BULLETIN

MAKE / MODEL:	YEAR:	ENGINE CODE:
All	**1994**	**All**

SUBJECT / SYMPTOM / TROUBLE CODE:

A/C compressor R134a, R1234yf, troubleshooting magnetic clutch & variable compressor ECV, oil analysis

SOLUTION:

Mainly, there are 3 types of control for compressors:

- **Magnetic clutch**
- **Variable (2003-)**
- **Both variable and magnetic clutch, for example PSA**

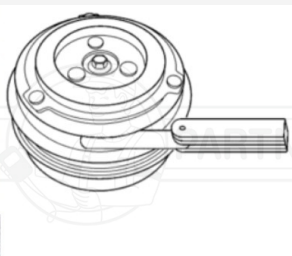
Magnetic clutch:
The clutch is activated using the ON/OFF power supply.
You will have to note whether the shaft (1) is pulled with the belt pulley when the magnetic clutch is activated.
If it is not pulled along with belt pulley when the magnetic clutch is activated, it may be caused by:

- **Faulty magnetic clutch (electric)**
- **Faulty clutch (possibly adjustment)**
- **Broken shaft**

You have to note that the voltage drop does not exceed 0.5V in the wires to the compressor. Measure this while the compressor is activated.
If the voltage drop exceeds this, it may cause the clutch to slide and eventually burn out.

The resistance in the coil to the magnetic clutch must be approx. 3-4 ohms.
Please note that some coils are designed to automatically switch off at a temperature of approx. 180°C. This is known as a "thermal fuse".
This protects the compressor against heat.
Therefore, you will have to note whether this is why it is impossible to measure the flow in the coil.
It is important to know this, if the clutch repeatedly needs replacement.

In some compressors you can replace the clutch as an individual component. In this case, you need to know data for adjustment of clutch clearance, e.g. 0.4-0.8 mm.
Measure the clearance using a feel gauge or by measuring the clutch moving range during activation with a vernier caliper.
The clearance is adjusted with washers/spacers.



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SOLUTION CONTINUED:

Variable compressor:

In this type, the compressor is constantly pulled by the belt in the belt pulley.
Please note that this belt pulley can be destroyed by e.g. a fault in the belt tightening (faulty belt tensioner which pulsates) or chip tuning.
You adjust the stroke length in the compressor via the control valve (ECV), which is controlled with a PWM signal.
The electrical resistance of the ECV valve is 10-14 ohms.
In most compressors you can replace this valve separately.

If you wish to check the compressor function, you should check the PWM signal to the control valve using an oscilloscope.
If you do not have an oscilloscope at your disposal, you can do as follows:

- **Turn the ignition off**
- **Disconnect the connector to the control valve of the compressor and connect instead a 5W bulb or a test light**
- **Delete fault codes**
- **Start the engine and check whether the bulb turns on when the A/C system is activated**

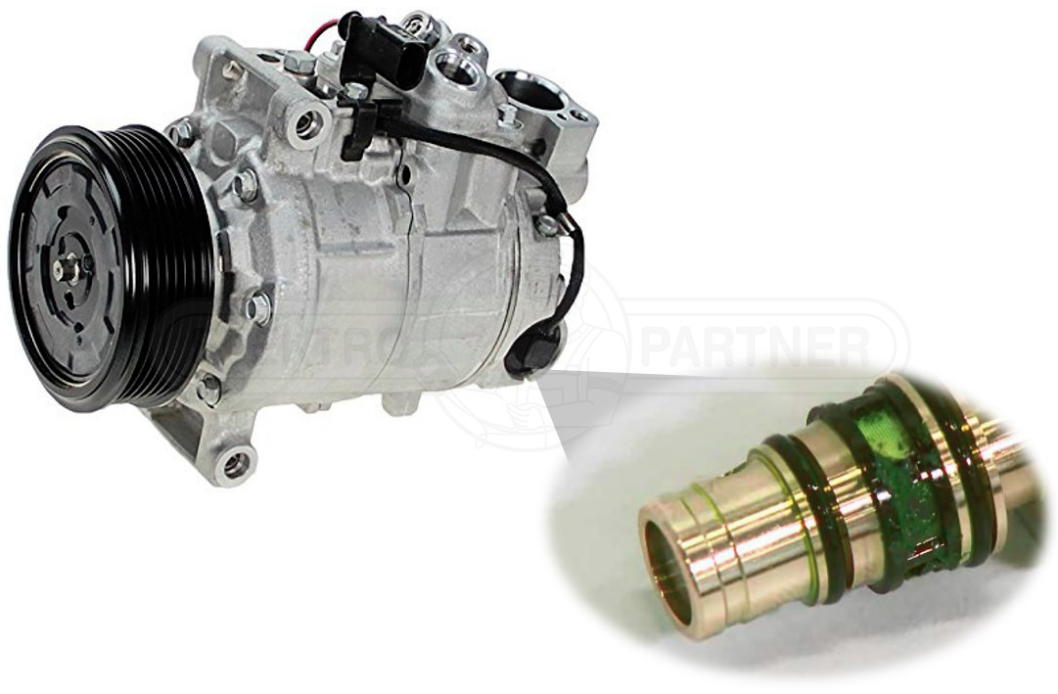
If the bulb is on, it indicates that the control unit attempts to activate the compressor.
Concentrate the troubleshooting on the compressor.

