



# **Installation Operation Maintenance Instructions**

## **Model D12 – D32 Rotary Blowers Vacuum Pumps and Natural Gas Compressors**

Serial Number

Site Location

Installation Date

	<b>Page</b>
General .....	3
Operating Principle .....	3
Health and Safety .....	4
Technical Specification .....	5
Packaging .....	5
Storage .....	5
Handling .....	6
Installation .....	6
Pre Start-up Checks .....	8
Start-up .....	8
Protective Devices .....	8
Operating Notes .....	9
Stopping Procedure .....	9
Lubrication .....	9
Maintenance .....	10
Troubleshooting .....	11
Check Blade Wear .....	11
Blade Inspection .....	12
Reassembly after Blade Inspection .....	12
Cylinder Renewal .....	12
Change Bearings and Seals.....	13
Reassembly .....	13
Spare Parts .....	14
After Sales Service .....	14
Spare Parts List .....	15
Warranty .....	16

### **Warning**

Read the installation and maintenance information before commencing work on this equipment. Your attention is drawn to the health and safety information on page 4. Until the equipment into which the machine has been incorporated and the said equipment declared to be in conformity with the Machinery Directive, they must not be put into service.

### **Foreword**

The D series rotary compressor has been developed based on many years of experience in the compressor and vacuum pump industry. Using modern design techniques and production methods coupled with rigorous testing and high quality standards ensure this series of machines have a long, efficient and reliable service life.

These operating instructions have been written for all personnel who have responsibility to the machine, it contains all the necessary information required for the machine to have a long trouble free service life. This manual must be stored near the machine and read before attempting any work on it.

Ensure that all operation and maintenance is only performed by competent and trained personnel and any repairs use only original parts from the manufacturer

**General**

The normal routine of running the machine is very simple. If it is carried out strictly at all times, many years of trouble free service can be expected.

We emphasise two points of paramount importance-

- 1. Filtration of incoming air of gas
- 2. Lubrication

If possible provide a logbook so that the operator can enter daily readings. After several months a record will show whether the machine is performing as it did originally. If readings are to be taken the following are all that is required. Inlet and outlet air temperatures, suction conditions and grease level.

A typical layout for the log book is shown in the table below.

Machine Log Book				
Date	Inlet Gas Temp.	Discharge Gas Temp.	Inlet Conditions	Grease Level.

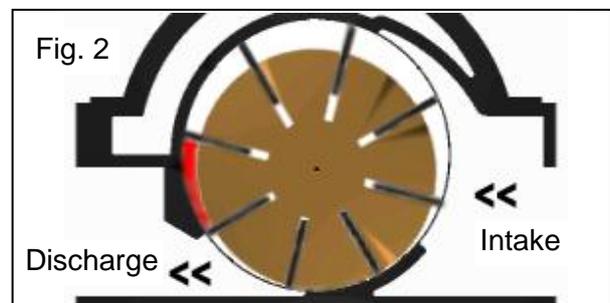
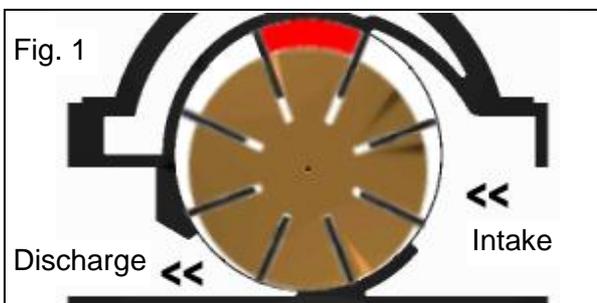
**Operating Principle**

Rotary sliding vane compressors and vacuum pumps are multi-cell machines, which work on the displacement principle. They provide a constant, low-pulsation supply of air or gas.

The machines have a cylindrical bored housing. The rotor, which is also cylindrical, is fitted eccentrically in the cylinder so that a crescent-shaped working chamber is formed. Movable rotor vanes are fitted in the longitudinal grooves in the rotor; centrifugal force and the force of the air or gas presses the blades against the cylinder-housing wall when the rotor turns.

The vanes divide the crescent-shaped working chamber into cells of different sizes. As the rotor turns, the cell volume on the intake side increases, and the cell draws air in at low pressure, at which point is open to the intake delivery line. As the rotor continues to turn, the cell is closed (see fig 1) and the volume of the cell decreases. This causes the enclosed air or gas to be compressed (see fig 2) and forced out through discharge delivery line under atmospheric pressure.

The machine can only be run in one direction, which is indicated by an arrow on the cylinder. The direction of rotation must not be reversed.



Read the installation and operating instructions carefully.

Rotating machinery and pressurised components, which may contain toxic, flammable or otherwise hazardous media are potentially dangerous equipment if not operated and maintained correctly. It is imperative that all users of such equipment fully educate themselves to the potential dangers and satisfy themselves that the personnel responsible for installing, testing, commissioning, operating and maintaining the plant are competent to do so. Instruction manuals are provided for guidance but must assume some basic level of competence by users. If there are any doubts or ambiguities concerning correct procedures, ask Utile Engineering. **DO NOT TAKE RISKS.**

Certain machinery can generate high levels of noise which can be harmful if exposed to it for lengthy periods of time. Various codes of practice are in existence and users must ensure that adequate precautions are taken to prevent a health hazard to employees or third party.

