

AIR COMPRESSOR-AIR COOLED

Description

The single cylinder compressor is of the reciprocating type and is air cooled.

Lubrication is from the engine system, oil entering the compressor through a connection in the front cover and passing to the front cover bushes and through a drilled oilway in the crankshaft to the connecting rod bearing and then to the rear bush. The gudgeon pin and cylinder wall are splash lubricated. Surplus oil returns to the engine through the engine timing case.

The one piece forged steel crankshaft runs in bushes in the front and rear covers. The drive shaft end of the crankshaft is tapered and fitted with a key to accommodate the drive gear which is driven by the timing gears.

The piston connecting rod has a split thin wall bearing at the big end and a steel backed, lead bronze lined bush for the gudgeon pin. The piston is of orthodox design with two compression rings and scraper rings at the piston skirt. The fully floating gudgeon pin is positioned by a circlip at each end.

The cylinder head embodies the inlet and delivery valve assemblies. The inlet valve is a hardened and lapped circular steel disc, lightly sprung against a replaceable valve seat. The inlet valve spring is located by a spring guide, pressed into the head against the valve seat. The delivery valve consists of a square shaped valve disc which is held on the removable valve seat by the valve spring contained in the delivery valve cap.

Operation

Mounted above the inlet valve is an unloader mechanism controlled by a governor valve fitted in the air system. When the air reservoir pressure reaches 9,0 Bar (130 lb.in²) the unloader valve plunger is depressed and lifts the inlet valve off its seat, so that no further air is compressed. When air has been released from the system by a brake application and the air in the reservoir falls below 7,6 Bar (110 lb.in²) the plunger returns to its

original position and the inlet valve functions normally so that the compressor can recharge the reservoir.

During the down stroke of the piston, a partial vacuum is created above the piston, which unseats the inlet valve and allows air drawn from the air cleaner to enter the cylinder above the piston. As the piston starts its upward stroke, the air pressure under the valve, plus the action of the inlet valve return spring force, closes the inlet valve.

The air above the piston is further compressed until the pressure lifts the delivery valve and the compressed air is discharged through the line into the reservoir. On the piston down stroke the delivery valve reseats, preventing the compressed air from returning to the cylinder, and the same cycle is repeated.

When the pressure in the reservoir reaches the setting of the governor valve, compressed air from the reservoir passes through the governor into the cavity above the unloader piston in the cylinder head. The air pressure depresses the unloader piston which in turn lifts the inlet valve off its seat. During each upward stroke of the piston, air is merely passed back to the air cleaner. When the air pressure in the reservoir falls below the governor setting, the governor releases the air pressure above the unloader piston. The unloader spring lifts the unloader piston and the inlet valve spring returns the inlet valve to its seat and the compression of air is resumed.

Maintenance

Remove and clean the inlet air filter at the recommended service interval.

Check the tightness of all unions and pipe fittings. Check the tightness of the coupling bolts and mounting bolts.

Check the tightness of the cylinder head nuts with a torque wrench.

Remove the delivery valve cap, withdraw the seat and valve spring. Remove carbon deposits from the cap and the passage in the cylinder head. If carbon deposits are apparent in the delivery line, remove and clean the line. Also examine the non-return valve at the sensing reservoir. Refit the delivery line, spring and delivery valve cap.

At the recommended service interval, remove the cylinder head and valves, decarbonise, reseal or fit new valve as necessary, re-assemble, refit and test.

Fault Diagnosis

If the pressure in the air system is not maintained, or the air system is not recharged in a reasonable time, the fault may be an inefficient air compressor, but can also be due to carbon build-up in the supply line between compressor and sensing reservoir. Check the supply line and non-return valve before dismantling the compressor. If the compressor does not raise any pressure at all check that the unloader valve and inlet valve are free in the cylinder head.

Supply line — compressor to sensing reservoir.

Exhaust all air from the reservoir by repeated application of the foot control valve.

Disconnect the outlet at the compressor delivery port and the inlet on the non-return valve of the sensing reservoir.

Remove, clean and refit the non-return valve at the inlet to the sensing reservoir.

Check the supply pipe between compressor and sensing reservoir for build up of carbon. Clean out as necessary and confirm the free flow of air with the shop air line.

Air Compressor — Service Test

With the supply line disconnected at the delivery port, start the engine and run the compressor for two minutes to clear any accumulated oil.

