Installation, Operating & Maintenance Manual

(Original Instructions)

DRUM

D9000 HOOK & CLAW COMPRESSOR

4991460001
September 2013

Gardner Denver

Form 1085

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EC Machinery Directive

2006/42/EC

DECLARATION OF INCORPORATION

Vehicle Discharge Equipment Comprising:

Machine Name:
D9000

Machine Assembly Number:
C9017xxxxxxx, C9027xxxxxxx, C9127xxxxxxx

Machine Installation /Operating Instructions:
4991460xxx, 4991340xxx, 4991510xxx

Is in conformity with the provisions of the following other EEC Directives:

N/A

Harmonised standards applied (including parts/clauses of):

N/A

The equipment above must not be put into service until the machinery into which it has been incorporated has been declared in conformity with the provisions of the directive.

Signed: B Thomas.

Date: 20TH JAN 2010.

Name: Barry Thomas

Position: Director Engineering (Gardner Denver Drum Ltd)
Being the responsible person appointed by the manufacturer.

See KP01 – 08 for information on completion

Contents

1. HEALTH AND SAFETY

Read this manual carefully before starting an Installation

Static electricity - Care should be taken to ensure, where necessary, that this and any other equipment is earthed in accordance with BS 5958 Part 1 1983 "Control of Undesirable static Electricity". (or other prevailing legislation in the country of operation). Powder / Air combinations are potentially explosive if not correctly earthed.

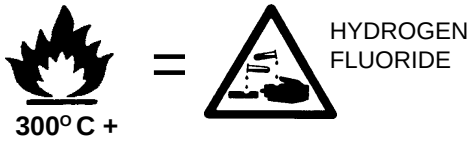
Drive line guards - Although care has been taken to avoid exposed rotating parts, It is the responsibility of the installer of the equipment to guard the exposed drive line in accordance with any prevailing safety legislation.

Never place your fingers into exposed inlet or outlet ports . If the rotors are turned, even by hand, serious injury could result.

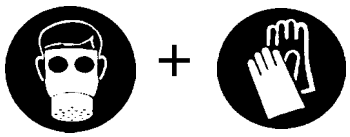
A relief valve must be fitted in the outlet pipework to protect the compressor which must vent away from the operator. A notice, warning of the danger of burns from vented air must be fitted near the relief valve. The relief valve is NOT intended to protect the tank from over pressurisation (this is the responsibility of the tank manufacturer

IN CASE OF FIRE

THIS PRODUCT CONTAINS
FLUOROELASTOMER POLYMERS (VITON)



IMPORTANT: Fluoroelastomer Polymer seals that have been exposed to temperatures of 300°C and above MUST not be handled with bare hands even when the seals have cooled down.



2. GENERAL DESCRIPTION

The D9000 compressor is an oil free hook and claw type compressor housed in an acoustic enclosure incorporating ancillary equipment. The unit is designed for the discharge of a wide range of bulk powders and granules.(A D9000 fitted with an after-cooler is available for the discharge of more heat sensitive products).

The D9000 is supplied in either Left Hand or Right Hand configuration to suit space availability on the vehicle to which the unit is to be fitted (refer to Fig 3A).

A Belt Drive can be fitted to allow the D9000 to be driven from a PTO (Power Take Off) rotating in either direction. On applications where drive from a PTO is not available, Drum can supply hydraulic and electric drives or a remote diesel engine (for trailer or static applications) Consult your Drum agent for appropriate drives.

Fig 1 shows a typical D9000 system package which features as standard:

- GRP acoustic enclosure and mounting bracket.
- Integral inlet filter.
- Integral Inlet and Outlet silencers.
- Relief Valve mounted on the Outlet Silencer.
- Check (Non Return) Valve mounted to the outlet port.
- Flange Pack and Air Inlet Pipe Kit.