Equipment with internal pressures above or below ambient pressures can create a hazard. Before attempting to investigate problems, service or maintain equipment, it must be safely depressurised or pressurised to ambient conditions. Also since the gaseous medium may be flammable, toxic, corrosive or otherwise hazardous it may be necessary to purge the installation with an inert gas, such as nitrogen. Special precautions are necessary for certain gases and the user must ensure that adequate procedures are implemented.

Moving parts of machinery must not be touched and all such parts must be adequately guarded. Suitable guards are provided and must be securely retained in position at all times.

Before commencing maintenance, servicing or making other adjustments, the prime mover and other equipment must be isolated electrically or otherwise immobilised to prevent accidental start-up. In this vein, a fully qualified electrician should carry out all electrical work and all electrical equipment should be isolated before it is touched and pneumatic or hydraulic controls depressurised and made safe. Procedures must also exist to ensure that electrical or other inputs cannot be restored accidentally during the maintenance or service period.

Safety trips, emergency stop-buttons and other such devices (if fitted) are to be checked regularly to ensure that they continue to function correctly and will protect the installation and personnel in the event of an emergency.

NO attempt should be made to touch the machine whilst it is rotating. Particular care is needed when checking rotor clearances. Any movement of rotors may trap fingers.

Most machines, certain pipes and ancillaries become hot during operation whilst certain machines with sub-zero inlet temperatures may result in very cold surfaces. If it is possible for personnel to come into contact with such surfaces unknowingly or accidentally they should be guarded.

If severe vibration is observed, the cause of this should be immediately investigated and the situation rectified. Excessive vibration can lead to fatigue and other failures. Similarly, if during operation a significant change is noticed in the level of vibration, noise, temperature or any other parameter, the cause of such changes must be determined, and the cause rectified. Inlet filters must be inspected regularly so that liquid or debris is not allowed to enter the machine, which could cause damage and consequently injury to personnel.

During routine maintenance, coupling alignment should be checked for misalignment.

Only approved lubricants must be used and quantities, etc must be checked regularly.

Before restarting after servicing, all nuts, set screws, etc must be checked for tightness, check all joints, for leaks and carry out purging as necessary before introducing the process gas. Also, before start-up, check the machine inlet and outlet isolating valves are open both non-return valves (if fitted) are the correct orientation.

Adjacent pipework and equipment must not impose undue forces and moments on the machinery flanges.

All welding work must be carried out by an approved gas coded welder.

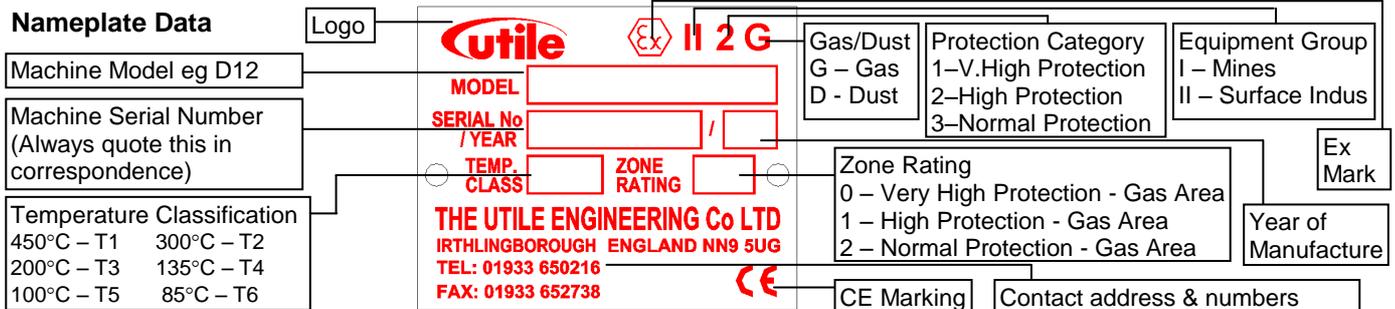
In order to prevent reverse rotation of machines, it is **ESSENTIAL** that a non-return valve be installed in the inlet pipework. Otherwise a hazardous situation can arise during a normal shutdown or if the prime mover power supply is interrupted for a period of time.

The environment around the installation may need to be monitored in order to detect gas leaks etc., and consideration must be given to the installation of gas detecting equipment, and the class of electric equipment.

All personnel working in or passing through the area should be adequately warned by signs and trained to exercise appropriate safety precautions. Ensure the correct personal protective equipment is worn at all times.

### Technical Specification

The model, machine serial number, year of manufacture, temperature class and zone rating for the machine appear on the machine data plate, other machine data can be found in the following table.



