A2203200415

Accumulator (big) near rear ABC valve block (53); A2203270115

Accumulator / pulsation dampener damper (52A) on pressure limiting valve;
A2203270215 (see section Pulsation dampener)

2nd generation ABC systems;

A2213270215 (mounted on front valve block)

A2213280015 (mounted on rear valve block)

Pulsation dampener mounted on the ABC Pump on 2007+ models W216/W221/R230;
Part no. A0004660310 or A0004660400 or A2213270215. (see section ABC Pump)

www.abcspecialist.nl price: €99 - 199

Function: The accumulator provides the ABC valve block with oil when the pressure is lower than a certain high pressure. When the oil returns it takes oil and smoothens out pressure peaks.

The accumulators are black spheres that contain nitrogen gas (air) trapped behind a rubber membrane. Hydraulic fluid is allowed to travel in and out of the sphere based on the pressure differential between the rest of the system and the air on the other side of the membrane. The compressed air in the accumulator pushes back against the fluid and can either absorb pressure or supply pressure. From physics we know that fluids do not compress. Only the air in the accumulators will compress. What happens is that the accumulators hold fluid when the system is under pressure, and the amount of fluid returned is proportional to the amount of fluid being held there during operation. The

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fact that the dipstick mark for when the car is running is lower than the one for when the car is off indicates it is normal for some fluid to flow from the ABC system back to the reservoir when the car is shut off and the system depressurizes. It can take 5-10 minutes for the system to depressurize, so be patient before taking measurements or beginning repairs.

How much accumulators? When you ask shop how many accumulators the system has, you often get different answers depending on whether the return accumulator and pulsation dampener are counted in (4pc) or not (3pc). 2nd generation ABC systems have 1 accumulator less (return accumulator)

1st generation systems;

First there are two large accumulators (4 and 53), part number 220 327 01 15, are connected to each of the two valve blocks. They provide the pressure necessary to add fluid to the struts when the valves open. The pump function is just to keep these two accumulators filled. These two accumulators are the most critical ones that will cause problems when they fail.

If an large accumulator fails, then there will be momentary drops in system pressure. It will be most noticeable when the car hits a bump or drop in the road, which requires fluid to be added quickly to the struts to compensate. The control module is monitoring system pressure and when it sees the pressure drop, it puts the "Drive Carefully" warning on the dash. When the pump catches up moments later the message goes away. You may also get frequent "Too Low" warnings, since the system can't fill the struts fast enough to meet demand.

The ABC system can run fine with only one main accumulator working. If you look closely at the hydraulic diagram, you'll see there is a clear path for fluid to flow from the rear accumulator to the front valve block, and vice-versa. The two accumulators can assist each other. So if "Drive Carefully" messages only appear during extremely large bumps or drops in the pavement, then it is likely you have just one blown accumulator. If the problem has reached the point that you are getting drive carefully messages even on modest bumps, then it is likely both main accumulators have failed.

The third accumulator (14), part number 2203200415, is often referred to as the "center" or "return" side accumulator. It is smaller than the other two and it's job is to smooth out the spikes in pressure that result when fluid is being let out of the struts. These accumulators are often overlooked since many techs do not understand their true function in the system. They are much more than just fluid repositories.

When the third accumulator fails the shocks are responding harsh to bumps in the road the red warning might appear in the console when the pressure reaches over 190 bars. Error codes C1525-016 (level calibration) could show up.

The pulsation dampener (52A), part number 220 327 02 15, is an accumulator as well. The design is the same. Its size and position in the system has it serving a different purpose though. It is to even out the vibrations in the fluid from the pump. When it fails you get a hum or whine noticeable below 2000 rpm.

Both the dampener and return accumulator are important in that they smooth out the system pressure. In good condition they will reduce stress on the system.

Diagnosis:

When the accumulators are not working properly, the oil level remains constant when the engine is started (it should be lower). Typically error codes C1525-16 show up.

There are two marks on the dipstick. The lower one is when the engine is running, the upper one for when the system is off and fully depressurized. If your fluid levels are set correctly for when the car is shut off (the higher mark), and then you start the car and don't see the fluid level drop to at least the lower mark, then there is likely a blown accumulator(s). Each of the two main accumulators account for about 1/3 of the dipstick difference. The pulsation dampener and return accumulator are smaller and make up the last 1/3.