If the bulb does not turn on, you have to examine what causes the lack of control. Check all fault code memories, and possibly the wire connection to this. Please pay attention to parameters, which may prevent activation of the compressor. Like e.g. incorrect reading in the pressure sensor.

If there are any signs of impurities in the valve, you should flush the system, replace drier filter and possibly condenser.

There are also tools to electrically control the compressor to create pressure.
Do not connect 12V to ECV, as this may destroy both valve and compressor.

In Audi and Mercedes from 2012-, there are 2 kinds of ECV valves. With and without the indicator.



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SOLUTION CONTINUED:

Compressor failure:

The same rule applies as in the case of e.g. a damaged turbocharger.
You should examine the cause of failure before replacing the component.
The cause is often the colour or the quantity of oil in the compressor.

Start by draining oil from the old compressor. This indicates the oil quantity in the entire A/C system.
50% of the entire oil quantity in an A/C system is always located in the compressor.
If the colour of the oil is as clear as water (without leak detection agent) or bright green (with leak detection agent), you must flush the system and replace filter and condenser. (See oil analysis in the following pages).

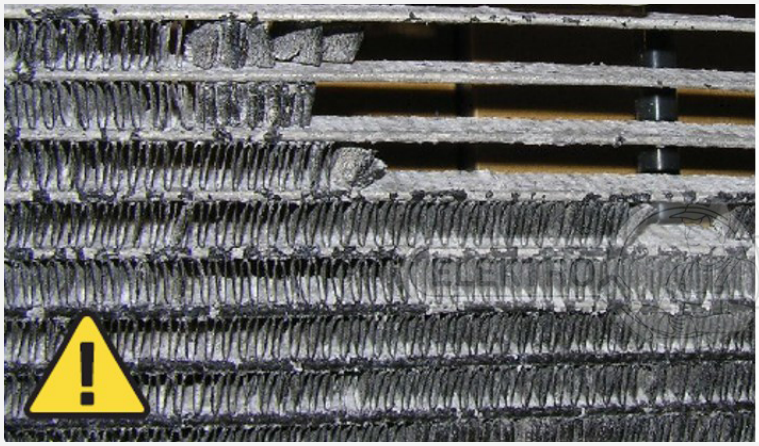
At compressor replacement, you need to know whether oil has already been filled from the manufacturer.
See how the oil is distributed in bulletin No. 5761.
An instruction should be with the new compressor showing the manufacturer's recommendations of how to fit the new compressor.
If no such instruction is available, you should contact the supplier.
However, the following rule should apply:
Either the total oil quantity is filled in the entire system (if this is the case, you drain the necessary oil quantity), or else no oil is filled at all.
In case of total quantity, drain the oil quantity equivalent to what is left in the components, which have not been replaced or flushed.
You may have to drain the oil into a cup in order to establish whether oil has been filled or not.

In case of doubt, it is better to fill too much oil than too little.
A system designed for 150 ml of oil is not damaged by having 180 ml filled.