	Units	D12	D18	D26	D32
Maximum Pressure	Bar	1.40	1.40	1.40	1.40
Maximum Vacuum	kPa	75	75	75	75
Speed - Maximum	R.P.M.	1800	1800	1800	1800
Speed - Minimum	R.P.M.	900	900	900	900
Volume at 1 Bar at Max. Speed (Air)	m3/hr	15.2	24.4	35.3	43.5
Volume at 1 Bar at Max. Speed (Nat Gas (SG=0.6))	m3/hr	12.6	20.3	29.4	36.5
Volume at 50 kPa at Max. Speed (Air)	m3/hr	19.5	29.5	42.2	51.8
Absorbed Power at 1 Bar at Max. Speed (Air)	kW	1.1	1.6	2.6	3.2
Absorbed Power at 1 Bar at Max. Speed (Nat Gas)	kW	1.0	1.5	2.5	3.1
Absorbed Power at 50 kPa at Max. Speed (Air)	kW	0.8	1.1	1.4	1.7
Maximum Ambient Temperature	°C	40	40	40	40
Surface Temperature at Max. Press. at Max. Speed (Air)	°C				
Moment of Inertia	kg m2				
Noise Level at 1 metre	db (A)	80 - 90	80 - 90	80 - 90	80 - 90
Weight	kg	14	18	22	21

Note: Machine must not be used on any other gas than originally specified. Utile Engineering must be consulted if traces of any other gas are introduced into the machine.

### Packaging

The packaging conforms to the relevant regulations. The symbols used on the packages are shown on the right. The machines are bolted down on a pallet and therefore should not move during transportation and either cased or shrink wrapped for general protection. The ancillary components are packed suitably within the case. The packaging and contents should be received in good condition. When unpacking do not remove the inlet/outlet protection covers. The contents should be inspected against the advice note, notify Utile Engineering within 3 days of any items, which are damaged or are missing, followed by a written claim within seven days of the goods being delivered.



Top /  
This Way Up



Fragile

### Storage

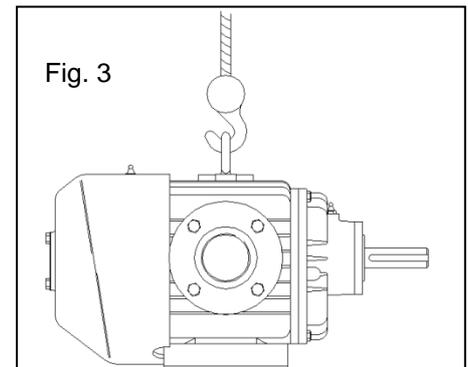
If the machine is not required for immediate installation, the machine should be stored in a clean, dry area protected from the weather. The intake and discharge port covers must remain in position until the machine is installed. We recommend that the shaft be turned a few revolutions by hand to ensure the machine is running free every month until the machine is installed.

The green protective coating on the shaft remains effective for approximately 1 year. If the machine is stored for a longer period of time, the coat must be renewed.

## Handling

Skilled personnel working in accordance with safe working practices must carry out the lifting of machines. Before lifting the correct equipment must be available. Cranes, jacks, slings, and lifting beams must be capable of carrying the weight of the machine to be lifted. The lifting eyebolt situated in the top of the cylinder and a crane hook must be used when lifting or moving the machine (see fig 3). Do not use the machine ports or the shaft extension for lifting or moving the machine.

For weights see above in Technical Specification.



## Installation

Before commencing installation, a site specific risk assessment, method statement and hazard identification list must be completed and adhered to. All work must be carried out in a safe area. Utile Engineering trained personnel or those trained to an equivalent standard should carry out installation, any claims for damage due to faulty installation will be void. The machine is delivered ready to be connected, with only the removal of the intake and discharge protection covers. All warning labels and instructions must be observed and retained with the machine. Before installation, ensure there is no damage to the machine and that it turns freely by hand.

Typical tools required for installation include: -

Set of spanners	Pipe Wrenches	Set of screwdrivers	Hacksaw
Hammer / mallet	Drill (low voltage)		

Typical bolt tightening torques are: -

Bolt Tightening Torques			
Size	Torque	Size	Torque
M4	4.00 Nm	M12	70.00 Nm
M5	6.00 Nm	M16	100.00 Nm
M6	10.00 Nm	M20	150.00 Nm
M8	18.00 Nm	M24	250.00 Nm
M10	40.00 Nm		

## Location

The machine should be installed in a clean, dry, well-ventilated area. Allow adequate space and facilities for service, inspection and future expansion. A minimum of 0.75m of working space around the machine is recommended. Adequate space around the motor and machine, particularly any fan inlets, is also necessary to facilitate cooling airflow. If several machines are installed in close proximity, care must be taken to ensure there is no recirculation of exhausted warm air.

## Foundation

Simple slab type foundations, designed for static loadings only are satisfactory. The foundations should raise the machine to a reasonable height above the floor for convenient service and inspection. The use of anti-vibration mounts between the base and foundation are recommended, these absorb the vibrations generated by the rotating parts of the machine and insulate it against any vibration in the surrounding environment. Ensure that the anti-vibration mounts are evenly loaded. Foundation bolts should fix the base.