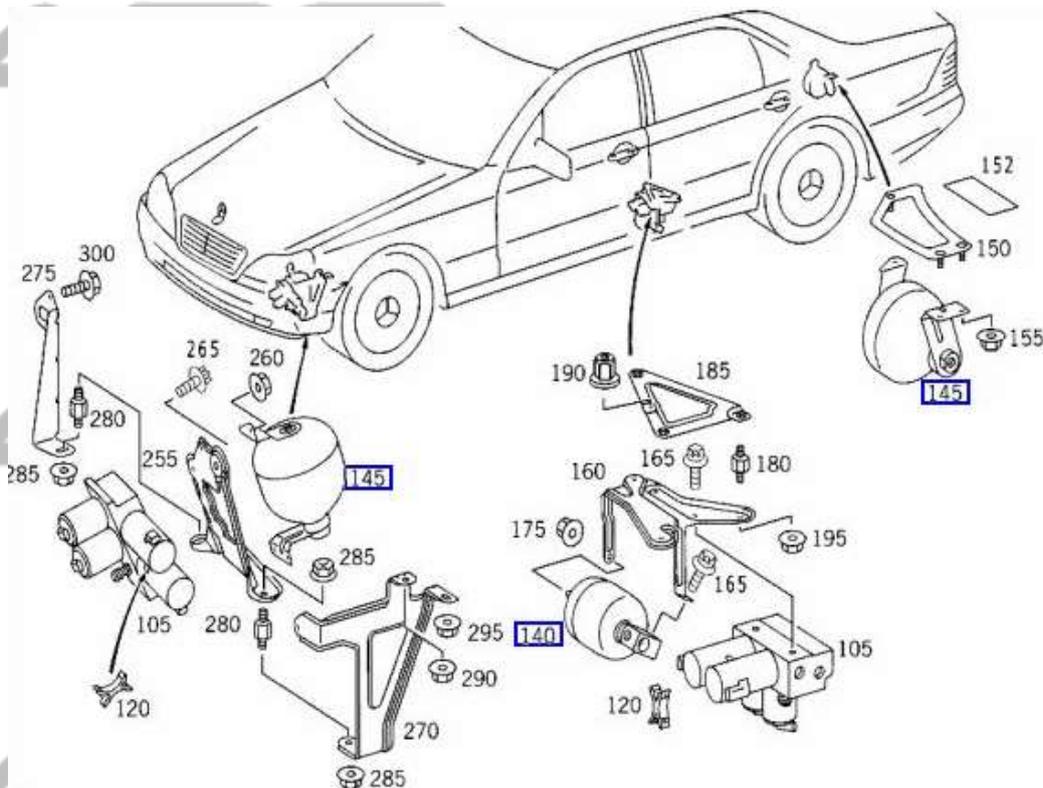
Advice: It can take 5-10 minutes for the system to depressurize, so be patient before taking measurements or beginning repairs.

Removal:

The accumulators can be bolted off quite easily.

On 2007+ models with the updated ABC design, one of the pulsation dampener / accumulators is attached to the pump instead. Replacing is a little more difficult than on older models. The MB workshop instructions say to remove the pump first, but other owners have reported that loosening the bolts that attach the pump to the engine will create enough clearance to get the dampener off.

Advice: ABC oil is sensitive for nitrogen gas. We advise to replace the oil after exposure to nitrogen gas, when a accumulator was blown.



ABC distribution valve block

Part number: A2203200251

www.abcspecialist.nl price: +-€100

The distribution valve is located in the front end of the car, and joins the returning oil lines from the front and rear valve blocks and the line to the oil cooler. It contains a temperature sensor (B40/1) and a pressure valve that limits the returning pressure with running engine to 10 bar.



ABC temperature sensor B40/1

Location: on the front distribution valve, which is located close to the front valve.

Part number: A0051532328

Function: measure the oil temperature

www.abcspecialist.nl price: on demand

Error codes about oil temperature usually mean either the sensor or the cooler is non functional. Often codes C1526-32 or C1147 "error in components B40/1 (Oiltemperature) arise.

Resistance should be in the range of 3 kOhm at 20 degrees to 0,3 kOhms at 100 degrees celcius.