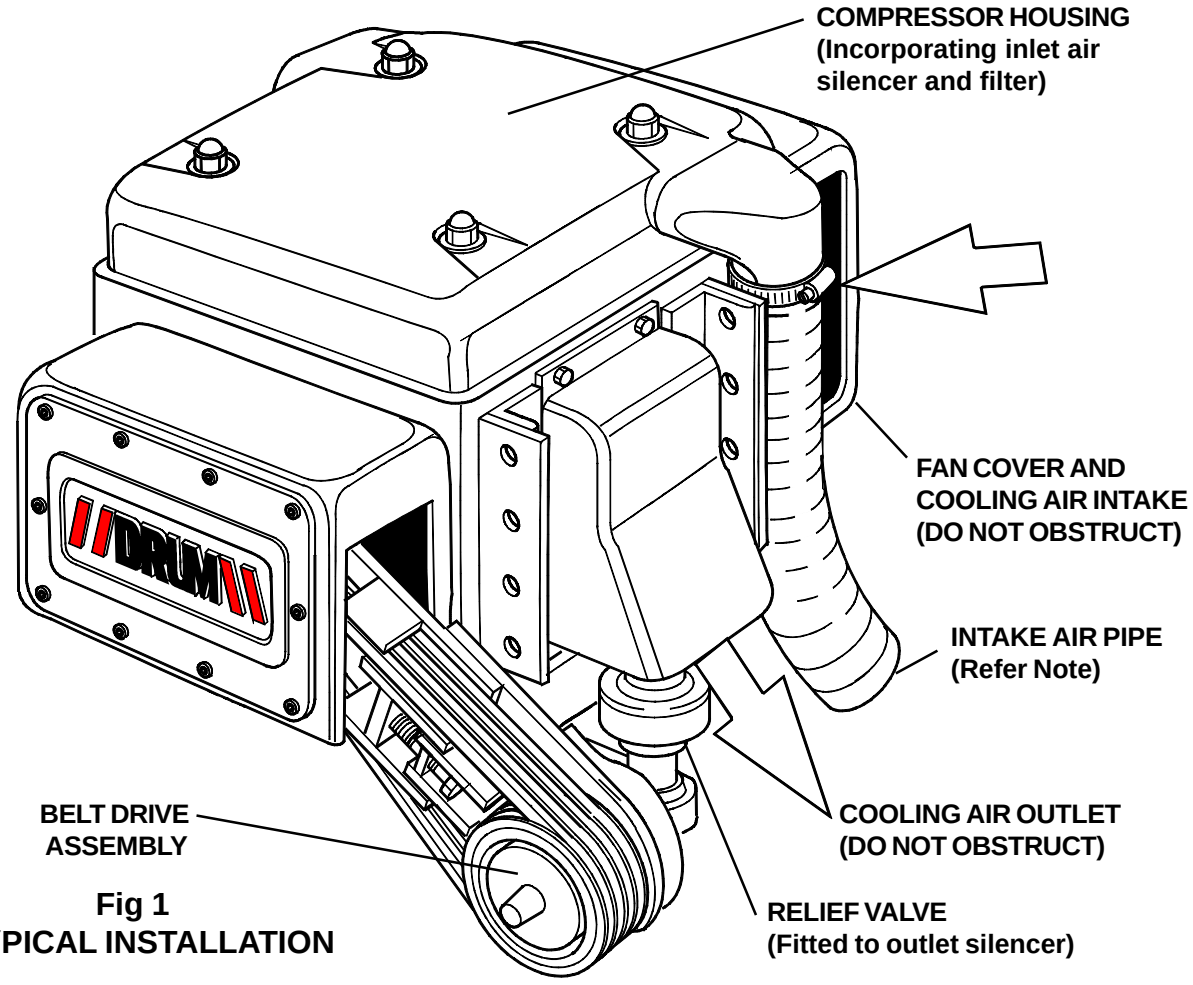


Fig 1
A TYPICAL INSTALLATION

Note: The free end of the Intake Air Pipe (89mm bore x 1 metre long) must be located in a position where it will be free from the ingress of water and other contaminants and the air supply is cool and dry. An alternative method is to connect the pipe to the vehicle air inlet stack with minimum of 100mm bore or fit a suitable rain hood. It is the responsibility of the installer to ensure that this meets the approval of the vehicle manufacturer.

2.1 Lifting and Handling

The D9000 unit weighs approx 300 Kg and should be lifted and installed onto the vehicle on its delivery pallet by fork lift truck.

2.2 Physical data.

The overall dimensions of the D9000 are shown in fig 2.

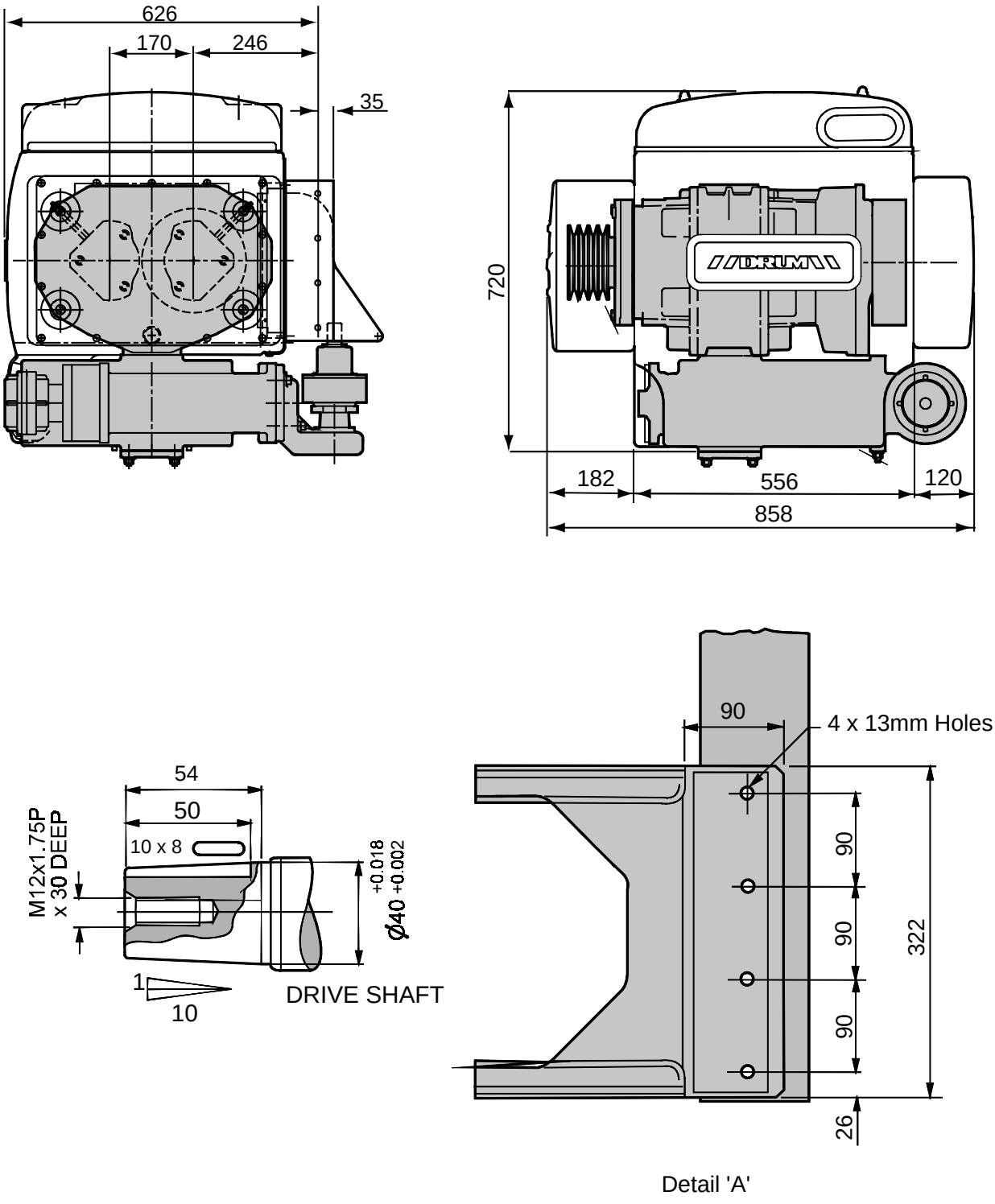


Fig 2
OVERALL DIMENSIONS

2.3 Orientation

The D9000 unit is supplied in either Left Hand or Right Hand configurations, Figure 3A shows how to identify Right or Left hand units.

