

SERVICE INSTRUCTIONS



HEALTH CHECK FOR YOUR AIR COMPRESSOR

Safety and Environmental Guidelines:

Note: The safety advice listed below is applicable to general service and diagnostic work on braking systems. Also observe any recommendations from the axle or vehicle manufacturer concerning towing, jacking-up and securing the vehicle.

CAUTION: KNORR-BREMSE IS NOT LIABLE FOR ANY INJURIES OR DAMAGES CAUSED BY IMPROPER USE OF SPECIFIED SERVICE KITS AND/OR SERVICE TOOLS. FURTHERMORE, MISUSE OF TOOLS OR INCORRECT INSTALLATION OR APPLICATION OF SERVICE KITS MAY RESULT IN DAMAGE OR POTENTIALLY UNSAFE VEHICLE OPERATIONS. IN THIS CASE, KNORR-BREMSE DOES NOT HAVE ANY WARRANTY OBLIGATIONS.

Before and during working on or around compressed air systems and devices, the following precautions should be observed:

- 1 Always wear safety glasses when working with air pressure.
- 2 Never exceed the vehicle manufacturer's recommended air pressures.
- 3 Never look into air jets or direct them at anyone.
- 4 Never connect or disconnect a hose or line containing pressure; it may whip as air escapes.
- 5 When removing or servicing a product, ensure all pressure related to the specific system it is contained in has been depleted to 0 bar. Be aware that if the vehicle is equipped with an air dryer system, it can also contain air pressure along with its purge reservoir, if fitted, even after pressure has been drained from the other reservoirs.
- 6 If it is necessary to drain the air pressure from reservoirs, etc., keep away from brake actuator push rods and levers since they may move as system pressure drops. On vehicles fitted with air suspension, it is advised when undertaking such work, to support the chassis from sudden lowering and therefore prevent any possibility of being trapped between the chassis and axle or ground.
- 7 Park the vehicle on a level surface, apply the parking brakes, and always chock the wheels as depleting vehicle air system pressure may cause the vehicle to roll.
- 8 When working under or around the vehicle, and particularly when working in the engine compartment, the engine should be shut off and the ignition key removed. Where circumstances require that the engine be running, EXTREME CAUTION should be taken to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components. Additionally, it is advisable to place a clear sign on or near the steering wheel advising that there is work in progress on the vehicle.
- 9 When working on vehicles equipped with air suspension, to guard against injury due to unexpected downward movement of the chassis caused by sudden pressure loss in the suspension system, ensure that the vehicle chassis is mechanically supported with a 'prop' between the chassis and the axle or between the chassis and the ground.
- 10 Examine all pipework for signs of kinks, dents, abrasion, drying out or overheating. Be aware that kinks in pipework may result in air pressure being trapped in the pipework and associated equipment. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems. Check the attachment of all pipework; it should be installed so that it cannot abrade or be subjected to excessive heat.
- 11 Components with stripped threads or damaged/corroded parts must be replaced completely. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle or component manufacturer.
- 12 Never attempt to install, remove, disassemble or assemble a device until you have read and thoroughly understood the recommended procedures. Some units contain powerful springs and injury can result if not properly dismantled and reassembled. Use only the correct tools and observe all precautions pertaining to use of those tools.
- 13 Before removing any device note its position and the connections of all pipework so that the replacement/serviced device can be properly installed. Ensure that adequate support or assistance is provided for the removal/installation of heavy items.
- 14 Only use genuine replacement parts, components and kits as supplied by Knorr-Bremse or the vehicle manufacturer. Only use the recommended tools as specified in related Knorr-Bremse instructions.
- 15 The serviced or replaced product must be checked for correct function and effectiveness.
- 16 If products have been dismantled, serviced or replaced, whose performance could affect braking performance or system behaviour, this should be checked on a roller dynamometer. Bear in mind that a lower performance may be experienced during the bedding-in phase if new brake pads/linings and/or brake discs/drums have been fitted.
- 17 The use of impact screwdrivers or impact wrenches in conjunction with Knorr-Bremse service tools for air disc brakes is not permitted. The service tools are not designed for such use. It is likely that the tools or the vehicle will be damaged and there is a serious risk of injury – see Caution on previous page.
- 18 Do not use compressed air to clean the disc brake. Avoid air contamination of brake dust.
- 19 Prior to returning the vehicle to service, make certain that all components and the complete brake systems are leak free and restored to their proper operating condition.