Hold a sheet of white card 50mm (2 in.) from the delivery port for ten seconds. A light oil mist should be deposited on the card, confirming that the lubrication of cylinder and piston is adequate.

If a large patch of oil is deposited on the card, wear of the cylinder/piston/piston rings is indicated. Remove and overhaul the compressor.

Reconnect the supply line to the sensing reservoir and delivery port. Start and run the engine to recharge the system to governor pressure, or failing this, to the maximum pressure the compressor will attain.

Set the engine to idling speed and remove the connection at the inlet port of the compressor. If air escapes during the compression stroke the inlet valve, inlet valve seat and/or spring is faulty and must be rectified.

If the previous tests do not reveal any fault, remove the compressor cylinder head and connect an air line with 7 bar (100 lbf.in²) pressure to the delivery port. An escape of air indicates a defective delivery valve, valve spring and/or seat.

To Remove

Drain the air system by operating the foot control valve.

Open and secure bonnet.

Disconnect battery.

Remove engine cover in cab.

Remove left hand side insulation panel.

Remove front under tray.

Remove fibre shield if fitted (Two cross-head screws).

Disconnect the anti-freeze intake pipe (if fitted).

Disconnect the compressor air pipes, seal ends to prevent the entry of dirt and other foreign matter.

Disconnect and remove the oil feed pipe.

Remove the two nuts, spring washers and set-screws securing the compressor support bracket to the engine mounting bracket.

Remove four setscrews and spring washers securing compressor bottom plate, remove plate and gasket. This is necessary to provide sufficient space to remove long securing bolt.

Disconnect the dipstick tube at sump.

Remove eight bolts and spring washers securing compressor to timing case.

Withdraw and remove compressor.