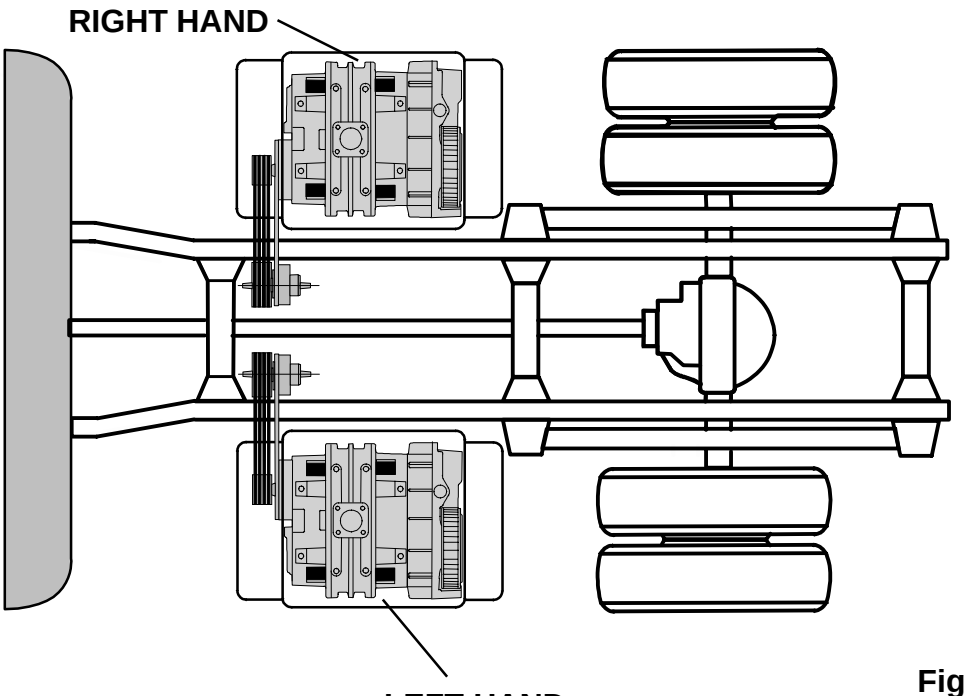
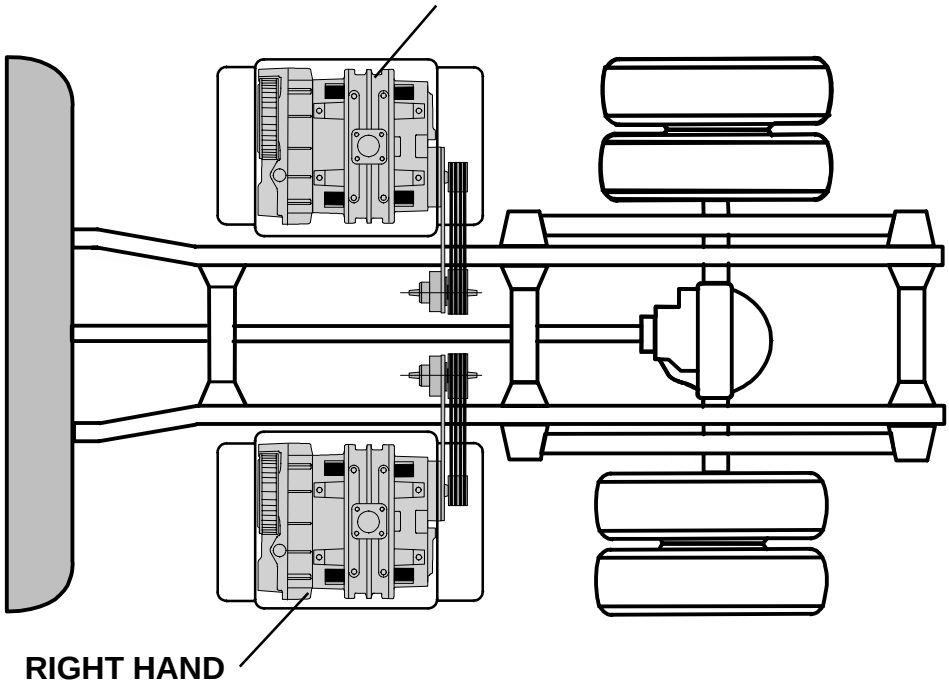


Fig 3A



The D9000 unit can be driven from either of the 2 input shafts provided that the direction of rotation of the compressor shafts is correct. Refer to the direction of rotation labels attached to the unit.(Fig 3B)

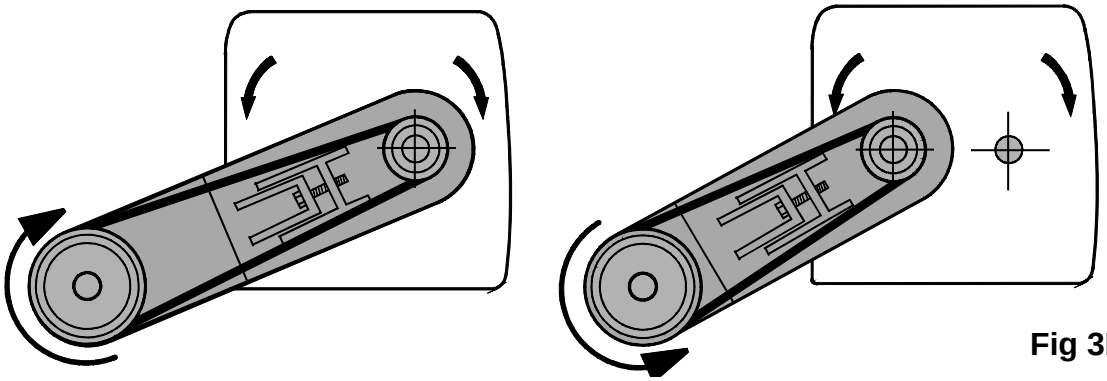


Fig 3B

3 INSTALLATION

When installing the D9000 unit the following must be checked:-

- The correct rotation of the D9000 rotors.
- The alignment of the D9000 drive and the vehicle PTO is within limits
- The cooling air inlet to the unit is unobstructed.
- The belt drive is installed and aligned correctly.

3.1 Power Requirements

The vehicle Power Take Off (PTO) should be rated for the full power consumption of the D9000 i.e. 60 Kw. at 3000 rpm input shaft speed (190 Nm. torque at the compressor input shaft) = 340 Nm at propshaft for standard 1. 78:1 Belt Arm

A belt drive capable of transmitting the required power and with a drive ratio to ensure an operating speed range of between 1800 and 3000 rpm for the D9000 is required. Consult your Drum agent for an appropriate belt drive.

3.2 Mounting

The D9000 should be attached to the vehicle chassis via two sections of channel (minimum 4" x 2" or 100 mm x 50 mm). The D9000 machine and bracket assembly can then be then be bolted to these channels using 8 off M12 bolts and lock nuts.

The axis of the D9000 must be parallel to the vehicle PTO shaft (see figure 5) this can be achieved by angling the channel. This may result in the D9000 unit being visually out of alignment with the vehicle chassis.