## Electrical Supply and Connection

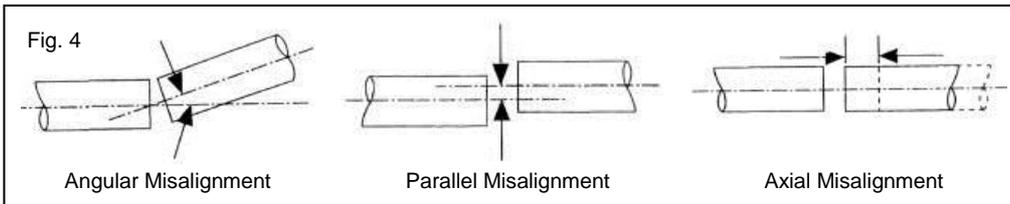
The voltage rating of the supply must be compatible with the motor and the fittings. All electrical installation must be carried out by a qualified electrician and in accordance with current regulations and within the framework of the Electricity of Work Regulation 1990. Ensure all electrical connections, plugs, sockets etc are secure before switching the supply on.

## Earthing

It is important that the motor enclosure is soundly earthed by metallic earth continuity conductor, or by separate earth bonding, but in all cases the installation must be made and tested and approved for this feature by a qualified installer before the supply is applied to the motor.

## Fitting Pulleys and Couplings

These should be bored to our standard limits (details supplied upon request) and fitted to the shaft with a screwing motion. On no account should they be driven on. Tapping of fitments onto the machine shaft with a hammer or mallet, causes bearing damage. This results in an increase in bearing noise and a significant reduction in bearing life. Attention should be paid to the guarding of all moving parts.



### Drive Alignment

The rotor shaft must always be horizontal. There are three basis modes of misalignment, these are angular, parallel and axial (shown in fig. 4).

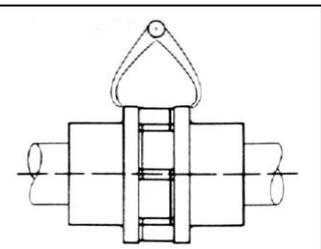
### Flexible Coupling

1. Remove any dirt, oil, etc. from all mating surfaces. Place bush in hub and match half holes on both shafts.
2. Place setscrews loosely in threaded holes. Mount assembly in desired position on shafts.
3. Tighten setscrews. Place disc/flexible coupling in position, and bring the shafts together obtaining the manufacturers assembled length for the coupling given in their instructions.
4. To check for angular alignment: (see fig. 5)  
Rotate the coupling through 90° and measure the distance between the faces. Repeat adjusting the shafts until four identical measurements are obtained.  
To check for parallel alignment: (see fig. 5)  
Place a straight edge across the coupling. The hubs will be in correct alignment when the straight edge contacts the 4 points squarely.

### Drive Belts

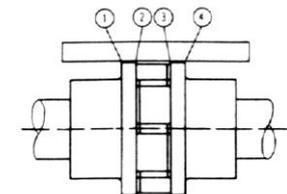
1. Remove any dirt, oil, etc. from all mating surfaces. Place bush in hub and match half holes on both shafts.
2. Mount assembly in desired position on shafts ensuring both shafts are parallel and in correct alignment, use a straight edge, a correctly aligned drive will contact both pulleys squarely (see fig. 6).
3. Fit driving belts. Measure span of belts between tangent points of the two pulleys. A deflection of 1.5mm is obtained for every 100mm of the measured span. Compare the deflection force required with the table. If the force required is according to the table then the tension is suitable. Too little force indicates under-tension and visa-versa.
4. The belts should be tensioned towards the high side, to allow for the tension drop after the belts have been run-in. Belt tension should be checked daily in the first week after installation/renewal.

Belt Section	Force Required to deflect belt 1.5mm per 100mm span (kgf)
SPZ	0.5 to 0.8
SPA	1.0 to 1.5
SPB	2.0 to 3.1
SPC	4.1 to 6.1

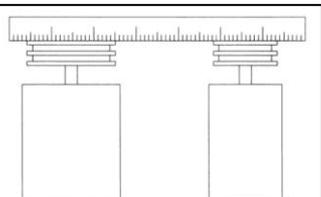


Angular Alignment Check

Fig. 5

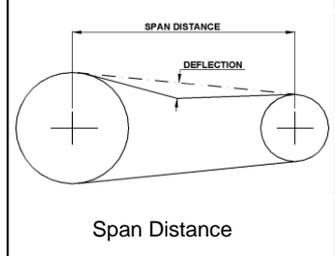


Parallel Alignment Check



Correct pulley alignment

Fig. 6



Span Distance

### Warning:

**Excessive tension on the pulleys will damage the bearings and lead to a probable shaft rupture.**

**Belts, which become charged electrostatically, must not be used in hazardous atmospheres.**

### **Pipework**

- The connecting pipework must be completely clean, dry and free from internal rust or scale.
- When fitting the intake and discharge pipework it is essential that adequate supports be provided and that it is properly aligned to prevent excessive strain being placed upon the machine, flexible pipe should be placed in the pipeline to remove this strain. The pipe diameter must not be smaller than the machine intake.
- During installation take care to ensure that no foreign matter enters the machine or serious damage may result.
- An intake filter must be fitted into the intake side to prevent any particles from entering the machine.
- Use P.T.F.E. tape only as a jointing medium since surplus from jointing compounds will damage the blades if drawn into the machine.
- When the machine is delivering into or exhausting from a receiver, or working with a system having a large storage capacity, it is essential to fit a non-return valve in the pipework, preferably on the intake side to prevent the machine from running in reverse on shutdown.
- Arrange both the intake and discharge pipework so that any condensate flows away from the machine.
- If user is installing their own protective switches and devices these must be suitable for operation in the zone classified.
- All pipework and fittings must comply with IGE/UP/2 or the national standard for the country of installation.
- Adequate filtration must be incorporated downstream to prevent carbon dust from damaging any plant equipment.