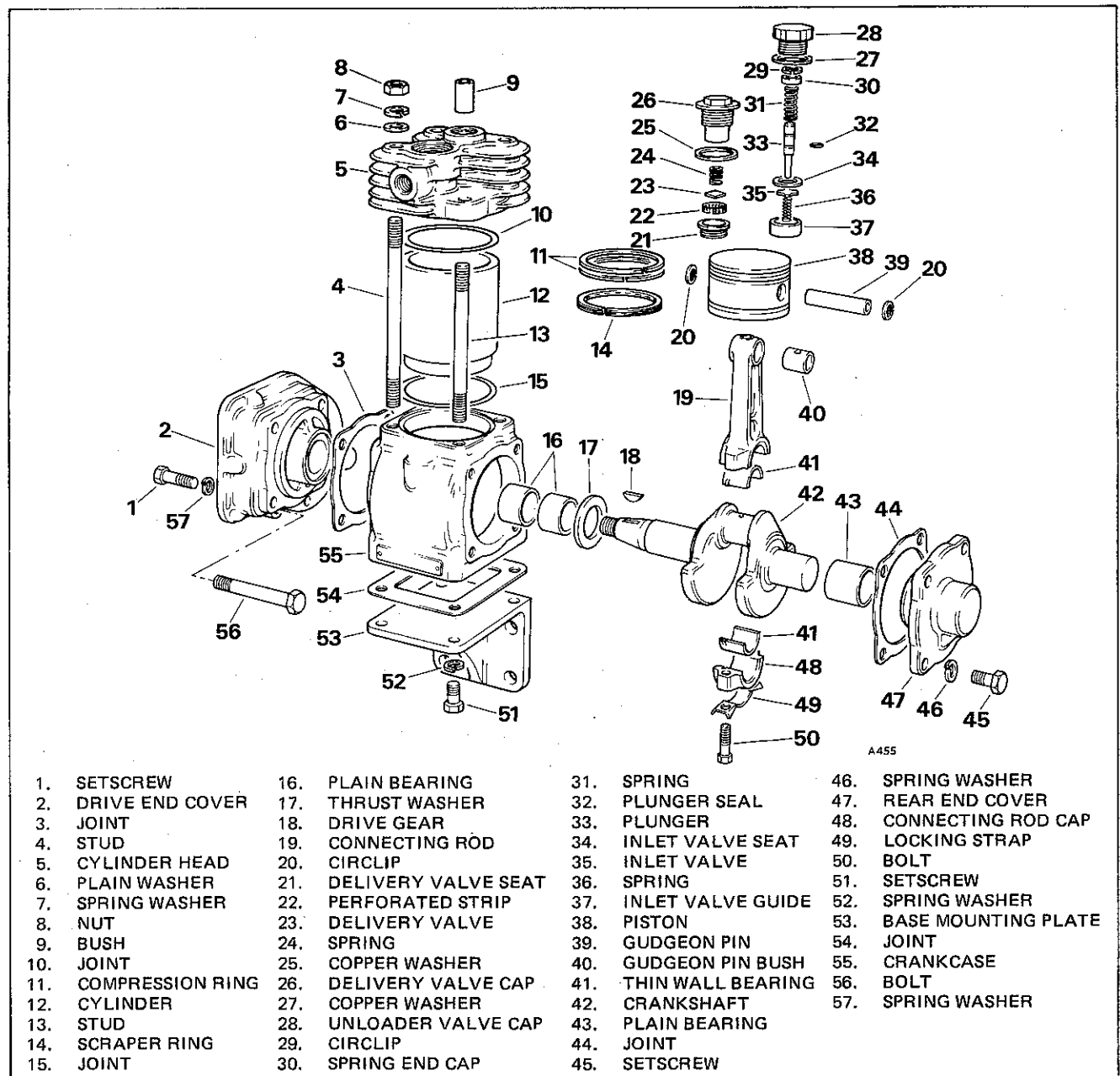


Fig. 1 Details of air cooled compressor.

To Dismantle

Before attempting to dismantle the compressor unit, the exterior should be cleaned of any dirt, grease or oil. The following items of the compressor should be identified to show the correct relationship for ease on re-assembly; the position of the cylinder head in relation to cylinder and crankcase, and the position of end covers in relation to crankcase.

Remove the air cleaner.

Remove the four cylinder head nuts and spring washers, remove head and joint.

Remove delivery valve cap, remove "O" ring from cap.

Remove spring and delivery valve.

Remove perforated locking strip and valve seat.

Remove the unloader valve cap and washer.

Withdraw the unloader plunger assembly and spring.

Remove the spring and spring cap from the plunger.

Remove the seal from the plunger, unless required the circlip can remain on the plunger.

Remove the inlet valve guide, staked in four places, remove the spring, inlet valve and seat.

Withdraw the cylinder and joint.

Turn the crankshaft to B.D.C. enabling the tabs of the locking strap to be released. Release the two bolts and remove the connecting rod cap.

Withdraw the piston assembly and replace the connecting rod cap.

Remove the piston rings from the piston. If it is required to remove the piston from the connecting rod, release one gudgeon pin retaining circlip and withdraw the gudgeon pin from the piston and connecting rod.

Remove the locknut and washer securing the crankshaft gear.

Using a suitable puller withdraw drive gear from crankshaft and remove key.

Remove four setscrews and spring washers securing the drive end cover.

Remove cover, joint and thrust washer.

Remove four setscrews and spring washers securing rear cover.

Withdraw rear cover and crankshaft, withdraw crankshaft from cover. Remove joint from cover.

Inspection and Overhaul

Clean all components in cleaning solvent and dry with compressed air. Ensure that all carbon is removed from the cylinder head. Check that the passages in the head, front cover and crankshaft are clear and clean.

Clean the inlet and delivery valves, where not damaged or excessively worn, by lapping them on a sheet of crocus cloth held on a flat surface.

Check the cylinder bore for excessive wear, ovality and scoring. If the ovality exceeds 0,041 mm (0.002in.) or the bore is tapered more than 0,076mm (0.003in.) the cylinder should be replaced.

Inspect the piston for scores, cracks or damage of any kind and renew if necessary. Check the fit of the piston rings in the ring grooves, clearances should be 0,127/0,635mm. (0.005/0.0025in.).

Install the rings in the cylinder bore and ensure that the gaps are 0,762/1,778mm. (0.003/0.007in.).

Check the fit of the gudgeon pin in the piston and the connecting rod. The gudgeon pin should be a light press fit in the piston, and the clearance in the connecting rod bush should not exceed 0,038 mm. (0.0015in)

Inspect the connecting rod bearing for the correct fit on the crankshaft journal. Clearance between the journal and the bearing must not be less than 0.025mm (0.001in) and not more than 0.076mm (0.003in.). Check the connecting rods for cracks or damage.

Inspect the crankshaft for wear and the key and keyway for damage.

Check that the crankpin diameter is within the limits of 22,200/22,187mm (0.874/0.8735 in.), if found faulty a replacement crankshaft and big end bearings should be fitted.