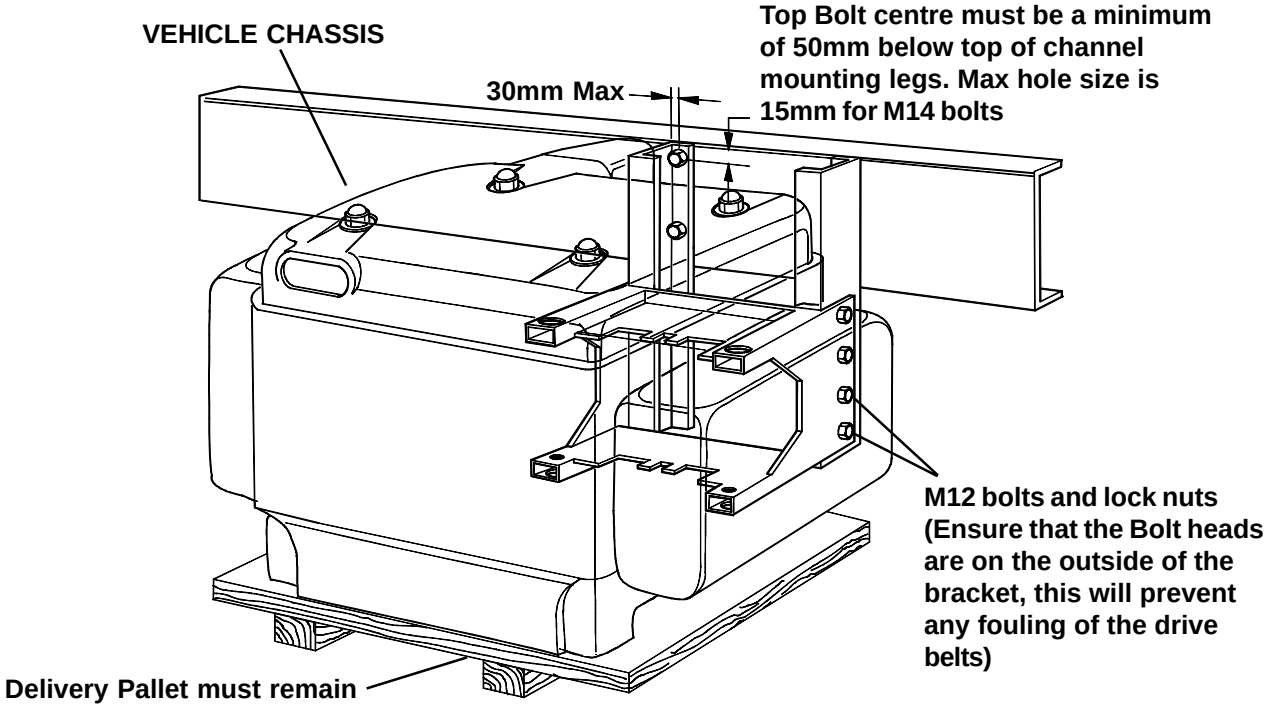


Fig 4

3.3 Alignment

The D900 input drive and the vehicle Power Take Off (PTO) should be parallel within 1 degree and positioned such that the linking drive shaft makes an angle of no greater than 12 degrees.
Note: Refer to PTO manufacturers literature when installing.

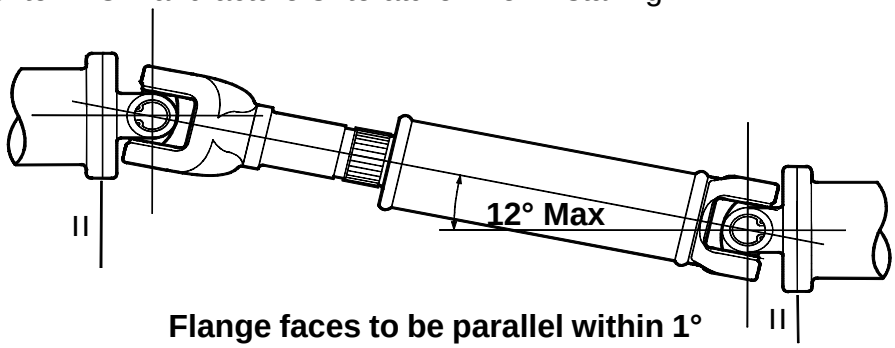


Figure 5

3.4 Belt Drive.

The D9000 unit is designed to be belt driven from the vehicle PTO. A belt drive unit suitable for the installation and capable of transmitting the required power can be ordered via your Drum dealer. Figure 6 shows the components of a typical Drum belt drive unit. The belt drive can be fitted to either of the two shafts on D9000 but the direction of rotation of the D9000 unit must be maintained **(see section 2.3).**

When ordering the belt drive the following information will be required:-

- The centre distance between the D9000 driven shaft and the PTO driver shaft.
- The angle of inclination of the belt drive to the horizontal.
- Required step-up ratio (standard is 1.78 : 1).