### **Pre Start-up Checks**

Before starting the machine for the 1st time after installation, maintenance or a long downtime, make the following checks:

- ✓ Ensure all the anchor bolts for the machine, base and motor are securely fastened.
- ✓ Check that the machine is free running by turning the shaft by hand through a few revolutions.
- ✓ Flick start the motor to check that the direction of rotation agrees with the arrow on top of the machine cylinder. Note this should be completed with the coupling/drive belts removed.
- ✓ Recheck coupling/drive alignment and retension (see page 7).
- ✓ Ensure all equipment is installed and earthed in accordance with current legislation.
- ✓ Check all piping connections.
- ✓ If the system is to be pressure tested, all gauges and pressure switches must be isolated or removed. Maximum purge or pressure test is 1.50 times the working pressure.
- ✓ Check all protective devices ensuring they are working correctly.
- ✓ Ensure personnel are adequately protected from accidental contact with all dangerous equipment.
- ✓ Instruct the operating personnel that the machine is operational.

### **Protective Devices**

All pressure and temperature switches must be set and tested at the desired set point by simulating the set point in actual operation.

With the machine running at the duty pressure after warming up, adjust the discharge temperature switch downwards to actuate and stop the machine. Reset the switch at the cut out temperature plus 10°C - 15°C in order to avoid false tripping from small and reasonable increases above normal levels.

Inlet low-pressure switches are wired normally open and set no lower than 10mbar. Outlet high-pressure switches are wired normally closed, adjust the switch in the same manner as the temperature switch and reset at working pressure plus 10%. The pressure proving switch may be wired normally open or normally closed to make or break your circuit, the set pressure should be just below actual operating pressure.

After the first 50 running hours, the inlet filter, clean and replace. If a large amount of debris has been collected run for a further 50 hour period repeating the process until the filter remains clean.

### **Start-up**

Proceed as follows: -

- i. When starting compressors the intake valves are fully open. Compressors can usually be started against normal discharge pressure. When starting vacuum pumps the intake can be closed to reduce the starting power and then slowly opened as the machine reaches operating speed.
- ii. Some compressors are piped with a manual start-up bypass valve from discharge to intake, for pressure equalisation during startup, This must be fully opened before startup.
- iii. Start the drive motor and bring the machine up to operating speed.
- iv. When full speed is reached slowly close the manual start-up bypass valve.
- v. Check all protective devices and controls making sure they are working correctly.

**Operating Notes**

- After the initial running in period, check the belt tension. Belt squeal denotes a loose belt that requires tightening.
- After the initial running in period, check belt tension. Belt squeal denotes a loose belt that requires tightening.
- Inspect the filter fitted to the inlet, regularly clean and renew the element when necessary.  
Excessive discharge temperature for normal operation as indicated by the rise in temperature shown in the logbook indicates inadequate cooling, faulty lubrication or a dirty intake filter. The machine should be stopped and inspected.
- Check the machine internally for wear every 10,000 running hours. (see Inspection and Service)
- The blade depth should be checked after the initial 2,000 running hours and thereafter every 5,000 running hours for wear and renew if the rubbing tips have worn to a depth of 21mm D12-26 or 24mm on D32. (see Check Blade Wear).  
Condensate if allowed to enter the machine can cause severe blade wear.
- Regrease both bearings at 1,000 running hour intervals giving **ONE** stroke of a grease gun.
- If machine is on a standby service, run for a few minutes each week.

**Stopping Procedure**

Proceed as follows: -

- i. Trip out or Stop the drive motor.

**Lubrication**

The recommended grade of grease is **Shell Albida R2** the typical physical characteristics are shown on the right.

The quantity and relubrication times cannot be exactly specified as the grease consumption depends on the operating conditions of the machine and on the environmental conditions. In general the bearing housing volume should be filled up to 1/2 of the free volume.

Note: if lubrication is excessive, bearing self-heating takes place with an increasing bearing temperature over time. However, if the lubrication is correct after an initial increase the temperature decreases.

<b>Shell Albida Grease</b>	<b>R2</b>
<b>Base Oil (type)</b>	Mineral
<b>NLGI Consistency</b>	2
<b>Kinematic Viscosity</b> @ 40°C cSt 100°C cSt (IP71/ASTM-D445)	100 11.3
<b>Dropping Point</b> °C (IP132)	260
<b>Max. Operating Temp.</b> °C (peak)	150 (180)
<b>Min. Operating Temp.</b> °C	-20

## Maintenance

Fully trained and competent staff must carry out any maintenance work. Utile Engineering offers contract maintenance services if required contact our service department.

When carrying out any maintenance and inspections always follow the health and safety guidelines on page 4.

A regular correct maintenance plan is essential to good operational reliability and a long service life for your machine. As operating conditions vary, no exact timings can be specified for wear checks, repairs and inspections, however the following plan can be used as a guide until time scales to better suit the machines environment are found.