Welding

To avoid damage to electronic components when carrying out electrical welding, the following precautions should be observed:

- 1 In all cases, before starting any electrical welding, remove all connections from any electronic control units or modules, noting their position and the order in which they are removed.
- 2 When re-inserting the electrical connectors (in reverse order) it is essential that they are fitted to their correct assigned position - if necessary this must be checked by PC Diagnostics.



Disposal of Waste Equipment by Business Users in the European Union

This symbol on the product, packaging or in user instructions, indicates that this product must not be disposed of with other general waste. Instead, it is your responsibility to dispose of the waste electrical and electronic parts of this product by handing them over to a company or organisation authorised for the recycling of waste electrical and electronic equipment. For more information about arrangements for waste equipment disposal please contact your Knorr-Bremse distributor or local Knorr-Bremse representative.

CONTENT

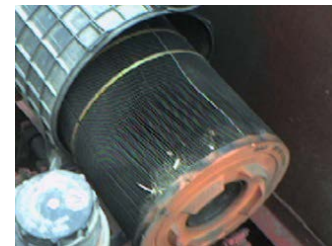
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Note:
 If you are having problems with an air compressor such as slow pump-up of the vehicle's air system (as a guide – more than 25% longer than when the vehicle was new) or excessive oil carry over then check the following.

1. Condition of the engine induction system

If the compressor takes its air from the engine intake system, in particular check the condition of the engine induction (intake air) filter. Check also the pipework of the engine induction system and correct any blockage or damage. Problems with the engine induction system can lead to excessive depression (vacuum) at the engine intake and at the compressor inlet leading to a potential increase in oil carry over from the compressor.



Check the condition of the engine air filter

2. Condition of the compressor induction pipe/filter

Check the pipework of the compressor inlet system for any blockage or damage. Correct any problems found. Any restriction in the compressor inlet pipework can lead to a potential increase in oil carry over from the compressor.

Any holes or splits in the pipework can lead to contaminated air being sucked into the compressor leading to premature wear. If the compressor uses a separate inlet filter then check the condition of this filter. Check the pipework of the compressor inlet system for any blockage or damage. Correct any problems found. Any restriction in the compressor inlet pipework can lead to a potential increase in oil carry over from the compressor.



Check there is no damage or crushing of the compressor inlet pipe

3. Duty cycle of the air compressor

The duty cycle of an air compressor is the ratio between the average time spent 'on load' (i.e. charging the air brake system) and the average time spent 'off load'. As a rule of thumb this should be less than 50% (i.e. less than 50% of the time on load). If the duty cycle is found to be high then check:

- System leakage – static leakage test
 - Chock the wheels of the vehicle and make sure there is no danger of it rolling away. Release the parking (hand) brake and, with the engine running, apply and release the foot brake until the compressor cuts in.
 - Charge the air system to maximum pressure (when the compressor cuts out). Switch off the engine and allow the vehicle to stand for two minutes then make a note of the pressures on the cab pressure gauges.
 - Leave the vehicle to stand for 30 minutes and check for any drop in pressure. If there is a drop in pressure in excess of 0.5 bar on any gauge then carry out a physical check for leakage on that part of the system. Correct any leakage found and repeat the test. Beware cab pressure gauges can be unreliable for small pressure changes and if in any doubt connect calibrated pressure gauges to the test points on the vehicle close to the reservoirs. Excessive system leakage will mean that the compressor will have to come on-load more often to replace the air which has leaked from the system.
- Unloader operation
 - The unloader, which is commonly built into the air dryer but can be a separate valve, controls the cut-in and cut-out of the air compressor and its operation should be checked against the information provided by the vehicle manufacturer.
- Blockage in the compressor delivery – see points 5 and 6

4. Condition of the air dryer exhaust

The condition of the air dryer exhaust is a good indicator of the presence of oil carry over from the compressor. Examine the exhaust from the air dryer (normally an exhaust silencer). If the surface of the exhaust and the surrounding area is covered by a light film of oil and road dirt this is normal. If it is covered with wet glistening oil and there is any sign of oil dripping from the exhaust then there is an oil carry over problem. If there is evidence of oil carry over then also check the exhausts of valves in the brake system to establish if any oil has reached these. If it has they will need to be serviced or replaced to maintain correct function of the braking system. Be sure to drain any oil and water from the air reservoirs.