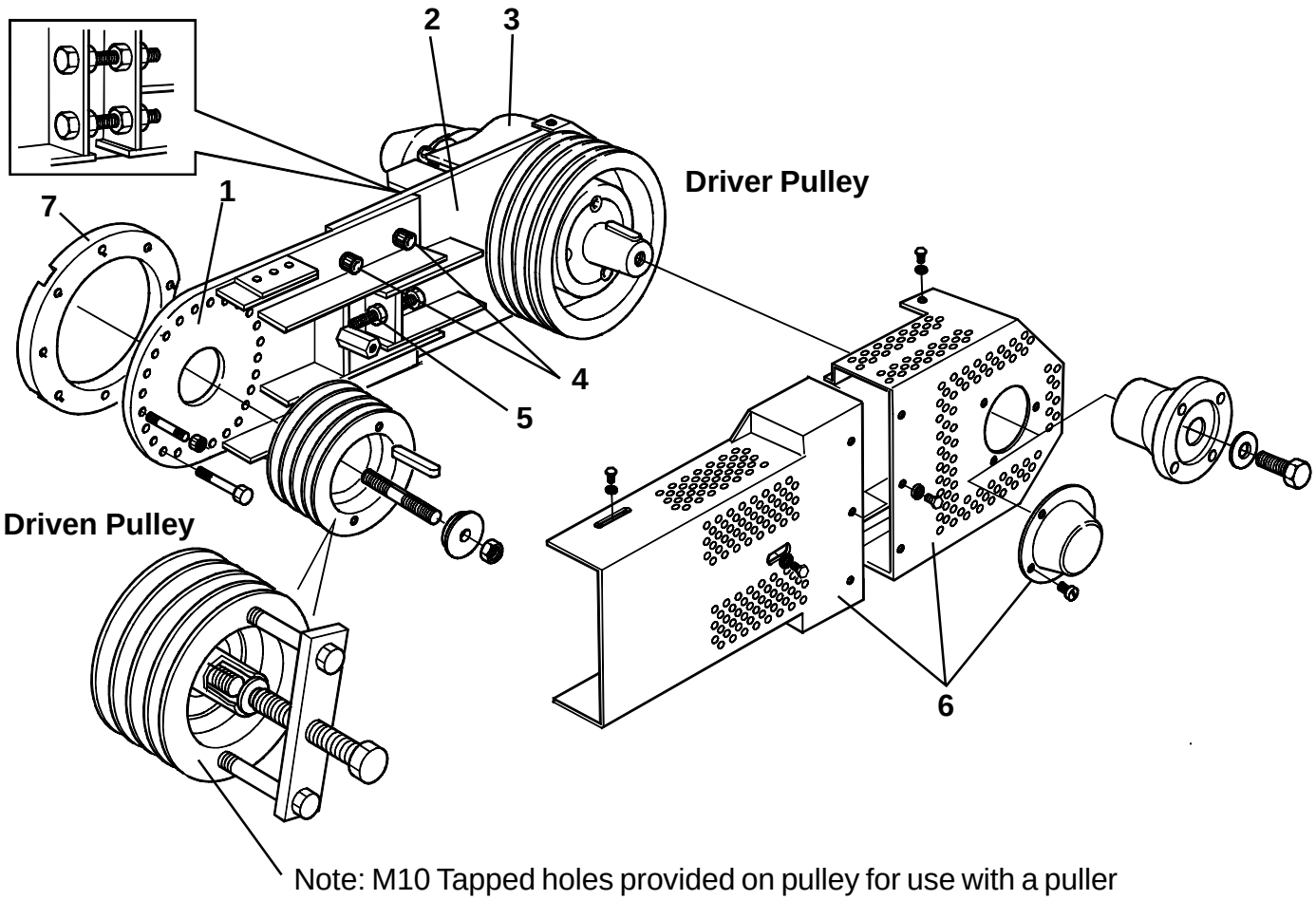
Belt Drive Installation.

The Belt Arm Assembly must be fitted **AFTER** the D9000 unit has been fitted to the chassis and not whilst the Compressor is on its delivery pallet. The pallet is not designed to allow the lifting of both Compressor and Belt Arm Assembly.

Assemble the inner Arm (1), Outer Arm (2), Outer Bearing Housing (3), and spacer (7) onto the D9000 compressor at the required side and angle of inclination. (Refer Fig 6, Page 8).
Note: The driver pulley is factory fitted in a mid position and may need adjustment when checking the alignment of the pulleys.

Fit Driven Pulley onto D9000 Drive Shaft using Shaft Key. Position pulley to acheive the best possible taper lock, and lock onto the drive shaft using the stud, securing nut and washer.

Loosen M10 setscrews (4**)** clamping the outer arm to the inner arm, slide the outer arm so the centre distance between the compressor and the bearing housing shafts is at a minimum. Re-tighten any two of the setscrews to hold this position.

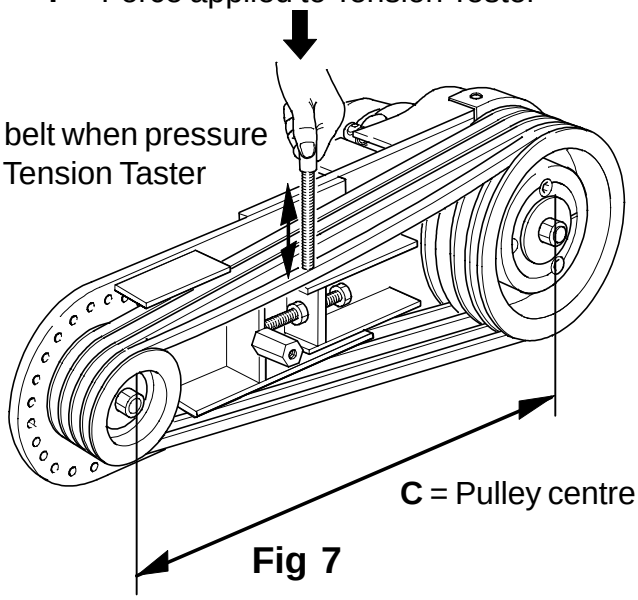


Note: M10 Tapped holes provided on pulley for use with a puller
A piece of steel tubing may be necessary to go over the stud

Fig 6

F = Force applied to Tension Tester

D = Deflection of belt when pressure is applied to Tension Taster



C = Pulley centre distance

Fig 7

		BELT TENSION VALUES					
C	mm	567	667	702	767	782	812
D	mm	5.6	6.7	7.0	7.6	7.8	8.1
F	N	40	40	40	40	40	40
	Kg	4.1	4.1	4.1	4.1	4.1	4.1
	Lbf	9	9	9	9	9	9

Fit the wedge-belts over the pulleys, loosen the two M10 setscrews which were tightened, and slide the outer arm away from the compressor so the wedge-belts are not slack.

Tighten all M10 capscrews (4**)** holding the outer arm to the inner arm to 40 Nm.

NOTE : The wedge-belts are not under tension at this stage.Use a straight edge check the parallelism of both shafts as follows:

Using the front face of the driver pulley as a base reference, place the straight edge so it sits flat against the full faces of the two pulleys.If the straight edge does not touch on both sides of each pulley, the shafts are not parallel.

Alter the bearing housing shaft to a parallel condition by adjusting the two M10 bolts behind the outer arm (inset fig 6) slightly bending the belt arm. Re-tighten to 52.5 Nm.

Re-check alignment until the compressor pulley touches the straight edge across the full face of each pulley. It may be necessary to re-align the Power Take Off end pulley by sliding it backwards or forwards on the shaft extension collar after loosening the taper lock bush.

Re-check the pulley alignment.

Re-adjust if necessary.

Tighten the tension belts as follows :

Loosen the M10 setscrews (4) clamping the inner arm to the outer arm and then tighten fingertight.

Using the M16 tensioning bolt (5), apply tension to the wedge-belts and using a belt tension indicator (Drum Part No. 648.20.00.000-2), apply the correct tension **(as shown in table fig 7)** at the mid-point of distance **("C")** with force **("F")** applied perpendicularly to the belt, which at the correct tension **(shown in Table fig 7)** should displace the belt by distance **("D")**

Tighten the M10 setscrews holding the inner arm to the outer arm, to 40 Nm.

Re-check the alignment of the pulleys and if necessary, readjust the bolts behind the outer arm to bring the pulley faces back into alignment.

Re-check the belt tension and adjust if necessary.

