



TECHNICAL GUIDE

Quick Release Valve (QRV): Faults, Replacement & Care

How a quick release valve (QRV) works on truck air brakes: fault symptoms, diagnosis, step-by-step replacement, torque values and maintenance tips.

Every technician who works on heavy commercial vehicle brake systems will, at some point, run into a truck whose brakes "release late." The driver lifts off the brake, but the chamber or brake piston bleeds off the air slowly; the vehicle drags along braked for a moment longer, the linings heat up, the trailer scuffs at the rear. Behind most of these complaints lies not an expensive main valve but a part no bigger than the palm of your hand: the quick release valve. This guide explains how to recognize this valve in the field, how to isolate its fault, and how to replace it correctly.

About this guide: The content below was prepared by the VADEN technical team, drawing on field experience with heavy commercial vehicle pneumatic brake systems. The pressure, torque and dimensional ranges given are typical reference values; for exact figures, always refer to the current service manual of the vehicle and axle manufacturer. Last updated: September 2026. Heavy commercial vehicle air brake systems are designed within the framework of ECE R13 (UN/EU braking regulation) and ISO 611.

What Is a Quick Release Valve (QRV)? Function and Operating Principle

A quick release valve (QRV) is a pneumatic valve that, when the brake is released, shortens the release time by exhausting the compressed air in the brake chamber or piston directly to the atmosphere through an exhaust port right next to the chamber, instead of sending it all the way back to the main valve along the control line.

The operating principle is simple but effective. Inside the valve there is a flexible diaphragm (membrane) and an exhaust port. When the driver presses the brake pedal, the compressed air from the main brake valve enters through the inlet port (port 1), pushes the diaphragm down to close the exhaust port, and lets the air pass to the delivery ports (port 2) – that is, to the brake chambers. When the driver lifts off the pedal, the pressure in the inlet line drops; the air on the chamber side lifts the diaphragm up and is expelled directly through the exhaust port. This way the air does not have to travel back through metres of hose to the main valve; the brakes release far faster.

Why Is Its Location in the System Critical?

On long-wheelbase tractors and buses, the line between the main brake valve and the rear axle chambers is quite long. The delay that occurs as the air travels back along this line can cause the brake to release late and the wheel to lock. By positioning the QRV as close to the chamber as possible, this exhaust path is reduced to a few centimetres. The same logic applies to the synchronous release of the front axle chambers and the rapid exhaust of trailer/semi-trailer lines.

Main Components

- **Body:** Usually aluminium alloy or technopolymer; houses the inlet, delivery and exhaust ports.
- **Diaphragm (membrane):** A flexible element based on nitrile (NBR); it is the heart of the valve and the part most prone to fatigue and hardening.
- **Exhaust cover / muffler:** A cap that prevents dust and water from entering the exhaust port while also reducing the exhaust noise.

- **Port connections:** Threaded ports such as M22, M16, or push-in connectors.

Typical Applications and Matching

Quick release valves are mainly used on vehicles equipped with Knorr-Bremse and Wabco (today ZF) type systems. The table below is a rough guide based on the valve's typical position in the system and its flow capacity; for an exact application, the vehicle catalogue is decisive.

Position / Application	Typical Vehicle Class	Key Feature
Front axle chamber line	Tractor, truck, bus	Synchronous release, medium flow
Rear axle chamber line	Long-wheelbase tractor	High flow, mounted close to the chamber
Trailer / semi-trailer supply	Semi-trailer, trailer	Rapid exhaust, muffled exhaust
Auxiliary / chamber balancing	Bus, special bodywork	Low-to-medium flow, compact body

Part number verification: Although QRVs look almost identical from the outside, the port diameter, opening pressure differential and flow capacity vary from model to model. A valve with the wrong flow capacity leads to uneven brake release and pulling to one side. Always note the OE part number of the valve you remove, and when selecting an equivalent, match the port size and connection type (threaded/push-in) exactly.

Fault Symptoms and Diagnosis

QRV faults often look like a "brake system failure" but are in fact localized. The table below matches the symptoms most frequently seen in the field with their likely causes and verification methods.