The machine, ancillaries and surrounding area should be kept as clean as possible.

Ensure all items are properly held and supported during all aspects of maintenance as not to pose a problem for health and safety. Observe all lifting points and apply care when handling the equipment.

Ensure all machines and associated pipework have cooled down sufficiently before touching and attempting any maintenance.

Typical tools required for maintenance include: -

Set of spanners	Pipe Wrenches	Circlip Pliers
Set of screwdrivers	Vernier Gauge / Micrometer	Two-leg Pulley drawer
Set of Allen Keys	Hammer / mallet	Feeler Gauges

Typical bolt tightening torques can be seen on page 6.

New gaskets must be fitted every time the machine is dismantled.

Bearings and seals are recommended to be replaced after 15000 operating hours or 2 years whichever is sooner.

Blades must be replaced regardless of wear after 10000 operating hours as failure due to fatigue could cause serious damage.

After maintenance the machine and equipment must be treated, as new and all pre-commissioning checks should be made. Install all protective devices and controls properly after completion of work. Ensure all cabling, unions and guards are correct, secure and in place. Dispose of any used grease and cleaning solutions as prescribed by law.

MAINTENANCE PLAN			
DAILY CHECKS		QUARTERLY CHECKS	
TASK	CHECK	TASK	CHECK
Clean inlet filters (Daily for 1 <sup>st</sup> week).		Check machine for blade wear.	
Check Belt condition/Tension (Hourly for running in period).		Check control panel for wiring, cleanliness and function of all panel features. (if applicable)	
Drain all vessels, condensate traps, outlet filters manually		Check function of emergency stop button and local motor isolator. (if applicable)	
		Check motors for excessive vibration and damage.	
WEEKLY CHECKS		Check function of non-return valves	
Check belt condition / tension		Check function of pressure relief valves	
Clean inlet filters (After for 1 <sup>st</sup> week).		Regrease machine bearings	
Run Standby machine for a few minutes.		Check function of pressure gauges.	
MONTHLY CHECKS		YEARLY CHECKS	
Check function and operation of all valves.		Check flanges and joints for leaks.	
Check differential pressure across filters (clean and replace if necessary).		Clean internally vessels, condensate traps, filters (including elements).	
Check function and operation of autodrain / condensate lines.		Inspect machine internally (at least once a year)	
Clean fins on machine and motors			

### Troubleshooting

The following table shows some typical problems and the remedies.

Note: If assistance is required in determining or correcting the fault with the machine then contact our service department.

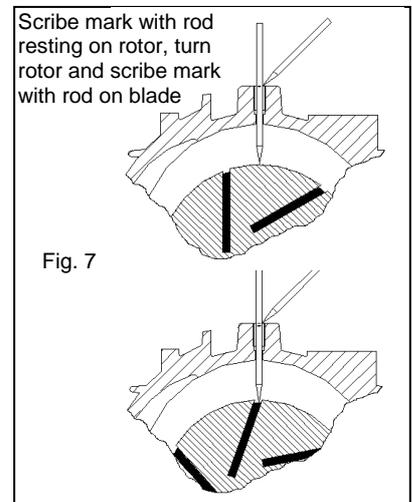
SYMPTOMS	CAUSES	REMEDIES
Machine revolves in wrong direction	Incorrect connection of motor terminal	Re-arrange terminal connection
Discharge air temperature excessive	1. Machine operating at higher duty than specified. 2. Blocked intake filter. 3. Insufficient or wrong lubrication. 4. Warped / Sticking blades	1. Check rating. 2. Clean intake filter. 3. Use correct lubrication and feed rates. 4. Replace blades
Excessive blade wear	1. Dirty inlet air/gas. 2. Excessive operating temperature	1. Clean & inspect intake. 2. See remedies for excessive discharge temperature.
Abnormal noise, vibration or periodic knocking	1. Worn bearing. 2. Excessive blade wear. 3. Erratic cylinder wear. 4. Insufficient lubrication 5. Rotor contacting coverplates  6. Drive misalignment 7. Warped rotor blades. 8. Excessive liquid carryover.	1. Replace bearing. 2. Replace blades & check lubrication 3. Rebore, redowel & check lubrication. 4. Increase lubrication rate 5. Check temperature, pressure & internal clearances 6. Realign and retension drive. 7. Replace rotor blades. 8. Drain all points.
Pressure cannot be built up or only up to a certain extent.	1. Worn blades. 2. Improper belt tension. 3. Sticking relief valve.	1. Replace rotor blades. 2. Adjust belt tension. 3. Clean and replace.
Slipping of belts	1. Improper belt tension. 2. Worn belt.	1. Adjust belt tension. 2. Replace with new ones.
Overheating of electric motor	1. Overloading of motor due to excessive working pressure.	1. Lower working pressure.
Machine does not start	1. Breakdown of electric current 2. Malfunction of motor. 3. Wrong motor connections.	1. Contact power company. 2. Check motor. 3. Check electrical connections.
Shaft partially or totally locked	1. Faulty bearing 2. Foreign particles in machine.  3. Machine seized.	1. Replace bearing. 2. Disassemble machine and remove foreign particles. 3. Repair machine.