Re-tension the wedge-belts after 30 minutes running time and check tightness of all fastenings.

Fit Cover(6) to Belt arm assembly. (Refer Page 10 and Fig 8 for fitting instructions)

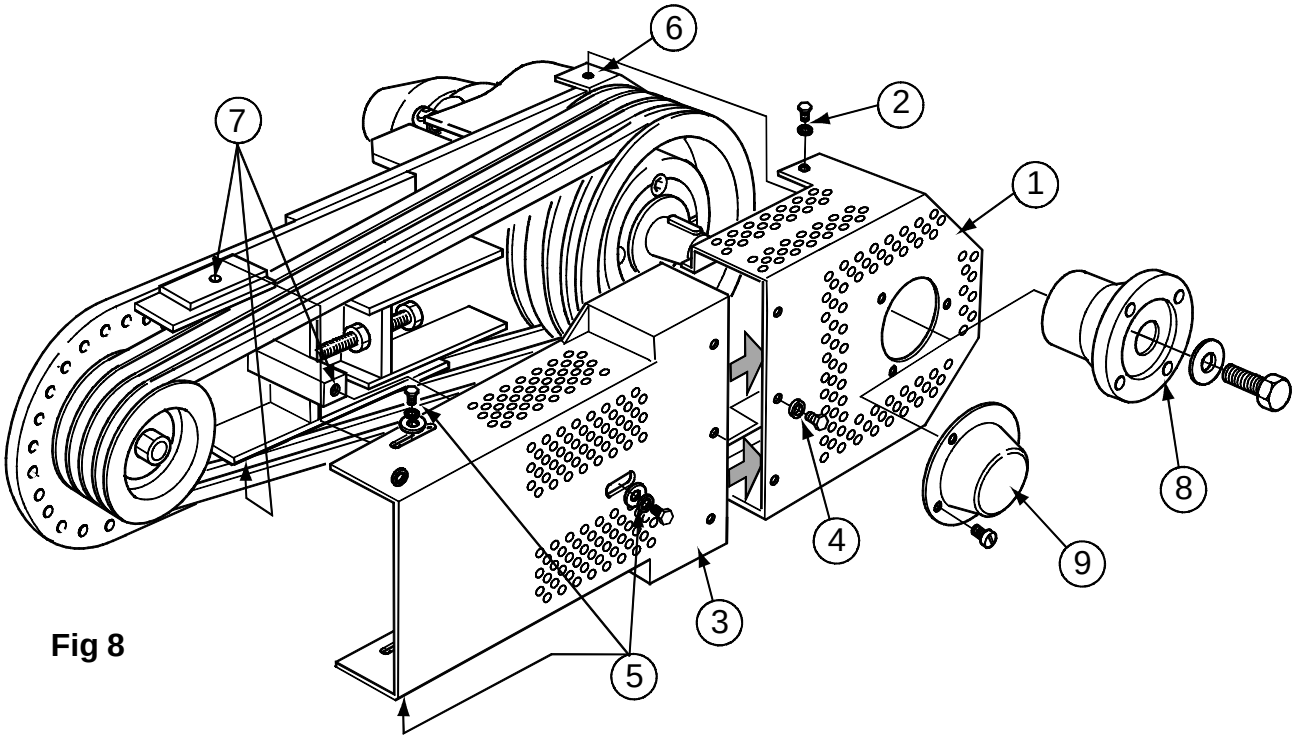


Fig 8

• Attach outer belt guard (1) to belt drive mounting bracket (6) using three M6 x 16 setscrews and shakeproof washers (2).

• Slide inner belt guard (3) inside the outer guard until the three attachment holes line up with each other, then secure both guards together using three M6 x 16 setscrews and shakeproof washers (4).

• Secure inner guard to the three mounting points (7) provided on the belt drive assy and secure with three M6 x 16 setscrews, shakeproof washers and plain Form C washers. (5).

• Depending on the direction of drive, either attach the companion flange (8) to the drive shaft and secure or fit the shaft guard (9) using three M6 x 16 setscrews and shakeproof washers.

3.6 Ancillary Equipment

3.6.1 Relief Valve.

The D9000 unit must never be operated without the integral relief valve.

The relief valve must be capable of venting the full flow of the compressor, at a maximum pressure of 2 bar g.(Please contact your Drum supplier for more information). The relief valve must be mounted to vent away from the operator and a warning label must be attached near to the relief valve, warning of the danger of burns by hot air venting.
The relief valve must vent direct to atmosphere.

3.6.2 Integral Inlet air filter.

A pleated aluminium or paper type inlet air filter is fitted to the D9000 unit to prevent the ingress of any material that could damage the machine
(Refer to page 13 for replacement details).

3.6.3 Check Valve.

A check valve is fitted into the outlet silencer discharge port to prevent reverse rotation of the unit which can be caused by pressurised air in the vehicle's tank.

3.6.4 Silencers.

An outlet silencer is integral with the unit and is situated underneath the compressor.
An inlet silencer is built into the lid assembly.

3.6.5 Discharge filter (not supplied).

Drum can supply an inline micronic discharge filter (Rated at 5 microns) to remove contaminants in the discharged air. Filters of this type are essential for use with foodstuffs. When fitted, discharge filters should be fitted after any valves in the system.

3.6.6 Discharge pipework.

The discharge pipework can reach temperatures of 200 degrees Celsius.
It is recommended that all discharge pipework be guarded and a warning label attached to warn the operator of the danger of burns.
Combustible material must not come into contact with the discharge pipework.
Where possible the discharge pipework should be isolated from direct transmission of vibration to the vehicle chassis.

4 OPERATING INSTRUCTIONS

4.1 Safety

To avoid the risk of burns, **do not touch pipework or stand next to venting valves.** If there is a risk for any reason we recommend the use of heat resistant gloves/clothing.

For safe use, the maximum speed should not exceed 3000 rpm and the maximum pressure should not exceed 2.0 bar gauge.Where the operator will be subject to prolonged exposure to noise, it is recommended ear-plugs should be provided. Drum International's own tests show noise levels for the D9000 to be between 88 to 90 dB(A) at above operating figures

4.2 Starting the compressor

Check that the Power Take Off is **disengaged** then start the engine.

NOTE : The D9000 should not be started against full discharge pressure. Depressurise by operating the pressure relief valve before starting the D9000 unit.

Set the engine speed to tick over.

Depress the clutch and allow a minimum of 5 seconds for the gears to stop rotating.

Engage the PTO.

SLOWLY release the clutch.

Check that the D9000 is producing air.

Set the engine speed to give a compressor operating speed between 1800 rpm and 3000 rpm as required.