ABC Shocks / struts

Part numbers: There are a lot of following up part numbers for each shock. Please check the information on our website for a complete overview of the part numbers.

New price: €1400 - €1700

www.abcspecialist.nl price: €699 - €909

Spare parts

ABCspecialist sells spare parts for ABC shocks. Please note; for this spare parts no installation manuals exist. We advise only workshops with trained mechanics to install this product under their responsibility with care else damage may occur.

Separate springs or parts
Dust cover / rubber sleeve
Ball joints
Domlager / top mount rubber bladder
Plunger Sensor / Plungerwegsensor

Connections / oil line connector

5 different connections/lines exist for the C215/W215 front shocks and 2 different models for C216/W221. ABCspecialist sells all oil line models.



Left / Right side: All shocks are different for the left or right side.

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Function: The ABC strut contains a spring and a shock absorber, just as standard struts do. As in typical struts, the spring does the work of supporting the vehicle's weight and absorbing impacts from bumps in the road, and the shock absorber keeps the spring from oscillating or "bouncing".

The ABC strut goes a step further, and adds a hydraulic fluid chamber so the height can be adjusted by adding or removing fluid. This enables the ABC control module to adjust the height of each corner of the car, and it does so at the rate of 10 times per second.

Installation: Replacing the strut is fairly straight forward. There is just one hydraulic connection and one sensor connection. Beyond that it is not much different than any other strut to physically remove and install. After installation, it will require extra steps to fill the strut with fluid and bleed the air out of the line. And the SDS system will be needed to recalibrate the ride height. So a shop knowledgeable about Mercedes vehicles is advisable. An alignment may also be necessary.

Diagnosis: When the ABC shock is non functional owners typically describe a hars ride and error codes popping up when hitting bumps in the road. When reading out the system the pressure at the shock is typically to low. Also, the shock may be leaking oil which may lead to the shock starting to "sweat" or loose oil. Last, the so called "plungerwegsensör" or plunger sensor which is mounted inside the shock may be defect, giving rise to the car not being able to control the correct height or enter safety mode.

Note: When the ABC system shuts down due to a system failure, the ride also becomes very hard. The reason for this is that the gas shock absorber integrated into the ABC strut is smaller than usual and only handles oscillations at frequencies above 5 Hz since the ABC control module is responsible for handling oscillations below 5 Hz. When the ABC system is shutdown, the dampening ability below 5 Hz (the larger oscillations or bounces) are not being handled anymore.

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W215 / C215 (CL-Class) and W220 (S-Class) front / rear



W216 / C216 (CL-Class) and W221 (S-Class) front / rear



R230 / W230 SL-Class front / rear

ABC Hydraulic Valve block Y36/1 Y36/2 pre-facelift



Part numbers: A2203200358, A2203201258, A2203280031

Part numbers: A2209970136 (locking valve), A2209970036 (control valve),
0109883778 (clamp)

Location:

1 valve block with large accumulator near the front left wheel regulating the pressure to the front left and front right shock.

1 valve block with small accumulator between the rear wheels regulating the pressure to the rear left and rear right shock.

New price: €1500 - €1700

www.abcspecialist.nl price: +€399 block only - € 499 complete assembly with accumulator

Function: The valves have a double function. One part of the valve block allows fluid to enter the strut, to close off the strut, or to leave the strut. When the ABC system is active, this control valve is operating and able to control the 3 different height levels during driving. The other part of the valve locks the struts at their current fluid levels when the ABC system is not in operation (locking valve). When the car is not running, parked or the transmission is not in gear, this valve is closed. When the car is put into drive or reverse, the valve will open. If the control module senses a malfunction and disables itself, it will also close this part of the valve for safety reasons.

Diagnosis: The car having difficulty to maintain height when driving and/or when parked. Problems that connect to the situation of the car being parked or driving. When the valve block is internally leaking, it will be unable to hold the pressure at the struts, resulting in the car dropping to the lowest position either parked and/or when driving. Also the car might be unable to move through the different height positions.

