

Meat&Doria **996438**
Hoffer Products **996438**



FOCUS

Radiator Cooling Fans



Our Premium Quality

A superior quality range, guaranteed by direct control of the entire process.

Design and production are supervised by the Group's engineers, in compliance with the original equipment specifications. Subsequently, each component undergoes end-of-line validation testing by the Quality team, with the aim of offering a product that always stands out for its quality, reliability, and durability.



Design



Fleet Coverage



Testing



After-Sales Support

What Are They?

Radiator cooling fans (or simply "radiator fans") are components of a vehicle's cooling system. Their purpose is to **cool the radiator coolant** when the engine reaches high temperatures.

They are electric fans mounted near the radiator (usually in front of or behind it), controlled by an electronic control unit (ECU) or a temperature sensor.



Unlike older mechanical fans connected directly to the engine, these fans **only activate when cooling is required**.

Operation

1 Engine Heating Up

The coolant absorbs heat from the engine and flows through the radiator.

2 Temperature Monitoring

When the coolant reaches a certain temperature (for example, 90–100°C / 194–212°F), the sensor or ECU activates the fan.

3 Fan Activation

An electric motor rotates the fan blades, forcing air through the radiator and reducing the coolant temperature.

4 Radiator Cooling

The airflow removes heat from the radiator fins, lowering the coolant temperature.

5 Fan Deactivation

Once the temperature returns to normal, the ECU cuts power to the fan.

Fan Activation Conditions

Radiator cooling fans generally activate:

When the vehicle is stationary in traffic

During demanding uphill driving

In hot weather conditions

When the air conditioning system is operating

At low vehicle speeds (when natural airflow is insufficient)

Why Are They Important?

Without functioning radiator fans, the following issues may occur:

Engine overheating

Loss of engine performance

Severe engine damage (head gasket failure, warping, etc.)

Increased fuel consumption

Engine block cracking or microfractures caused by excessive temperatures





Signs of Failure

Problems may be present if:

The fan never starts

The fan runs continuously (even when the engine is cold)

The engine quickly reaches high temperatures

Summary

Radiator cooling fans are essential for:

Maintaining the correct engine operating temperature

Avoiding structural engine damage

Preventing overheating

Ensuring proper cooling system performance

How to Inspect and Test Radiator Cooling Fans

Modern vehicles often feature:

Two fan speeds

Electronic management through the engine ECU

One or two fans

Fan operation even when the air conditioning is activated

1 Visual Inspection and Listening Test

Check fuses, connectors, wiring, and blade condition. With the engine warm, verify that the fan activates normally.

2 Air Conditioning Test

Turn on the A/C at maximum setting. The fan should start within a few seconds.

3 Fuse and Relay Inspection

Inspect the fan-related fuses and relays and replace any defective components.

4 Direct Fan Test

Supply power directly from the battery: if the fan does not spin, it is faulty. If it spins, the problem is elsewhere.

5 OBD Diagnostic Test

Check for ECU fault codes and, if possible, command the fan through diagnostic software.

6 Engine Temperature Test

Allow the engine to warm up and verify that the fan activates around 90–100°C (194–212°F).

7 Multimeter Test

Check for voltage at the fan connector to identify electrical faults.



Most Common Fault Codes

P0480 - Fan 1 Control Circuit

Problem in the primary fan control circuit.

Causes: Fan relay; wiring; ECU; fan.

P0482 / P0483 - Fan control

More generic control or performance-related faults.

Causes: Fan not reaching the correct speed; intermittent fault.

P0494 - Low-speed fan failure

Typical when only high speed works or when low speed never activates.

P0481 - Fan 2 control circuit

Typical in dual-speed systems; relates to the second speed or the second fan.

P0493 - High fan speed out of range

Problem affecting high-speed operation.

Causes: High-speed relay, resistor (if fitted), wiring.

P0495 - Fan always active

The fan remains on continuously.

Causes: Faulty temperature sensor; stuck relay; ECU fault.

Related fault codes (not direct but important)

P0115 - Coolant temperature sensor

If this component is faulty, the fan may not activate or may operate incorrectly.

P2181 - Cooling system performance

General issue involving the fan, thermostat or water pump.

P0128 - Engine temperature too low

Usually caused by a thermostat stuck open (it is not a fan issue, but it can be misleading).

How to correctly interpret fault codes

A fault code **never directly indicates that a component must be replaced**. For example, fault code P0480 does not automatically mean "faulty fan": the cause may be a relay problem.

Before replacing any component, it is necessary to check the fan (by carrying out a direct test), the power supply and the control signal.

Correct approach

If the fault refers to a fan-related code:

Clear the fault code*

Test the fan using the battery

Check fuses / relays

Check whether 12V is present

Only then consider replacement

*and check whether it returns

Typical mistake Seeing fault code P0480 and immediately replacing the fan.

Why is this wrong? Because in many cases the issue is simply a faulty relay or a broken wire.