NOTE : Avoid starting and stopping the compressor against pressure.

Return engine speed to tick over before disengaging the PTO.

5 MAINTENANCE INSTRUCTIONS

5.1 Routine Maintenance

The service intervals stated below are based upon intermittent usage of the D9000 unit, with total operating time of less than 5 hours/ day. For continuous operation, or operation at high temperatures, a more frequent and more rigorous service schedule is required. Consult your Drum distributor for details.

Monthly	-	Inspect Air Filters. Check oil Level in Gearcase.(Page 13) Check security of mounting bolts. Check Drive Belt tension.(Page 9)
3 Monthly	-	Check Relief Valve operation.(Page 13)
6 Monthly	-	Inspect Inlet Air Filter, Clean or replace if necessary.(Page 14)
Yearly	-	Replace Air Filter.(Page 14) Change Gearcase oil.(Page 12-13) Grease Bearing Housing Caps.(Page 14)

5.2 Draining the Gearcase Oil

To change the gearcase Oil:-
Remove the GRP cover by removing the four dome nuts and washers. (Fig 9) and withdraw the cover.
Remove the 3/8'' B.S.P. plug (Fig 9) and washer and drain the oil into a suitable container

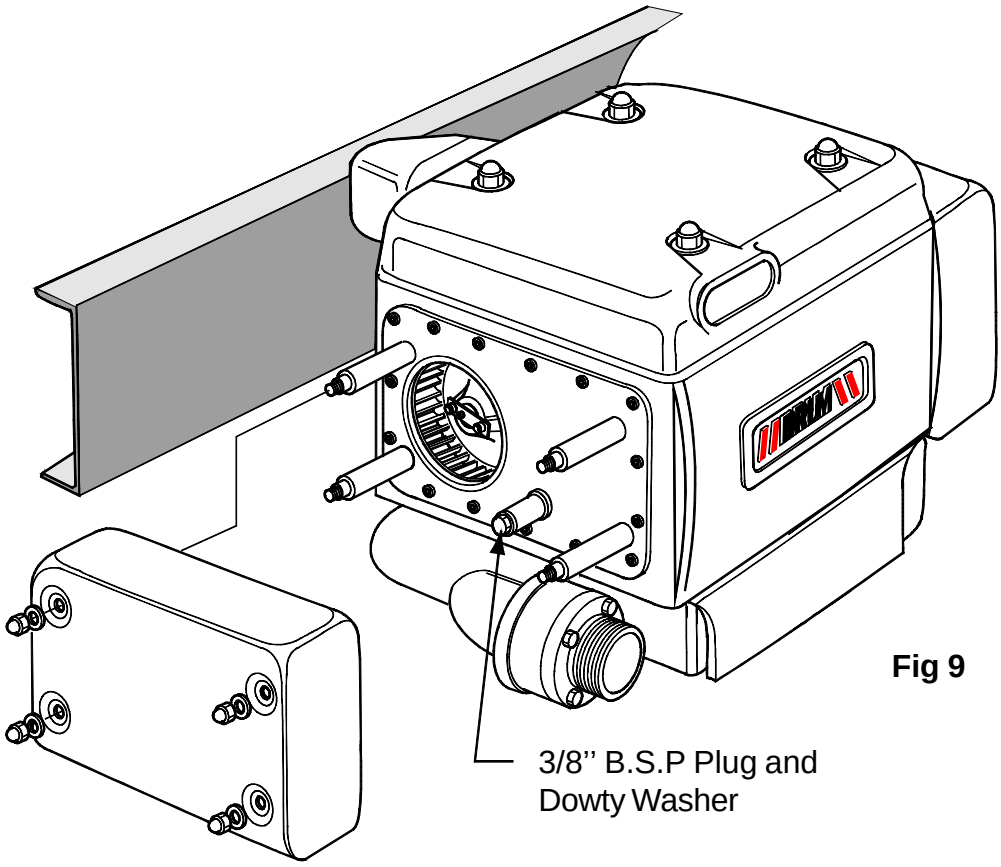


Fig 9

5.3 Refilling and checking the oil level.

To change the oil first drain the machine as described in section 5.2 then remove the 4 dome nuts and washers securing the top GRP cover. Remove the combined oil filler/dip-stick and pour approx 1.75 litres of replacement oil (Refer chart on this page for recommended oils) through the oil filler tube. Check oil level after allowing to settle, do not allow oil level to be above the maximum mark on the dipstick.(Fig 10)

