

## AIR DISC BRAKES (ADB) TROUBLE SHOOTING PRINCIPLES

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
I. Differential wear	<b>1. Caliper binding/ not sliding properly</b>	
	a) Sealings and covers of caliper guiding damaged	Replace caliper guiding. Use original WABCO repair kits.
	b) Guiding pins corroded	
	c) Foreign bodies (stones etc.)	Remove foreign bodies, clean carrier seat with wire brush (be careful not to damage rubber boots).
	d) Axle flange flatness	Loosen brake carrier bolts on one side (1-2 turns are sufficient) and check caliper sliding ability again: <ul style="list-style-type: none"> <li>▶ If you are unable to slide the caliper then replace the brake.</li> <li>▶ If you are able to slide caliper then remove brake and re-work the axle flange.</li> </ul>
	<b>2. Movement of brake pads and/or pressure plate restricted/ binding</b>	
	a) Corrosion or dirt in carrier seat	See I.1.c)
	b) Damaged groove / nose	Replace brake.
	c) Foreign bodies (stones etc.)	See I.1.c)
	d) Hold-down springs or bracket damaged	Replace pad kit. Use original WABCO repair kit incl. hold-down system.
	<b>3. Installation issues</b>	
	a) Interference with surrounding parts (caliper travel limited)	Remove obstacles.
	b) Pipe and/or wire length not sufficient (full caliper movement not possible)	Relocate airlines or brackets to avoid restrictions on the caliper.
	<b>4. Environmental influences</b>	
	a) Rotor heavily affected by dirt	Reduce dirt load by installing dust-shields. If dust-shields are already installed, check gap between shield and rotor surface (rotor surface should be covered incl. ~20 mm (0.8 in) of outer rotor diameter).
	b) Rim does not cover rotor sufficiently	
II. Premature wear	<b>1. All wheel ends with excessive pad wear</b>	
	a) Tractor-trailer combination has significantly different pad/lining wear lifetime	Check braking force for each axle on roller test bench: <ul style="list-style-type: none"> <li>▶ Braking forces should be equally distributed.</li> <li>▶ Especially with low pressures 1-1.5 bar (15-22 PSI) braking forces should not differ by more than 20% between tractor and trailer.</li> </ul>
	b) Rigid truck has very high pad wear	Check if application is very demanding (vehicle frequently fully laden, high no. of stops (regional or city), demanding down-hill routes, extremely dirty and muddy environment). <ul style="list-style-type: none"> <li>▶ Contact ZF for appropriate chamber and/or correct pad materials.</li> </ul>
	<b>2. Only one wheel end or axle subjected to excessive pad wear</b>	
		a) See symptom 3. Overheating (smoking brake).
		b) Compare affected wheel end or axle with good wheel ends acc. to actuator size, crack pressure, contamination, other apparent differences.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
III. Overheating (smoking brake)	<b>1. Sliding ability caliper not given</b>	
	a) Sealings and covers of caliper guiding damaged	Replace caliper guiding. Use original WABCO repair kits.
	b) Guiding pins corroded	
	c) Foreign bodies (stones etc.)	Remove foreign bodies, clean carrier seat with wire brush (be careful not to damage rubber boots).
	d) Axle flange flatness	Loosen brake carrier bolts on one side (1-2 turns are sufficient) and check caliper sliding ability again. <ul style="list-style-type: none"> <li>▶ If you are unable to slide caliper then replace the brake.</li> <li>▶ If you are able to slide caliper then remove the brake and re-work the axle flange.</li> </ul>
	<b>2. Movement of brake pads and/or pressure plate not given</b>	
	a) Corrosion or dirt in carrier seat	See I.1.c)
	b) Damaged groove / nose	Replace caliper.
	c) Foreign bodies (stones etc.)	See I.1.c)
	<b>3. Pad material</b>	
	a) New pads	Bedding of brake pads can lead to gas emission and subsequently to smoke and burnt smell. This is just a temporary condition and disappears after few days.
	b) Chemical contamination of pads and rotor	Contamination with chemicals (e.g. grease or oil from wheel bearing) can lead to smoke and burnt smell. Detect root cause of contamination and fix it. Replace pad kit. Use original WABCO repair kit.
	<b>4. Brake adjuster</b>	
	a) Adjuster malfunction	For driving axles block the front wheels to prevent the vehicle from moving, lift the rear, remove the chambers, put the vehicle in neutral and spin the wheels to verify the wheels are spinning freely. <ul style="list-style-type: none"> <li>▶ If not ok: Replace brake.</li> </ul> If wheels are spinning freely: check other system components to make sure they are functioning correctly. (i.e. drive axle gearing, ABS system, etc. Remove hold-down system and measure lining gap with feeler gauge between outboard pad and caliper (brake must be cold): 0.5 mm (0.02 in) ≤ lining gap ≤ 1.2 mm (0.05 in) (If the running gap is too small check for corrosion and dirt. If the gap cannot be adjusted, please replace the brake.) Check adjuster function by de-adjusting (180°) and applying service brake with low pressure ~2 bar (~30 PSI) 10 times. Check the function by observing the movement of the de-adjuster during brake application (alternatively mark it and check before and after applying the brakes). <ul style="list-style-type: none"> <li>▶ If adjuster is not functioning: Replace brake.</li> </ul>
	<b>5. Actuator malfunction</b>	
	a) Leakage at spring brake	Check actuator tightness with leak detection spray. <ul style="list-style-type: none"> <li>▶ In case of untightness: Replace actuator.</li> </ul>
	b) Valves and/or air Lines sufficient (full wear distance)	Modify air lines to avoid any reaction on actuator and brake.