Related products

The products related to radiator cooling fans are:

Complete fan assembly

Fan motor

Relay - 73240140

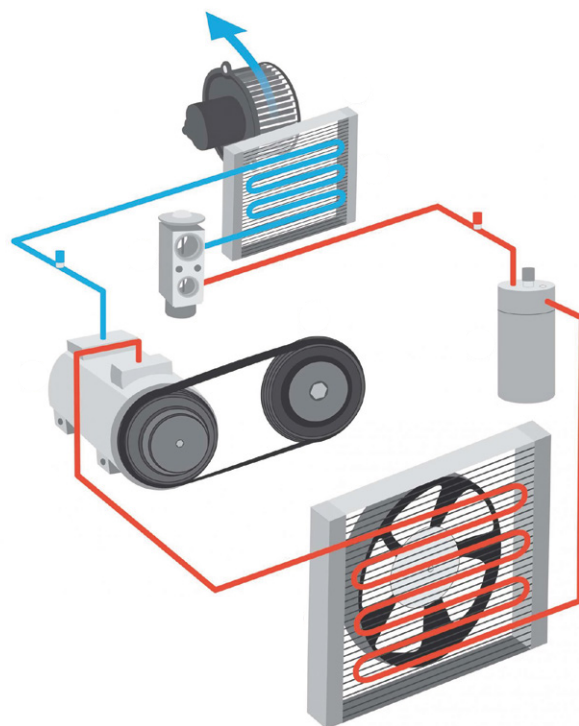
Fuse - Maxi fuse 30A / 40A standard automotive

Temperature sensor - 82105

Resistor - 667352

ECU / Control module

Wiring and mounting brackets - K26202



Tests carried out by M&D Group

The quality of our radiator cooling fans is proven through a series of rigorous bench tests, in compliance with the highest OEM standards.





Equipment used

12V power supply (or vehicle battery)

Multimeter

Optional resistor / load for speed testing (Maximum Test)

Ammeter (preferably a clamp meter)

Jumper cables with clamps (at least 2, preferably 4)

Technical pinout diagram

1 Basic operation test

Procedure

- + battery = fan positive pin
- battery = fan negative pin

2 Current draw test

Procedure

Connect the ammeter in series with the positive supply.

Typical values

- Small fans: 5-10 A
- Medium fans: 12-20 A
- Large fans: 20-40 A

3 Speed test (if 2 speeds)

Types

- Fan with resistor
- PWM / ECU-controlled fan

Caso 1: Fan with resistor

Supplying power directly to the fan provides high speed.

Supplying power through the resistor provides low speed.

Caso 2: Modern fan (3/4 wires)

In this case, control is electronic.

Typical pins are:

- +12V
- Ground
- Control signal (PWM)

4 Noise and vibration test

Mechanical diagnosis

Check for:

- Metallic noises
- Vibrations
- Uneven rotation

If present:

- Worn bearings
- Deformed blades

5 Inertia test (free rotation)

Procedure

With the fan switched off, rotate the blades by hand.

6 Voltage drop test

Procedure

Measure the voltage during operation (normal value: close to 12V).



7 Thermal test

Procedure

Run the fan for 2-5 minutes, then check the temperature of the fan motor; if it is excessively high, the windings may be damaged.

8 ECU test

For smart fans

Measure the PWM signal with an oscilloscope or ECU testing equipment.

Additional tests

Dielectric strength test (Hi-Pot)

Verifies electrical insulation by applying high voltage to ensure there are no leakage currents or short circuits to the outer housing.

Electrical operation test

Measures voltage (V), current draw (I) and power consumption (W) at various speed levels.

Rotational speed measurement

Using optical or stroboscopic sensors, the exact number of revolutions per minute (RPM) of the blades is verified to ensure proper airflow.

Noise and vibration analysis

A microphone or vibration sensor detects mechanical anomalies, whistling noises, imbalance or defects in the electric motor bearings.

ECU control check (PWM)

For modern brushless fans, the PWM (Pulse-Width Modulation) control signal is tested to verify response to variable speed steps.

Performance and fluid dynamics tests

These tests ensure that the fan moves the correct amount of air.

Revolutions per minute (RPM)

Verifies that the target speed is achieved.

Airflow and efficiency

Production samples are tested in wind tunnels to measure air pressure and airflow rate.



Durability and quality protocols

In addition to 100% testing of all manufactured units, sample destructive and endurance tests are carried out in specialized laboratories, including:

Climate chamber testing

To verify operation at extreme temperatures (e.g. from -30°C to +130°C).

Leak Test

For sealed motors, checks for water or dust ingress (IP rating verification).

Salt spray and dust testing

Resistance tests against water, mud and road salt to verify motor sealing performance (e.g. IP67 or IP69K protection ratings).

Vibration testing

To simulate the mechanical stresses experienced by the vehicle's engine.