



TECHNICAL GUIDE

Air Brake Governor: How It Works, Cut-In/Cut-Out and Failure Signs

How a truck air brake governor loads and unloads the compressor, where cut-in and cut-out sit, how it triggers the dryer purge and how to test it for faults.

When a truck's air gauge climbs past its usual stopping point, takes too long to get there, or the compressor never seems to rest, the first part to suspect is often not the compressor but the air brake governor that tells it when to work. The governor is a small pressure-sensing valve, yet it decides every loading and unloading cycle of the compressor and, on most systems, the moment the air dryer purges. This guide covers how the governor works, what cut-in and cut-out mean, where the same function sits on European trucks, and how to check it.

This guide was prepared by the VADEN technical team from field experience with truck air brake systems and OE manufacturer documentation. The pressures, ranges and test figures given here are general references, including figures quoted from US driver-licensing manuals; for exact cut-in and cut-out values and test limits, the current OE service manual matching the vehicle's engine and chassis code is what governs. Last updated: October 2026.

What Is an Air Brake Governor and What Does It Do?

An air brake governor is a pressure-sensing control valve that switches a truck's air compressor between its loaded (pumping) and unloaded (idling) states. The air brake governor reads reservoir pressure, sends a control air signal to the compressor unloader at cut-out pressure and exhausts that signal at cut-in pressure, holding system pressure inside a fixed working band.

An air brake governor is needed because the compressor cannot simply be switched off: on most trucks it is driven by the engine through a gear or belt and turns whenever the engine turns. Without a governor, it would pump until the safety valve opened, wasting fuel and overheating the compressor head.

A typical North American-style air compressor governor is a compact valve body with a piston, a calibrated spring and a combined inlet and exhaust valve. It is bolted directly to the compressor or mounted remotely on the frame or engine, and it usually carries three kinds of ports:

- **Reservoir port:** receives system pressure from an air tank through a dedicated line, often through a small filter.
- **Unloader port:** sends the control signal to the compressor unloader and, on most systems, to the air dryer.
- **Exhaust port:** vents the unloader line when the compressor must go back to work.

How Does an Air Brake Governor Control Compressor Loading and Unloading?

An air brake governor works on a balance of forces: reservoir pressure pushes on the governor piston, and the calibrated spring pushes back. While pressure is rising toward cut-out, the spring wins, the inlet valve stays closed and the unloader port is open to exhaust. The unloader line carries no pressure, so the compressor is loaded and every stroke sends air to the dryer and the tanks.

At cut-out, the piston overcomes the spring, the exhaust closes and the inlet opens. Reservoir air flows to the compressor, where unloader pistons hold the intake valves open; on other designs, a

control element closes off the intake or disengages a compressor clutch. The unloader parts and the intake and discharge valves are covered in the [compressor valve and unloader guide](#), and clutch-driven designs in the [clutched air brake compressor guide](#).

When brake applications and accessories draw pressure down to cut-in, the spring pushes the piston back, the inlet closes and the exhaust opens. The unloader line vents with a short puff of air and the compressor goes back to work. The gap between cut-out and cut-in is built into the governor design so the compressor does not switch on and off many times a minute. Worn unloader parts are serviced with a [compressor unloader kit](#); designs with a separate unloader take a complete [unloader valve](#).

What Are Typical Air Governor Cut-In and Cut-Out Pressures?

Air governor cut-in and cut-out pressures are set by the vehicle and compressor manufacturer and differ between system generations and markets. In the United States, state CDL manuals (the handbooks drivers study for the air brake endorsement of a commercial driver's license) describe cut-out at around 125 psi (about 8.6 bar) and cut-in at around 100 psi (about 6.9 bar). European-built trucks commonly cut out somewhere in the 8 to 12.5 bar range depending on system generation, with recent systems toward the upper end.