Examine the crankcase, end covers and mounting bracket for cracks and damage. Check the bushes for wear, the crankshaft should be a neat sliding fit in the front and rear bushes.

Inspect the cylinder head for cracks and the unloader valve guide bush for wear.

Check that the unloader plunger is a neat sliding fit in the guide and examine the unloader plunger seal ring for wear.

Inspect the inlet and delivery valves and seats. If it is found that the valves are grooved to a depth in excess of 0,0762mm. (0.003in.) where they contact the seat they should be renewed. If the valves are not severely grooved they may be re-faced on crocus cloth. Valve seats, if showing only slight scratches may be reclaimed by lapping with fine grinding paste. If the seats are badly pitted or scratched, use a seating reamer before lapping.

Renew the delivery valve spring and check the remaining springs for corrosion, fatigue or permanent set.

All joints must be renewed.

To Re-assemble

Lubricate all internal parts with clean engine oil to prevent possible damage until the oil supply is functioning.

Fit new joint to rear cover, install the crankshaft into the rear cover and then fit the crankshaft to the crankcase, securing the end cover after ensuring that the match marks and joint are correctly positioned.

Fit the front cover joint and thrust washer, ensuring the match marks are correct, check that the crankshaft rotates freely before fully tightening the cover setscrews.

Refit the key to the crankshaft keyway.

Refit the piston rings to the piston and then assemble the piston to the connecting rod. Fit the connecting rod to the crankshaft and tighten the bolts to the recommended torque before turning up the tabs of the locking strap.

Space the piston ring gaps and then assemble the cylinder together with the joint over the piston, ensuring the match marks are correct.

Position the inlet valve seat in the cylinder head, followed by inlet valve, spring and inlet valve guide. Secure the guide in the cylinder head by staking at four equi-distance positions.

Lightly smear the unloader plunger with Shell Silicone grease, fit the spring cap, spring and new seal to the plunger. Fit the assembly to the cylinder head and secure with the unloader valve cap and washer.

Fit the delivery valve seat, perforated locking strip, delivery valve and spring into the cylinder head. Secure with delivery valve cap and "O" ring.

Fit the joint to the cylinder and then fit the cylinder head ensuring the match marks are correct, tighten the nuts progressively to the recommended torque.

Line up the crankshaft drive gear with the key on the crankshaft and push onto crankshaft taper, secure with washer and locknut.

To Refit

Refitting is a reversal of the removal procedure. With the compressor running, check for noisy operation, oil and air leaks.

AIR COMPRESSOR - WATER COOLED

AIR COMPRESSOR – WATER COOLED

Description

The single cylinder water cooled compressor is similar to the air cooled type with the exception of the cylinder head and crankshaft. The cylinder head has a manifold with coolant passages which are connected by pipes to the engine cooling system. The crankshaft runs in a ball race and oil seal at the drive end and one plain bearing at the rear, when a power steering pump is fitted to the compressor two plain bearings are used at the rear. The cylinder, piston, connecting rod and crankcase are common to both types.

The dismantling of the cylinder head is different and is covered in the following text. The remaining dismantling procedure is similar to the air cooled compressor. For all other information, including testing and fault diagnosis, refer to Air Compressor – Air Cooled.

To Remove

Disconnect the battery.

Drain the air system by operating the foot control valve.

Open bonnet and secure.

Remove heater air duct.

Remove front undertray.

Remove right hand front insulation panel.

Drain the cooling system.

Disconnect the water coolant and air pipes at the cylinder head. Seal the pipes to prevent entry of dirt and other foreign matter.

Disconnect and remove the thermostat housing and gasket.

Disconnect the compressor oil feed pipe.

Remove bolt, cylinder head stay.

Remove nuts, compressor base bracket.

Slacken off belt tensioning adjuster.

Remove thrust pad adjuster.

Remove drive belts off pulley.

Remove compressor.

Cylinder Head – To Remove and Dismantle

Before attempting to dismantle the compressor unit, the exterior should be cleaned of any dirt, grease or oil. The following items of the compressor should be identified to show the correct relationship for ease on re-assembly; the position of the cylinder head in relation to cylinder and crankcase, and the position of end covers in relation to crankcase.

Remove the unloader valve cap and washer. Withdraw the piston assembly and spring.

Remove the four nuts and washers securing the cylinder head. Remove head and joint.