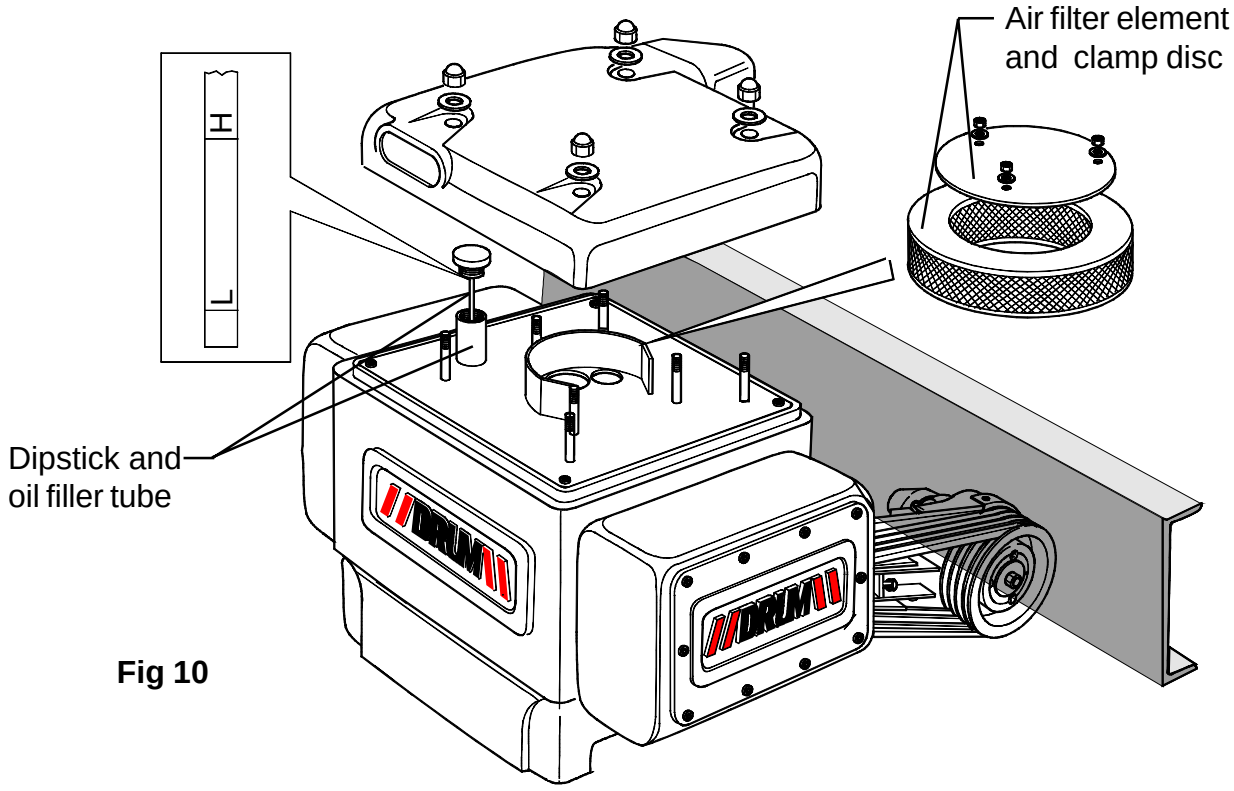


Fig 10

RECOMMENDED OILS

Gearbox oil suitability chart - Gearbox capacity 1.75 litres - ISO 220 (SAE 90) Synthetic oil

BURMAH CASTROL	ELF OIL	SHELL OILS	MOBIL OILS
ALPHASYN T220	REDUCTELF SYNTHESE 220	SHELL TIVELA WB	GLYGOYLE 30

5.4 Relief Valve.

A relief valve is fitted into the discharge pipework and its operation should be checked at regular intervals This can be achieved by the follwing procedure:

- Fit a gate valve and pressure gauge into the discharge air pipework downstream of the relief valve.
- Start the compressor with the gate valve open and bring the compressor up to speed. Slowly close the gate valve and check that the pressure on the on the gauge does not exceed the pressure setting of the relief valve.
- When the 'crack' pressure is reached, close the gate valve completely and observe the reading on the gauge when the valve reaches full by-pass, (This reading should match the setting that is stamped on the hexagon at the base of the valve).
- If the reading exceeds 0.2 bar above the set pressure, the relief valve is defective, and the test procedure must be stopped immediately. The valve must be replaced before running the compressor again.

Slowly open the gate valve and stop the compressor.

This procedure should be carried out every three months to clear the valve seat and check the valve is functional. (Ear Protection is recommended).

5.5 Changing the Air Filter

To change the Air Filter, remove the top GRP cover and Filter Clamp Disk (Fig 10).
The element can then be lifted out and replaced. Paper elements (Part No. 6289992000-2) should be changed every 6 months.
Pleated aluminium elements (Part No 6289892000-2) should be inspected every 6 months and any blockage can be blown out with a compressed air line.

IMPORTANT: When the element has been removed, ensure that nothing can fall into the machine through the inlet port.

5.6 Greasing the Drive Shaft Bearing Caps

To grease the drive shaft bearing caps it will be necessary to remove the GRP cover plate (Fig 11) by unscrewing the 10 socket head screws. Two 'elbow' type grease nipples are located on extension shafts above the drive shafts / bearing caps. Drum recommends they are greased (Aeroshell No.5) once a year or every 500 hours of operation, whichever is the sooner. When applying grease it is important to note that old grease followed by the new will be expelled past the shaft seals when bearing housings are full. Ensure that this excess grease is cleaned off to avoid contamination of the drive belts.

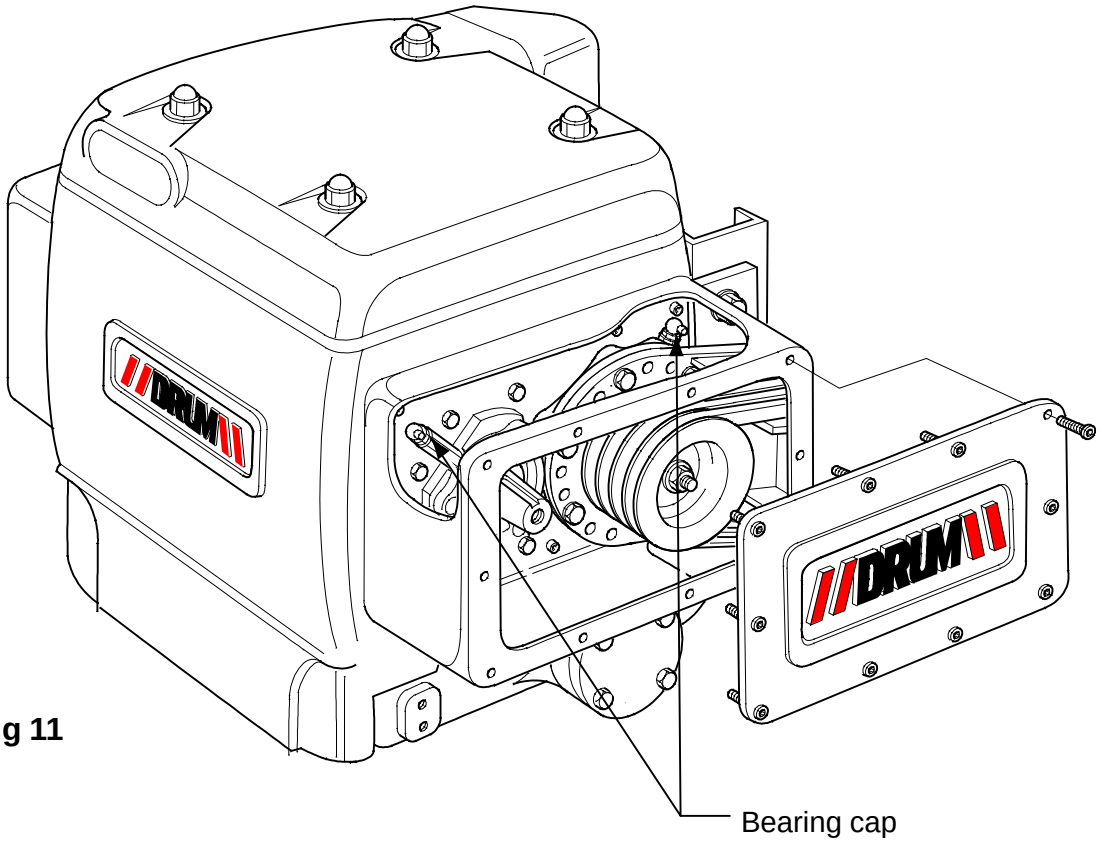


Fig 11

Contact Us

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