Air brake governor reference points (general reference; the vehicle's current OE service manual governs)

Reference point	How US CDL manuals describe it	Typical European practice	What to rely on
Cut-out pressure	Around 125 psi (about 8.6 bar)	Commonly about 8 to 12.5 bar, by generation	Service manual value for the engine and chassis code
Cut-in pressure	Around 100 psi (about 6.9 bar)	Below cut-out by a fixed regulator gap	Service manual and governor or regulator data
Pressure build-up check	85 to 100 psi within about 45 seconds on dual air systems, at operating engine speed	Filling time test defined by the manufacturer	Service manual test procedure and engine speed
Low-pressure warning	Must come on before pressure falls below 60 psi (about 4.1 bar)	Set by vehicle design under UN Regulation No. 13	Vehicle documentation and type-approval data

These figures are reference points, not repair targets. Dash gauges drift, so check readings with a calibrated master gauge before condemning the governor.

How Do the Governor, Unloader and Air Dryer Purge Work Together?

The air brake governor, the compressor unloader and the air dryer purge valve usually act on one shared signal. On most North American-style systems the governor's unloader line is teed to the air dryer's control port, so the moment the compressor unloads, the dryer purges:

- 1 Pressure rising: the unloader line is at zero, the compressor is loaded and the dryer removes moisture through its desiccant cartridge.
- 2 Cut-out: the governor pressurizes the unloader line, the compressor unloads and the same signal opens the dryer purge valve.
- 3 Purge: water and oil in the dryer sump are blown out in a short burst, and dry air flows back through the desiccant to regenerate it.
- 4 Cut-in: the governor vents the unloader line, the purge valve closes and the compressor loads again.

That burst of air under the dryer at cut-out is the easiest audible sign that the governor is cycling, and the shared signal is why governor faults show up as dryer problems: if the governor never reaches cut-out, the cartridge saturates and water reaches the tanks; if it cycles too often because of a leak, the dryer purges far more than intended. Purge valve faults are covered in the [air dryer purge valve guide](#); replacement desiccant comes as an [air dryer cartridge](#), and complete units are listed under [air dryer valves](#).

Where Is the Governor Function on European Trucks?

The air brake governor as a separate valve is typical of North American-style systems. On many European-built trucks there is no separate governor: the pressure-regulating function is built into the air dryer housing, as an air dryer with integrated pressure regulator, or into an air processing unit that also contains the multi-circuit protection valve. Systems of this kind from suppliers such as WABCO and Knorr-Bremse are common on trucks from makers including Mercedes-Benz, Volvo, DAF and MAN.

An integrated pressure regulator stops compressor delivery in one of two ways. In the vent-off arrangement, the regulator opens the dryer exhaust at cut-out; the compressor keeps pumping, but its delivery is vented to atmosphere through the dryer while a check valve holds system pressure. In the control-port arrangement, the regulator signals the compressor unloader or an energy-saving clutch. On an electronic air processing unit, a control unit reads pressure sensors and switches solenoid valves, so cut-in and cut-out are stored parameters.

Where the governor function sits, by system arrangement (general overview)

Arrangement	Where the governor function sits	How the compressor stops building pressure	Where to look when it fails
Separate governor	Valve on the compressor or mounted remotely	Signal to the compressor unloader; also triggers dryer purge	Governor, unloader and reservoir lines, unloader
Air dryer with integrated pressure regulator	Regulator section inside the air dryer housing	Vent-off through the dryer, or signal to the unloader	Dryer regulator, purge valve, outlet check valve
Electronic air processing unit	Control unit plus solenoid valves	Solenoid signal to unloader or clutch, or vent-off	Fault memory, pressure sensors, solenoid valves

So when a governor is needed for a European truck, the part to examine is usually the air dryer or the air processing unit; the [air processing unit guide](#) explains how those assemblies are built.

What Are the Symptoms of a Bad Air Compressor Governor?

A bad air compressor governor shows up as no cut-out, wrong cut-in or cut-out pressure, slow build-up, or cycling too often. Leaks, a worn compressor or a sticking unloader look the same on the gauge, so the governor is judged as one link in a chain.