Symptom	Likely Cause	Check / Verification
Brake releases late, vehicle drags	Diaphragm cannot open the exhaust port (stuck/hardened)	Listen for air discharge from the exhaust when the brake is released; if there is none, the valve is blocked
Continuous air leak from the exhaust port	Diaphragm torn or seating surface damaged	Apply soapy foam to the exhaust with the brake applied; continuous bubbling = leak
Brake releases late on one side / vehicle pulls	QRV on one axle side is blocked, flow imbalance	Compare the exhaust times of the left and right chambers
Brake applies slowly, engages with a delay	Inlet port or muffler blocked, air restricted	Measure the inlet pressure with a gauge; check the port by removing it
Water/mud spraying from the exhaust, freezing	Muffler/exhaust cover damaged, has taken in water	Remove the exhaust cover and look for moisture/rust on the inner surface
Continuous air consumption, compressor runs excessively	Diaphragm does not fully close, inlet air leaks through the exhaust	Engine off, tank full; listen for a leak from the exhaust with the brake applied
Spongy feel at the brake pedal	Partial air trapping inside the QRV or diaphragm deformation	Isolate the line and bypass the valve to compare pedal feel

Looking for the Leak in the Right Place

A leak from the exhaust port may not always come from the valve itself. Slight air coming from the exhaust while the brake is not applied usually indicates a diaphragm leak; air coming while the brake is applied indicates that the seating surface on the inlet side has deteriorated. Distinguishing the two prevents you from replacing the valve unnecessarily.

Exhaust Time Test

A sound QRV exhausts the pressure in the chamber almost instantly (usually in under a second) when the brake is released. In case of a dragging complaint, observe the pressure drop time with a gauge fitted to the chamber outlet; if there is a visible delay, the diaphragm inside the valve has hardened or the exhaust path is restricted.

System-Related Confusions

Dragging is not always the QRV. Misadjustment, fatigue of the chamber return spring, a seized slack adjuster, or a drum/disc caliper failing to retract can produce the same symptom. Before blaming the QRV, confirm with the exhaust test that the valve is actually exhausting.

Standards and further reading

This subject is governed by the equipment rules for air-braked commercial vehicles. In the United States the federal air brake standard, **FMVSS 121 (49 CFR 571.121)** defines the reservoirs, protection and timing a compliant system must provide, and Europe applies the equivalent limits of UNECE Regulation No. 13. For further detail, see the illustrated reference guide at airbrakecompressor.com. Always confirm specific figures against the current regulation and the vehicle manufacturer service data.

Outside the United States the equivalent duties sit in national law. In the United Kingdom, **regulation 18 of the Road Vehicles (Construction and Use) Regulations 1986** requires every part of the braking system to be maintained in good working order. In Canada, air brake systems fall under the **Motor Vehicle Safety Regulations, which contain CMVSS 121**.

Replacement / Installation Steps

Personal Protective Equipment and safety: This work is carried out on a compressed air system. Before starting, wear safety glasses and work gloves. Drain the vehicle's air tank, stop the engine, switch off the ignition and chock the wheels. A port connection removed before the pressure is released can violently launch the hose and its fitting. On spring brake chambers, the parking brake must be mechanically engaged.

- 1 Secure the system:** Park the vehicle on level ground, chock it, stop the engine and drain the pressure in all air tanks down to zero through the drain valve.
- 2 Locate the valve:** Identify the faulty QRV; it is usually the small three-port (inlet, delivery, exhaust) valve closest to the chamber. Photograph its position.

- 3 **Mark the lines:** Before removing the inlet and delivery hoses, label or mark them; a reversed connection will render the valve inoperative.
- 4 **Disconnect the connections:** Loosen the fitting nuts with a suitable wrench. A slight release of air at the moment of removal, due to residual pressure, is normal.
- 5 **Remove the old valve:** Detach the valve from the mounting bracket. Check the condition of the bracket and bolts for corrosion.
- 6 **Clean the ports and hoses:** If there is dirt, rust or old seal residue on the hose ends and fittings, clean it; it can cause leaks in the system.
- 7 **Prepare the new valve:** Verify that the port diameter, connection type and exhaust orientation of the new VADEN QRV are the same as the old one. Make sure the exhaust port faces down/outward so that water does not collect.
- 8 **Apply thread sealing:** On threaded connections, use the type of thread tape or liquid sealant recommended by the manufacturer; do not let it get inside the exhaust port.
- 9 **Install the valve:** Secure the new valve to the bracket and connect the inlet and delivery lines to the correct ports according to your marks. Tighten the fittings to the manufacturer's torque value; overtightening will crack the body.
- 10 **Restore pressure and test:** Start the engine and fill the system to nominal pressure. Apply soapy foam to all connections to check for leaks.
- 11 **Function test:** Apply and release the brake several times; at each release a clear, short air discharge should be heard from the exhaust, and the brakes should release quickly and evenly. Confirm with a short road test that the dragging has stopped.