The oil quantity must be filled in the compressor before it is activated. You must not fill the oil quantity via the service station, as it is important that the oil is in the compressor during start-up.
After having filled oil in the compressor, you must manually rotate the clutch/shaft to the compressor 10 times to spread the oil inside the compressor.

Several manufacturers demand that the system is flushed before a new compressor is fitted. Filter and condenser must also be replaced.
It is an advantage to flush the system, because this is the only way to be absolutely certain of what the oil quantity must be.
When all components have been flushed or replaced, the total oil quantity should be in the compressor (e.g. 150 ml).

A compressor failure is often caused by a bad condenser, which does not have a temperature drop of at least 30 %. See bulletins No. 5748, 5750.



SOLUTION CONTINUED:

Check of oil colour:

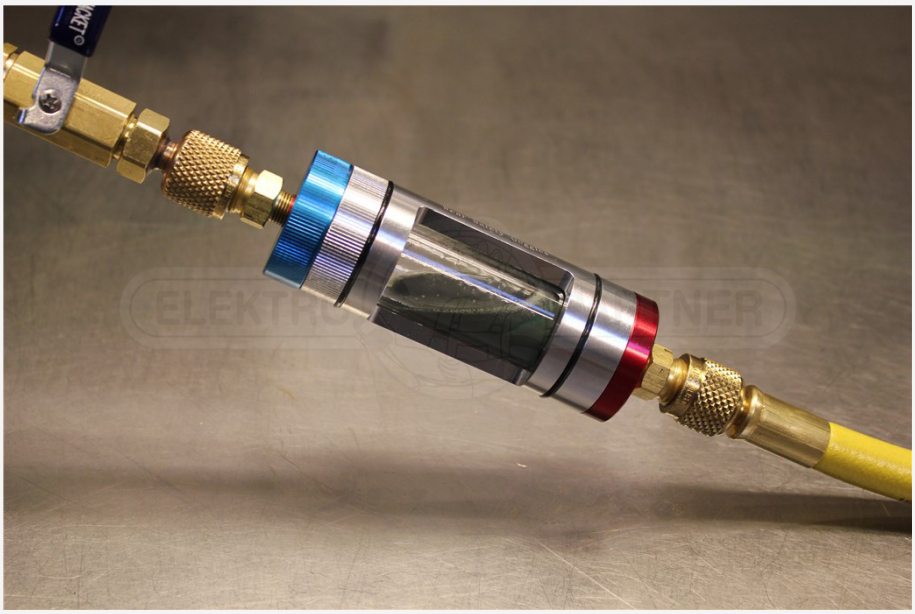
In order to check the oil colour without disassembly of components, you can use a gauge glass like this.
It is connected between the service connectors to low- and high-pressure while the system is cooling.
Let it stay connected for 10-15 minutes, so that it may catch any loose particles.

This is an example of flawless oil without leak detection agent:
Clear as water.

This is flawless oil with leak detection agent:
Bright green.

SOLUTION CONTINUED:

Dark brown or black colour:
This is caused by overheating.
Please note the condenser.



Dark green:
This is caused by too much leak detection agent in the circuit.

SOLUTION CONTINUED:

Visible metal shavings/particles: This may be caused by bad or too little oil.

Red/orange colour: Visible in case of too much red leak detection agent.

SOLUTION CONTINUED:

Milky, turbid texture:
Remains of aggressive flushing agent, which reacts with aluminium and Teflon coatings on the inner parts of the compressor.
Incorrect procedure used for flushing.

Gel-like, crystallised texture:
Leak stop agent of poor quality, which reacts with refrigerant oil or leak detection agent.
They forgot to create a vacuum before using leak stop agent.

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SOLUTION CONTINUED:

Uneven liquid mixtures:
Use of universal/incorrect oils.
Mix of various oils.

Visible rubber-/plastic connections:
Old gaskets, aggressive additives which react with gaskets and hoses.
Filter breakdown or a worn filter.

SOLUTION CONTINUED:

Visible bubbles:
Moisture in the system.
Contamination caused by additives of poor quality.
Incorrect vacuum created at the latest repair.

Light brown colour:
Overheating.