	c) Push-rod length in released condition not ok	Disassemble actuator and measure push-rod length (protrusion of push-rod = 15 ±1 mm (0.59 ±0.04 in)). <ul style="list-style-type: none"> <li>▶ If not ok: Replace actuator.</li> </ul>

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
III. Overheating (smoking brake)	<b>6. Vehicle setup</b>	
	a) Pressure imbalance between truck and trailer	Check system pressure configuration. Measure rotor temperatures of truck and trailer after normal road use. ▶ Significant differences between axle pressures and/or rotor temperatures indicate system setup problems. Please contact WABCO.
	b) Frequent overloading	Check recent vehicle loading conditions.
	<b>7. Road profile</b>	
	a) Terrain is extremely hilly and driving behavior is aggressive	Check GPS data (if available) ▶ If necessary, improve driver training (e.g. early down-shifting etc.).
IV. Caliper stuck	<b>1. Guiding system</b>	
	a) Sealings and covers of caliper guiding damaged	Replace caliper guiding. Use original WABCO repair kits.
	b) Guiding pins corroded	
	c) Guiding worn out (bolts and bushings)	
	d) Coagulation of guiding grease (hard grease)	Permanent ambient temperatures below -40°C (-40°F) may lead to temporarily harder caliper movement.
	<b>2. Movement of brake pads and/or pressure plate not given</b>	
	a) Corrosion or dirt in carrier seat	See I.1.c)
	b) Damaged groove / nose	Replace brake.
	c) Foreign bodies (stones etc.)	See I.1.c)
	d) Hold-down springs or bracket damaged	Replace pad kit. Use original WABCO repair kit incl. down-holder system.
V. Rotor heat cracks	<b>3. Installation issues</b>	
	a) Interference with surrounding parts (caliper travel limited)	Remove obstacles.
	b) Pipe and/or wire length not sufficient (full caliper movement not possible)	Relocate piping to avoid any reaction on caliper.
	<b>1. Sliding ability caliper not given</b>	
	a) Sealings and caps of caliper guiding damaged	Re-order caliper guiding. Use original WABCO repair kits.
	b) Guiding pins corroded	
	c) Foreign bodies (stones etc.)	Remove foreign bodies, clean carrier seat with wire brush (be careful not to damage rubber boots).
	d) Axle flange flatness	Loosen brake carrier bolts on one side (1-2 turns are sufficient) and check caliper sliding ability again: ▶ If you are unable to slide caliper then replace the brake. ▶ If you are able to slide caliper then remove the brake and re-work the axle flange.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
V. Rotor heat cracks	2. Movement of brake pads and/or pressure plate not given	
	a) Corrosion or dirt in carrier seat	See I.1.c)
	b) Damaged groove / nose	Replace caliper.
	c) Foreign bodies (stones etc.)	See I.1.c)
	d) Hold-down springs or bracket damaged	Replace pad kit. Use original WABCO repair kit incl. hold-down system.
	3. Installation issues	
	a) Interference with surrounding parts (caliper travel limited)	Remove obstacles.
	b) Pipe and/or wire length not sufficient (full caliper movement not possible)	Relocate piping to help avoid any reaction on caliper.
	4. Pressure imbalance between truck and trailer	
	a) Trailer over braked	Check pressure distribution between truck and trailer. Determine rotor/drum temperature distribution between truck and trailer.  ▶ If imbalance detected: Take suitable corrective actions (e.g. adjust Foot Brake Valve (FBV), reduce trailer or truck pressure advance).
	b) Truck over braked	
	5. Loading condition	
	a) Check GVWR and GTWR.	Check GVWR and GTWR. GVWR = gross vehicle weight rating GTWR = gross trailer weight rating  ▶ If overloading issue detected: Reduce load.
	6. Altitude profile	
	a) Hilly region or long slopes will lead to a higher rotor temperature	Reduce vehicle velocity by choosing the right gear to increase engine braking effect during long slopes.