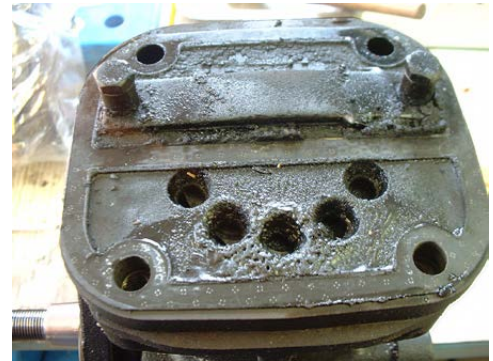
Normal air dryer exhaust



Exhaust with oil present

5. Condition of the compressor cylinder head and valve plate

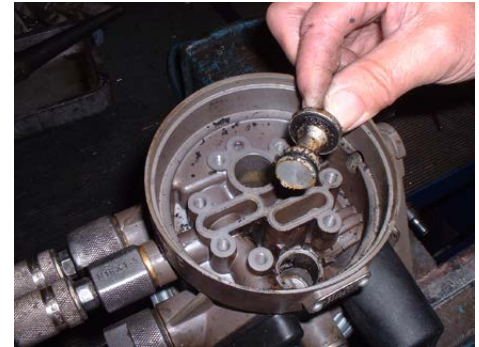
Look for any sign of leakage around the cylinder head and valve plate, particularly the gaskets. Replace any damaged gaskets. If you consider that the compressor is slow to charge the air system then there may be carbon blocking the cylinder head and/or delivery pipe (see point 6). If this is the case remove the cylinder head and valve plate and check for the presence of carbon. If there is significant carbon present then the compressor should be replaced as it is difficult to effectively remove these carbon deposits. It is important that the condition of the delivery pipe is checked (see point 6).



Carbon build up on valve plate

6. Condition of the compressor delivery pipe and beyond

Blockage of the compressor delivery pipe can lead to slow charging of the air systems, high compressor duty cycle and overheating of the air compressor leading to more carbon being generated. Blockages in the pipe will be worse at bends and so may be difficult to see. Blowing shop air down a delivery pipe is not an effective way of determining if the pipe is blocked. If in doubt, and particularly if carbon has been found in the cylinder head, replace the delivery pipe as chemical cleaning of the pipe is rarely satisfactory. If the delivery pipe is found to be blocked then there is a chance that there are carbon deposits in the air dryer – strip down and check.



Carbon build up in an air dryer

7. Condition of the engine oil and coolant

Ensure that the engine oil has been changed in accordance with the engine/vehicle manufacturer's recommendations. The use of contaminated oil (e.g. oil used beyond its recommended life) or oil of the wrong grade can lead to premature wear in the engine and air compressor. Check also that the engine's crankcase breather is not blocked as this will build up pressure in the compressor crankcase increasing oil carry over.

Check that the concentration of anti-freeze in the engine coolant is in line with the engine/vehicle manufacturer's recommendations. If the concentration is low then the boiling point of the coolant is lowered which can lead to localised boiling within the compressor cylinder head. If this happens then the coolant flow will be reduced or stopped leading to a worsening of the situation. Overheating of the cylinder head can lead to rapid carbon formation (see points 5 and 6).

8. Attachment of the compressor drive gear

If the pump up time for the air system is excessive check that the compressor drive gear is correctly attached to the compressor crankshaft and does not slip (modern compressors rely on the fit between the crankshaft and the gear and do not have a drive key). Check that the nut or bolt connecting the gear to the shaft is tightened to the correct torque and, if a bolt, check that the bolt does not bottom in the hole in the crankshaft.

If the gear has been found to slip and the compressor crankshaft is damaged then, when fitting the new compressor, check the fit of the gear in case it is worn (use of engineer's blue is advisable).

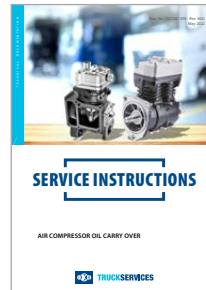


Unworn gear



Worn gear

For more information about oil carry over testing see Knorr-Bremse document Y037387.



WARNING!
Remember to use only genuine Knorr-Bremse spares when servicing your Knorr-Bremse compressors

Revision Details		
Rev. 001	May 2022	Complete redesign

KEEP IT RUNNING

Up-to-date information on our products can be found on our website truckservices.knorr-bremse.com



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