### 1. Check Blade Wear

When carrying out any maintenance and inspections always follow the health and safety guidelines on page 4. Fully trained and competent staff must carry out any maintenance work.

Carry out the following procedure after the first 2,000 running hours and repeat every 5,000-hour interval. Record all measurements.

With the pump stationary and with the system drained, remove the eyebolt or plug in the top of the machine cylinder and insert into the hole beneath a pointed measuring rod 6mm dia x 150mm long until contact is made with the rotor (see fig. 7). Scribe a mark on the rod. Slowly rotate the shaft by hand until the rod drops onto the tip of the blade, scribe a second mark on the rod. Measure the amount of movement and renew the blades if this exceeds 5mm. Replace the plug or eyebolt.



## **2. Blade Inspection**

When carrying out any maintenance and inspections always follow the health and safety guidelines on page 4. Ensure all electric circuits are isolated and cannot be switched on, and that the pipeline system has been cleared and is pressurised to atmospheric pressure. Fully trained and competent service personnel must carry out any maintenance work.

Inspection commences with the dismantling of the rear end.

- 2.1 Remove three screws (30&31) and remove fancowl (28), loosen the set screw in fan and remove fan (27).
- 2.2 Undo three screws (20) and take off end cap (5), then circlip (25).
- 2.3 Remove four bolts (21) and withdraw coverplate (3) complete with outer race of bearing (13) and seals (15), felt seal (16) and seal bush (14).
- 2.4 Measure and note the thickness of the gasket (22) fitted between the cylinder (1) and coverplate (3).
- 2.5 The blades (8) can now be removed from their slots for inspection.  
Check the blades for chipping or charring on their rubbing edges and for concave wear. For any other wear other than polished surfaces or if the blade depth has reduced to 21mm on D12-26 or 24mm on D32 or below then replace the blades.  
When replacing blades a complete set must be replaced. The old blades must be disposed of according to the local government laws. When fitting new blades, ensure they slide freely in their slots and if necessary remove high spots with fine emery cloth.
- 2.6 Inspect the visible part of the cylinder bore and rotor for any signs of excessive wear or scuffing and for excessive slot wear. If there is any sign of cylinder rubbing completely dismantle the machine. Factory reconditioning is recommended, but if work has to be carried out on site, we advise you most strongly to contact Utile Engineering Service Department for advice.

## **3. Reassembly after Blade Inspection**

Reassemble in the reverse order, taking note of the following points: -

- 3.1 Ensure the blades are orientated correctly in their slots.
- 3.2 If coverplate gaskets have been replaced, it is essential that they are the same thickness as the originals, otherwise internal clearances will be affected and could cause serious damage. Lightly smear the gasket with gasket sealant before replacing.
- 3.3 Replace coverplate assembly taking care not to damage the seal wiping lips on the shaft.
- 3.4 Fit circlip (25) in shaft and replace end cap (5) with screws (21).
- 3.5 Replace fan and fancowl. Ensure machine turns freely by hand.

## **4. Cylinder Renewal**

With the rear end coverplate (3) already removed as described in 2 for blade inspection, the next stage is to withdraw the rotor complete with the drive end coverplate (2).

- 4.1 Take off drive pulley, or coupling ring (41), coupling (42) and fan (38) from direct driven machines.
- 4.2 Remove six bolts (21) and withdraw coverplate assembly (2) or (47) complete with rotor assembly. Measure and note the thickness of the gasket (22) fitted between the cylinder (1) and coverplate (2 or 47). The cylinder can now be replaced or rebored.
- 4.3 When reboring the cylinder the maximum allowable increase in diameter is 0.8mm to give a final bore of 153.20mm. Contact Utile Engineering for appropriate assembly instructions in this case.

## **5. Removal of Bearings and Seals**

With the rear end coverplate (3) already removed as described in 2 for blade inspection.

- 5.1 Using a two-leg pulley drawer the roller bearing inner race (13) can be removed from the shaft.
- 5.2 If the rotor/shaft (7) show signs of wear where the bearing and seals run, then contact Utile Engineering.
- 5.3 The bearing seals (15) felt seal (16) and roller bearing outer race (13) can be pressed out of the coverplate for inspection.
- 5.4 Inspect the bearing, renew if it shows any signs of wear or pitting.
- 5.5 Examine the bearing seals (15) and renew if the wiping lips are worn or damaged.

With the drive end coverplate (2) already removed complete with rotor as described in 4 for cylinder renewal.

- 5.6 Undo four screws (20) and take off end cap (4).
- 5.7 Remove the circlip (25) and retaining washer (9). Some machines are fitted with shims (23 & 24). Care must be taken not to loose these items as internal clearances will be affected.
- 5.8 Pull the coverplate assembly complete with angular contact bearings (21), bearing seals (15) and felt seal (16) from the rotor/shaft assembly (6).
- 5.9 The bearing seals (15) felt seal (16) and angular contact bearings (12) can be pressed out of the coverplate for inspection.
- 5.10 Renew the bearings if noisy when spun by hand.
- 5.11 If the rotor/shaft (6) show signs of wear where the bearing and seals run, then contact Utile Engineering.
- 5.12 Examine the bearing seals (15) and renew if the wiping lips are worn or damaged.