	7. Actuator	
	a) Parking brake actuator or piping leakage	Lift wheel and check by hand if wheel rotates freely (with parking ADB actuators in release position). On driving axles vehicles must be in neutral.  ▶ If not ok: Check actuator piping for leakage. ▶ If still not ok: Use release bolt to deactivate parking brake function. ▶ If ok: Replace parking brake actuator. ▶ If still not ok: See probable cause no. 8, symptom “Rotor heat cracks”.
	b) Push-rod pre-actuates ADB	Lift wheel and check by hand if wheel rotates freely.  ▶ If not ok: Disassemble actuator (measure pushrod protrusion max 15 ±1 mm(0.59 ± 0.04 in)). ▶ If ok: Replace actuator. ▶ If still not ok: See probable cause no. 8, symptom 5. “Rotor heat cracks”.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
V. Rotor heat cracks	<b>8. ADB adjuster</b>	
	a) Adjuster malfunction	<p>Lift wheel and check if it is rotating freely (by hand). If wheel is not rotating freely, remove actuator and check again. On driving axles vehicles must be in neutral.</p> <ul style="list-style-type: none"> <li>▶ If not ok: Replace ADB.</li> <li>▶ Remove hold-down system and measure lining gap with feeler gauge between outboard pad and caliper (ADB must be cold): <math>0.5 \text{ mm (0.02 in)} \leq \text{lining gap} \leq 1.2 \text{ mm (0.05 in)}</math> (too small lining gaps frequently result from measurement practice, corrosion and dirt. Repeat 2-3 times) Check adjuster function by de-adjusting (<math>180^\circ</math>) and applying service ADB with low pressure <math>\sim 2 \text{ bar} (\sim 30 \text{ PSI})</math> 10 times.</li> <li>▶ Check the function by observing the movement of the de-adjuster during ADB application (alternatively mark it and check before and after applying the ADBs). If adjuster is not functioning: Replace ADB.</li> </ul>
VI. Burned sealing	<b>1. Sliding ability caliper not given</b>	
	a) Sealings and caps of caliper guiding damaged	Replace caliper guiding. Use original WABCO repair kits.
	b) Guiding pins corroded	
	c) Foreign bodies (stones etc.)	Remove foreign bodies, clean carrier seat with wire brush (be careful not to damage rubber boots).
	d) Axle flange flatness	<p>Loosen ADB carrier bolts on one side (1-2 turns are sufficient) and check caliper sliding ability again:</p> <ul style="list-style-type: none"> <li>▶ If you are unable to slide caliper then replace the brake.</li> <li>▶ If you are able to slide caliper then remove the brake and re-work the axle flange.</li> </ul>
	<b>2. Movability of brake pads and/or pressure plate not given</b>	
	a) Corrosion or dirt in carrier seat	See I.1.c)
	b) Damaged groove / nose	Replace caliper
	c) Foreign bodies (stones etc.)	See I.1.c)
	d) Hold-down springs or bracket damaged	Replace pad kit. Use original WABCO repair kit incl. hold-down system.
	<b>3. Pressure imbalance between truck and trailer</b>	
	a) Trailer over braked	<p>Check pressure distribution between truck and trailer. Determine rotor/drum temperature distribution between truck and trailer.</p> <ul style="list-style-type: none"> <li>▶ If imbalance detected: Take suitable corrective actions (e.g. adjust FBV, reduce trailer or truck pressure advance).</li> </ul>
	b) Truck over braked	
	<b>4. Loading condition</b>	
	a) Overloading situation	<p>Check GVWR and GTWR.</p> <p>GVWR = gross vehicle weight rating</p> <p>GTWR = gross trailer weight rating</p>
	<b>5. Altitude profile</b>	
	a) Hilly region or long slopes will lead to a higher rotor temperature	Reduce vehicle velocity by choosing the right gear to increase engine braking effect during long slopes.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
VI. Burned sealing	<b>6. Actuator</b>	
	a) Parking brake actuator or piping leakage	Lift wheel and check by hand if wheel rotates freely (with parking brake actuators in release position). On driving axles vehicles must be in neutral. <ul style="list-style-type: none"> <li>▶ If not ok: Check actuator piping for leakage.</li> <li>▶ If still not ok: Use release bolt to deactivate parking ADB function. Replace parking brake actuator.</li> </ul>
	b) Push-rod pre-actuates ADB	Lift wheel and check by hand if wheel rotates freely. If not ok: Disassemble actuator. If ok: Replace actuator.
	<b>7. ADB adjuster</b>	
	a) Adjuster malfunction	Lift wheel and check if it is rotating freely (by hand). If wheel is not rotating freely remove actuator and check again. On driving axles vehicles must be in neutral. <ul style="list-style-type: none"> <li>▶ If not ok: Replace ADB.                             <ul style="list-style-type: none"> <li>▶ Remove hold-down system and measure lining gap with feeler gauge between outboard pad and caliper (ADB must be cold): <math>0.5 \text{ mm} \leq \text{lining gap} \leq 1.2 \text{ mm}</math> (too small lining gaps frequently result from lack of experience during measurement, corrosion and dirt. Repeat 2-3 times)</li> </ul> </li> <li>▶ Check adjuster function by de-adjusting (180°) and applying service ADB with low pressure (29 PSI) 10 times per wheel. Check the function by observing the movement of the de-adjuster during ADB application (alternatively mark it and check before and after applying the ADBs).</li> <li>▶ If adjuster is not functioning: Replace ADB.</li> </ul>