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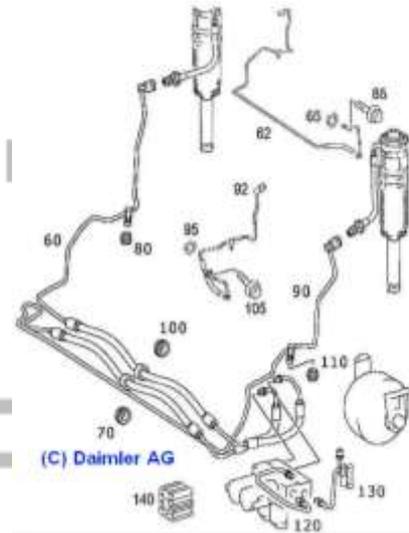
Note: The car can lower after parking about 20mm because of cooling of the ABC oil. 30mm lowering after some weeks of parking is also normal. Some sinking after a period of time is normal even for new Mercedes Benz parts. According to Mercedes Benz the inherent design of the sealing method required for system durability permit a limited level of leakage which can result in the vehicle slowly lowering. However when the car sinks too quickly or too deep, the valve block is internally leaking oil back from the struts to the system. Note that the wheels should always be free to move and turn.

Note that the dropping of the vehicle when parked can not be caused by a suspension strut. The strut can only be dropping when parked if it has an external leak, which can easily be diagnosed by the oil leakage.

Typical error codes: C1531-1: left front, C1531-2: right front, C1531-4: left rear, C1531-8: right rear

Installation: Working in a clean environment is advised in order to keep the ABC system without debris. Please bleed the system carefully after installation. It may be needed to use the bleeding valves on the hydraulic line running from the valve block to the accumulator, to get all the air out of the system. Another trick in order to bleed after installation, is to open the pressure line carefully some turns with engine off, and wait until oil comes out, then adjusting the line again.

Note the marks on the valve: FB1 = Federbein links (Left strut), FB2 = Federbein rechts (Right strut), P = Druckleitung von Pumpe (Pressure line from distribution valve / Pump), SP = Druckleitung zum Druckspeicher (Pressure line to accumulator), T = Leitung zum Ausgleichsbehälter (Pressure return line to distribution valve).



FB1: pressure line to left strut
FB2: pressure line to right strut
SP: pressure line to big accumulator

Note: Sometimes improper electrical connection to the valve block assembly is measured. Most often the cable is not well connected to the valve connector, or the pins in the valve connector are bended.

Note: Elektrical resistance of one valve unit should be 4-5 Ohms. Also a valve block that is connected but seems to be not responding, is often mounted at a wrong angle (the position should be exactly 45 or 90 degrees with respect to the valve block aluminium unit). Therefore the valve is internally stuck and won't be able to move. Its necessary to always use the H-shaped clips to hold the valve in place and in the right position with the correct angle.

Note: The valve block assembly comes with the valve, 1 line, 1 accumulator and 1 bracket. They are all connected with 10mm and 17mm and easy to change. We sell separate valve blocks mostly since assembling the old line, accumulator and bracket is a fairly easy job. However we would advice to test the accumulator before reinstalling it (see testing accumulator).

Front valve oil pressure reservoir accumulator = #14 (see section accumulators)

Rear valve oil pressure reservoir accumulator = #4 (see section accumulators)

ABC Hydraulic Valve block Y36/1 Y36/2 facelift

Note: Newer model ABC Valve blocks of 2nd generation systems are both completely different and don't fit the previous pre-facelift mentioned models. The pressure limiting valve function is fitted into the front valve block. The pressure sensor is fitted in the front and rear valve blocks.

Part numbers; A2213200258 (front) without and with A2213270215 accumulator



A2213200358 (rear) without and with A2213280015 accumulator



Level Sensors. B22/7 (rear left) B22/8 (front left) B22/9 (front right) B22/10 (rear right)

Part number A0025428818

Location: near each wheel, connected to the chassis by a small plastic arm.

The ABC sensors are Hall sensors and communicate data to the headlights to adjust the angle. Front and rear are equal.



www.abcspecialist.nl price +- €70/pc (new) on demand

Car height vs load. The ABC system corrects the height of the car according to the load with information from all three level sensors.

Diagnosis: Usually a faulty sensor is indicated by a false low pressure issue preventing the ABC system from keeping up with demand, but a faulty sensor could have given false information or no information to the control module. If you suspect one of these sensors is the problem, do a visual inspection to make sure the linkages are not damaged or loose.

Also check the wiring connector to make sure it is on tightly and the connection surfaces are not corroded. If you suspect the sensor is bad, you might try swapping it with one from one of the other wheel wells, and see if the problem moves.