Points to Watch (Common Mistakes)

Do not mix up the inlet and delivery ports: The QRV is directional. If the inlet (control air from the main valve) and the deliveries (going to the chambers) are swapped, the valve either does not work at all or the brake stays permanently applied/released. Always follow the port numbers and arrow marks.

Do not mount the exhaust port facing up: The exhaust must face down or to the side. An upward-facing exhaust takes in rain and wash water; in winter it freezes and locks the valve entirely.

- Do not remove the muffler/exhaust cover and leave it off; dust and water damage the diaphragm in a short time.
- Do not overtighten the fittings; technopolymer and aluminium bodies crack and cause micro-leaks.
- Check not just one valve but also the matching valves on the same axle; if only one side is renewed, the release imbalance may persist.

- Do not use an equivalent with the wrong flow capacity; "it fits but doesn't match" is the most common mistake.
- Before cutting out and discarding the old diaphragm, note the fault type (torn or hardened); it may be a sign of a systemic problem.

Technical Values and Checkpoints

The values below are typical/general references for heavy commercial vehicle pneumatic brake systems. Exact values vary according to the service manual of the vehicle, axle and valve manufacturer; in practice, the service manual is decisive.

Parameter	Typical Range (general reference)	Note
System operating pressure	~8–12.5 bar (116–181 psi)	Depends on the regulator cut-out pressure
Opening pressure differential (exhaust)	~0.1–0.5 bar	The differential at which the diaphragm opens the exhaust
Exhaust time (chamber)	< ~1 second	No visible delay on a sound valve
Operating temperature	~ -40 °C to +80 °C	Depends on the diaphragm material
Port diameter (typical)	M16 / M22 threaded or push-in	Varies by application
Permissible leakage	Practically "zero" (no bubbles)	In both the brake-applied and released states

Connection torques also vary according to the body material. The values below are for guidance only:

Connection	Typical Torque (general reference)
Mounting bolt (M8)	~18–25 Nm
Port fitting (M16)	~25–35 Nm
Port fitting (M22)	~35–45 Nm

Field tip: Even without a torque wrench, work on the "hand-tight + a quarter turn" principle; on technopolymer bodies, overtightening is the number one cause of leaks. When in doubt, tighten less and verify with a leak test, tightening in stages if necessary.

- No air should come from the exhaust while the brake is released (bubble test).
- The exhaust port should close while the brake is applied, with no leak from it.
- A clear, short discharge sound should be heard when the brake is released.
- The release times of the left and right chambers should be close to each other.
- The exhaust cover/muffler should be in place and intact, facing down.

Maintenance and Service Life

Although the quick release valve looks like a "fit-and-forget" part, it is in fact a quiet part of regular brake system maintenance. The main factor determining its life is the quality of the air passing through it: moisture and oil harden the diaphragm over time; road salt and dust block the exhaust port.

- During periodic brake maintenance, visually inspect the exhaust port and muffler, and clean off any blockage and water traces.
- Make sure the air dryer and its cartridge are working properly; dry air is the single biggest factor in extending QRV life.
- During major work such as a brake overhaul or chamber replacement, review the valve as well; renew an aged diaphragm on the spot so you do not have to dismantle it again later.
- As winter approaches, verify that the exhaust port faces down and is clean against the risk of freezing.
- Do not delay on early symptoms such as dragging or slight release delay; a small valve affects the life of the linings and drum.

A correctly mounted QRV fed with clean air will usually run for many years without trouble. However, it should not be forgotten that the diaphragm is a flexible wear element; replacing it at the first hesitation is the most economical choice for both driving safety and the rest of the brake equipment.

The VADEN ORIGINAL quick release valve (QRV) product family is produced in OE-equivalent dimensions and performance, with different port and flow options for the front axle, rear axle and trailer lines of heavy commercial vehicles. A VADEN QRV matched to the correct part number ensures that the brakes release quickly and evenly, protecting the life of the linings, drum and chambers; it keeps your vehicle safe and efficient.