Remove the setscrews securing the base plate to the cylinder head.

Separate the two halves by tapping lightly with a mallet to break the joint. Remove the inlet and delivery valves with their springs, noting the relative positions.

Remove the joint and clean all surfaces.

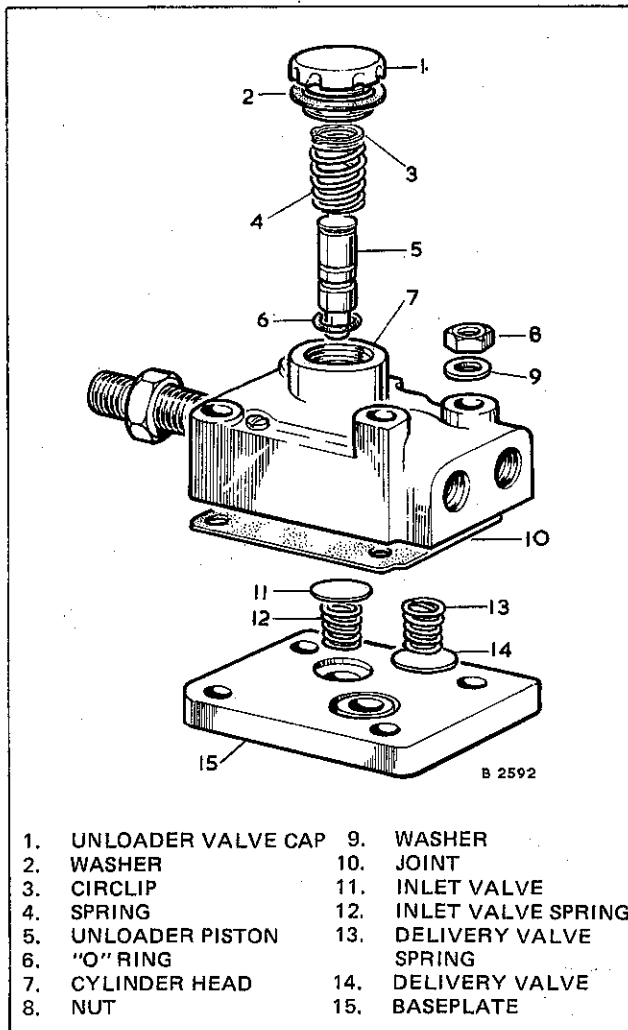


Fig. 2 Details of cylinder head

Inspection and Overhaul

Clean all components in cleaning solvent and dry with compressed air. Ensure that all carbon is removed from the cylinder head. Check that the passages are clear and clean.

Inspect the cylinder head for cracks, and the unloader valve guide bush for wear.

Check that the unloader piston is a neat sliding fit in the guide and examine the unloader piston seal ring for wear.

Inspect the inlet and delivery valve, and their seats. If it is found that the valves are grooved to a depth in excess of 0,08 mm. (0.003 in.) where

they contact the seat they should be renewed. If the valves are not severely grooved they may be refaced on crocus cloth. If the valve seats show only slight scratches they may be reclaimed by lapping with fine grinding paste. If heavily pitted or scratched a seating reamer may have to be used before lapping.

Renew the delivery valve spring, and check the other springs for corrosion or permanent set.

Renew the joint.

Cylinder Head – To Re-assemble and Refit

Fit a new joint to the base plate.

Lubricate the valves and springs with engine oil. Screw the springs into the tapered recesses in the cylinder head and base plate. Place the delivery valve in its recess in the base plate, and balance the inlet valve on its spring.

Insert a rod down through the guide of the unloader piston and press the inlet valve down into its recess in the baseplate to avoid it being trapped when the two halves are brought together.

Align the holes for the securing setscrews, press the base plate and cylinder head together to compress the delivery valve spring. Fit and tighten the setscrews evenly.

Lightly smear the parts of the unloader piston with Shell Silicone grease. Fit the sealing ring and spring on the piston and slide the piston into the guide. Screw in the unloader valve cap with the washer and tighten it securely.

Fit the joint to the cylinder and then fit the cylinder head ensuring the match marks are correct, tighten the nuts progressively to the recommended torque.

To Refit

Refitting is a reversal of the removal procedure, noting the following.

Ensure the drive belts are correctly adjusted.

With the compressor running, check for noisy operation, oil, water and air leaks.