The ride height as measured by the sensors in the 3 different positions increases normally by steps of about 20mm.

Movement sensors

The sensors are supplied by 5V voltage.

Sensor vertical movement direction: B24/3 (front left), B24/4 (front right), B24/5 (rear left)

Part numbers: A0045423518, A0045423418

Sensor horizontal movement direction: B24/14

Part numbers: A0045423418

Sensor: B24/12

Part numbers: A0025426918, A0025423518

Plungerwegsensors

Plungerwegsensors B22/1 (rear left), B22/4 (front left), B22/5 (front right), B22/6 (rear right) are sometimes called plungersensors or piston stroke sensor or ADS sensor.

Position: Mounted on shock. Sensors are reported to be very easily damaged by rough handling.

Installation: The sensors on R230 rear shocks <2007 can easily be replaced. The sensors of other model shocks are difficult to replace, but offered separately. In most cases the defect sensor needs replacement of the complete shock.

Note: R230 and W216/W221 shocks for models after april 2006 don't have a plungerweg sensor but information is retrieved from the pressure sensors.

www.abcspecialist.nl price: €150

The sensors are complex and highly sensitive units and send a complicated signal to the ECU. They are powered with 5V from the ABC ECU.

A defect sensor can be identified with SDS. Error codes C1126 – C1129 will show up.

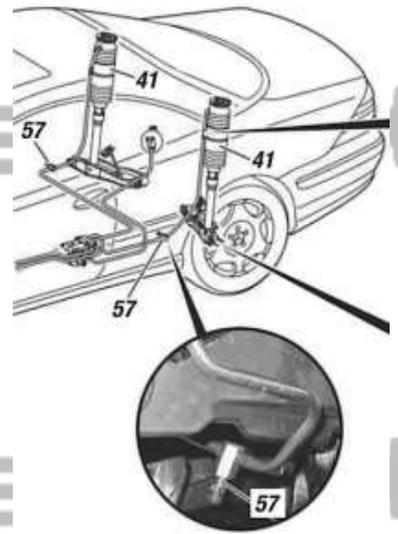
Air bleeding of the ABC system and power steering system

Air can get trapped easily in the system after replacing a component. Air bubbles will get out of the system over time by itself, as air bubbles will find the highest point in the oil. However, driving the car or running the engine while air is trapped in the system, will cause wear on the components of the ABCsystem and lead to problems. After installation of a shock, pump or valve there is often much air blown into the system giving rise to problems of insufficient pressure, no pressure, sounds, noises etc. Turn off the engine directly. Leaving the engine running while air bubbles are trapped in the system can damage vital ABC components.

We advice to fill new product with ABC oil before installation, such that a minimal amount of air will enter the system.

Some clients reported to start bleeding the system by slowly opening each connector on the end the furthest away from the pump, from each oil tube that was disconnected, until oil comes out, after which one quickly fastens the connector. Make sure the engine is not running and take protective steps and measures.

Lift the car up such that the 4 shocks are not loaded, the control valves are then shut and the ABC oil will stay in the system. In total there are 4 bleeding crews on the car, 1 near each shock (M10 bolts, 20 Nm). Also there are 2 bleeding screws below the car (front side and rear side). Open them slowly with engine off, such that the oil runs slowly out of the system in a similar way one would bleed a brake system. Then close the valve and start the engine while monitoring oil pressure and flow is sufficient not to damage components. Repeat several times, most clients report to repeat this step about 3 times. Then repeat the procedure by raising the car a few times up and down using the button in the dashboard, and bleed afterwards. Then repeat the procedure with the car standing on its wheels. Sometimes it's needed to drive the car a bit and then bleed the system again, repeat several times until all air and noise is gone.



To get the last air out one could use the ride height button again. Going through the ride height levels about 10-20 times is sufficient to get most of the last air bubbles out of the system. The air escapes through a pinhole in the dipstick cap.

Bleeding the oil of the steering system for air is done by turning the steering wheel left/right at full position about 30 times.

Rodeo procedure

A rodeo procedure can help speed the process or get the last air bubbles out, but it is not necessary. A rodeo test puts the struts through their travel ranges and components under loads that are not typically seen in normal driving. Sometimes a component may break down during the test or small pieces of debris or metal may break loose and end up in the abc oil.