Air brake governor symptoms, possible causes and checks (general diagnostic guide)

Symptom	Possible cause in the governor chain	Check
Pressure climbs past normal cut-out, safety valve opens	Governor piston sticking from oil, water or ice; blocked reservoir line or filter; blocked unloader line; seized unloader	Verify the gauge; watch for the unloader signal and dryer purge at cut-out
Slow build-up or pressure stays low	Governor leaking into the unloader line while loaded; blocked governor exhaust; unloader held open	Soap test at the exhaust; confirm the unloader line vents fully at cut-in
Compressor cycles too often	System air leaks, leaking purge or outlet check valve; governor gap out of specification	Leak-down test with engine off; record the cut-in and cut-out spread
Constant hiss from the governor exhaust	Worn inlet or exhaust seat, piston seal or O-rings	Soap test in both loaded and unloaded states
Water in the tanks, dryer never purges	Governor not reaching cut-out, or signal not reaching the dryer	Listen for the purge burst; check the dryer control line

Oil inside the governor points to the compressor as the deeper problem; see the [no air pressure and oil-pumping diagnostic guide](#) and the [air brake compressor faults and maintenance guide](#).

Never raise the governor cut-out pressure above the manufacturer's specification to cover slow build-up or to make the brakes feel stronger. Higher pressure overloads the compressor, dryer and lines and hides the real fault. Before disconnecting any governor, unloader or dryer line, chock the wheels, shut the engine off and release pressure from that circuit as the service manual describes. Choose any replacement by the OE number and chassis code, not by appearance.

How Do You Check an Air Brake Governor?

An air brake governor check starts with gauge observation. In the United States, the pre-trip air brake check taught in CDL manuals includes watching the compressor cut out, then fanning the brake pedal to bring pressure down and noting where it cuts back in, along with the build-up and low-air warning tests; these are driver checks, not repair specifications. In the shop, a structured test follows this order:

- 1 Chock the wheels and drain the tanks, noting whether water or oil comes out.

- 2 Connect a calibrated master gauge at a reservoir and compare it with the dash gauge.
- 3 Run the engine at the speed the service manual specifies and record cut-out; listen for the dryer purge at the same moment.
- 4 Lower pressure in steps with brake applications and record cut-in.
- 5 Compare cut-in, cut-out and the gap with the service manual values for that chassis.
- 6 Apply soap solution to the governor exhaust with the compressor loaded and again unloaded; a bubble in either state points to a leaking internal seat or seal.
- 7 Confirm that the unloader line receives pressure at cut-out and vents completely at cut-in, using the service manual's safe method.
- 8 Inspect the reservoir line and port filter for oil, debris or ice.
- 9 If the governor passes, move on to the unloader, compressor and dryer, starting with the fill-time check described in the compressor valve and unloader guide.

On trucks with an electronic air processing unit, start by reading the fault memory and checking sensor values against the master gauge.

Can an Air Governor Be Adjusted, and When Should It Be Replaced?

An air governor can be adjusted only on designs built for it. Some North American governors have an adjusting screw and locknut under a cover, set within the manufacturer's range with a calibrated master gauge. Many later governors are preset and sealed, integrated regulators in air dryers are generally not field-adjustable, and electronic units are set by parameters.

Air brake governor replacement is justified when an exhaust leak cannot be cured, when cut-in and cut-out drift out of specification again after the reservoir line and filter are cleaned, when the body is cracked or corroded, or when oil from a failed compressor has contaminated it. Inspect the governor whenever a compressor or air dryer is replaced. Replacement units are listed under [compressor governor valve](#), and integrated regulators in air dryers are serviced with an [air dryer valve repair kit](#). Confirm the OE number and chassis code before ordering.

Which Standards and Sources Cover Air Brake Governor Performance?

Air brake governor performance is not regulated as a stand-alone part; the rules apply to the air supply and braking system the governor controls. Internationally, truck braking systems are type-approved under UN Regulation No. 13, which covers energy supply, reservoirs and warning devices. In the United Kingdom, brake maintenance and efficiency in service is set out in [The Road Vehicles \(Construction and Use\) Regulations 1986, regulation 18](#), and inspection defects in the [DVSA MOT inspection manual for HGVs](#).

United States: compressor, reservoir, pressure gauge and low-pressure warning requirements for new air-braked vehicles are set by **49 CFR 571.121 (FMVSS 121)**, and brake equipment requirements for vehicles in service by **49 CFR Part 393, Subpart C**.

Main guide: **Air Brake Compressor: Faults, Replacement & Maintenance Guide**

This document is for information only; in practice the vehicle manufacturer's current service manual and safety instructions apply. Values are general references for common heavy-duty systems; use the relevant OE service document for model-specific figures. © VADEN Otomotiv San. Tic. A.Ş. · vadenoriginal.com