Common Faults, Problems, Error codes and solutions

Should any problems occur, it will inform the driver with a message on the dashboard. A blue or white error message is considered a warning. The control module detected a problem but the system is still operational. A red message is more severe, and if it stays on the dash it means the system is not operational. Some errors can be transient in nature, in which case the error message will disappear and the system will function normally again. "Drive Carefully" and "Visit Workshop" are the most common messages.

"Drive Carefully" is a warning message saying the system is not operating at 100%. Low pressure is the most common cause. Intermittent sensor glitches can also cause it to appear momentarily. "Visit Workshop" is more severe. It indicates a component has failed and is in need of repair.

Should the ride height of any of the 4 corners of the car fall to an unacceptable level, the ABC system will display a "Too Low" warning. If it stays on, you should stop driving

immediately or risk damage from the tires coming into contact with the wheel wells, not to mention a possible accident that might occur from that happening. It is better to deal with the inconvenience of having the car towed rather than incur expensive repairs to the car.

Error messages will have associated codes that will be logged, and they can be retrieved later by diagnostic tools.

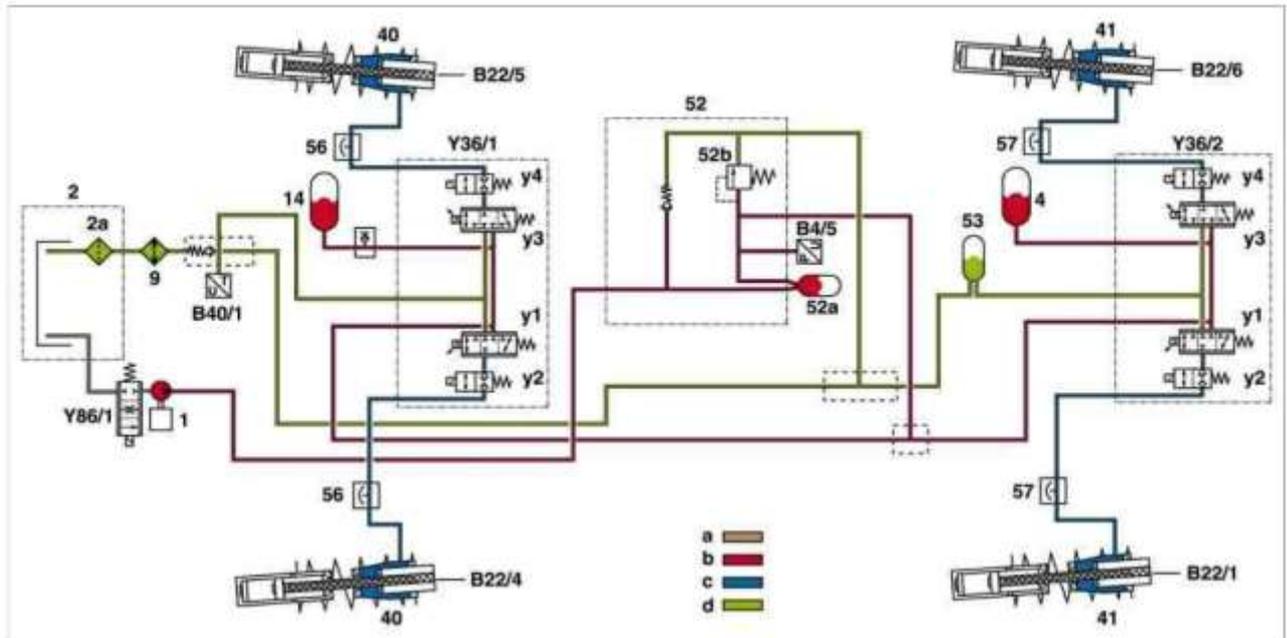
SDS Error Codes, description and possible solutions.

Error code	Error description	Possible cause
C1525-001 C1525-002 C1525-004 C1525-008	Critical Vehicle Level C1525-001 Front Left C1525-002 Front Right C1525-004 Rear Left C1525-008 Rear Right One or more sides of the car got too low.	ABC Valve internally leaking or stuck ABC Pump can't deliver enough pressure Accumulator can't deliver sufficient oil Bad level sensor or wiring
C1526-001 C1526-002 C1526-004 C1526-008	Fault in hydraulic circuit C1526-001 Front Left C1526-002 Front Right C1526-004 Rear Left C1526-008 Rear Right Fault in the valve block	ABC valve block defect, stuck or mounted in wrong position Faulty wiring or connection to the valve block
C1531-001 C1531-002 C1531-004 C1531-008	Suspension strut moves although locking valve is closed C1531-001 Front Left C1531-002 Front Right C1531-004 Rear Left C1531-008 Rear Right	Valve block defect, stuck or mounted in the wrong position Wiring or connection fault
C1353-001	Fault in component Y86/1 or Y86/2 (ABC suction restrictor valve)	ABC suction valve defect Wiring or connection fault to ABC suction valve
C1526-016	malfunction in PSI supply (System pressure too low)	ABC Pump can't deliver enough pressure ABC accumulator defect and can't deliver sufficient oil
C1525 - 032	Piston Stroke sensor calibration failed (Plungerwegsensor defect)	Plungerwegsensor in shock defect (replacement of the complete shock is necessary) Wiring or connection fault to Plungerwegsensor
C1526 -064	Load Calibration failed (calibration with SDS is needed)	Invalid calibration settings, recalibrate ride height

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C1126,C1127, C1128,C1129	Fault in component - Plunger travel Sensor C1126 - left front C1127 - right front C1128 - left rear C1129 - right rear	Plungerwegsensoren in shock defect (replacement of the complete shock is necessary) Wiring or connection fault to Plungerwegsensoren
C1148	Fault in component B4/5 (ABC pressure sensor)	Pressure sensor defect Wiring or connection fault to pressure sensor
C1147	Fault in component - oil temperature sensor	Oil temperature sensor defect Wiring or connection fault to oil temperature sensor
C1132,C1133, C1134,C1136	Fault in component - level sensor C1132 - left front C1133 - right front C1134 - left rear C1136 - right rear	Level sensor defect Wiring or connection fault to level sensor
C1343,C1344, C1345,C1346	Fault in component - strut control valve C1343 - left front C1344 - right front C1345 - left rear C1346 - right rear Valve in valve block defect	ABC valve block control valve defect, stuck or mounted in wrong position Faulty wiring or connection to the valve block
C1347,C1348, C1349,C1350	Fault in component - strut locking valve C1347 - left front C1348 - right front C1349 - left rear C1350 - right rear	The locking valve has a problem. Same solutions as for the control valve above.
C1353	Fault in ABC Suction Restrictor Valve	The suction valve that controls the rate of fluid flow from the reservoir into the ABC pump has an issue. Check wiring, electrical resistance or replace valve.
C1525-16	Level Calibration was not successfully carried out	Invalid settings were entered into SDS
C1525-64	System pressure too low	The ABC pump weak, replace Intermittent: one of the two main accumulators may be blown. Error codes show up when driving over a bump.
C1526-32	Oil temperature too high or sensor is faulty	Check to make sure air flow to the ABC fluid radiator is not obstructed.

ABC system 1st generation diagram.



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a	Suction pipe	52	Pressure supply valve unit	Y36/1	ABC front axle valve unit
b	Working pressure	52a	Pulsation damper	y1	Left front suspension strut control valve
c	Control pressure	52b	Valve pressure limiting valve	y2	Left front suspension strut shut-off valve
d	Return flow	53	Return flow pressure reservoir	y3	Right front suspension strut control valve
1	Radial piston pump	56	Front bleeder screw	y4	Right front suspension strut shut-off valve
2	Oil reservoir	57	Rear bleeder screw	Y36/2	ABC rear axle valve unit
2a	Oil filter	B4/5	ABC pressure sensor	y1	Left rear suspension strut control valve
9	Oil cooler	B22/1	Left rear plunger travel sensor	y2	Left rear suspension strut shut-off valve
14	Front axle pressure reservoir	B22/4	Left front plunger travel sensor	y3	Right rear suspension strut control valve
40	Front suspension strut	B22/5	Right front plunger travel sensor	y4	Right rear suspension strut shut-off valve
41	Rear suspension strut	B22/6	Right rear plunger travel sensor	Y86/1	ABC suction restrictor valve
		B40/1	ABC oil temperature sensor		