### 6. Reassembly Procedure

This section only applies when using original bore size or replacement cylinder. Before commencing reassembly ensure that all components are perfectly clean and oilways are clear. Lightly smear the shaft with grease to assist assembly.

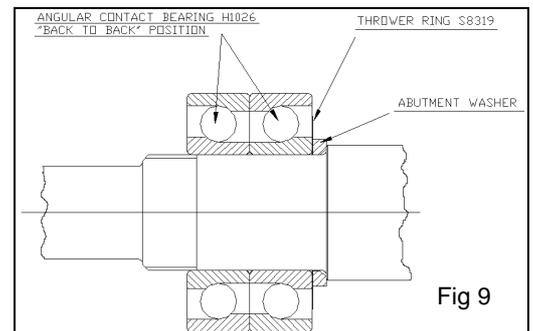
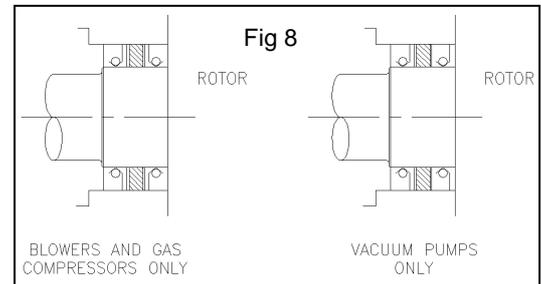
The correct clearances for these machines are: -

	D12	D18	D26	D32
Drive End Coverplate / Rotor	0.05mm / 0.08mm	0.05mm / 0.08mm	0.05mm / 0.08mm	0.05mm / 0.08mm
Rear End Coverplate / Rotor	0.15mm / 0.18mm	0.15mm / 0.18mm	0.15mm / 0.18mm	0.15mm / 0.18mm
Rotor / Cylinder	0.08mm / 0.10mm	0.08mm / 0.10mm	0.08mm / 0.10mm	0.08mm / 0.10mm

Reassembly should start with the preparing of the rotor and shaft assembly by the fitting of the inner race of the roller bearing at the rear end.

Starting at the drive end

- 6.1 Place the bearing seals (15) and felt seal (16) into position in the coverplate (2) ensuring the tension springs are as shown in fig 8.
- 6.2 Assemble the angular contact bearings (12) in the coverplate in the "back-to-back" position as shown in fig 9. Giving a shot of the grease gun into each recess between the balls in the bearings.
- 6.3 Ease coverplate (2) onto the rotor/shaft.
- 6.4 The whole bearing assembly can be secured onto the shaft with the circlip (21) and retaining washer (9). Smear a layer of grease over the exposed bearing. Care must be taken not to overgrease the bearings, in general the bearing housing volume should be filled up to 1/2 of the free volume.  
Note: if lubrication is excessive, bearing self-heating takes place with an increasing bearing temperature over time. However, if the lubrication is correct after an initial increase the temperature decreases.
- 6.5 The end cap (4) can now be fitted and any appropriate shims. Check and set clearance.
- 6.6 If coverplate gasket (22) has been replaced, it is essential that it is the same thickness as the originals, otherwise internal clearances will be affected and could cause serious damage.
- 6.7 Place drive coverplate assembly onto cylinder (1) via location dowel and bolt with six screws (21) and with coverplate gaskets (22) in place.
- 6.9 Check rotor / cylinder clearance.



Reassemble rear end

- 6.10 Refit sliding blades (8) in their slots after removing any high spots with fine emery cloth. Ensure the blades are orientated correctly in their slots.
- 6.11 Place the bearing seals (15) and felt seal (16) into position in the coverplate (3) ensuring that the tension springs are as shown in fig 8.
- 6.12 Press the outer race of roller bearing (13) into position in the coverplate (3).
- 6.13 If coverplate gasket (22) has been replaced, it is essential that they are the same thickness as the originals, otherwise internal clearances will be affected and could cause serious damage.
- 6.14 Place rear coverplate assembly onto cylinder (1) via location dowels and bolt with six screws (21) and with coverplate gaskets (22) in place.
- 6.15 The whole bearing assembly can be locked onto the shaft with the circlip (25). Giving a shot of the grease gun into each recess between the rollers in the bearing. Smear a layer of grease over the exposed bearing. Care must be taken not to overgrease the bearings, in general the bearing housing volume should be filled up to 1/2 of the free volume. Note: if lubrication is excessive, bearing self-heating takes place with an increasing bearing temperature over time. However, if the lubrication is correct after an initial increase the temperature decreases.
- 6.16 The end cap (5) can now be fitted with any appropriate shims.
- 6.17 Position fan (27) on the shaft, with the set screw. Refit fancowl (28) onto supports with screws (30&31).

Check that the shaft rotates freely by hand.

## 7. Spare Parts

A stock of the main wearing parts at the installation site is important to the constant availability and smooth running of the machine. We recommend the following parts and quantities to be kept in stock at the installation site.

Description	Part Number				Quantity
	D12	D18	D26	D32	
Blade	S 2701	S 1469	S 2709	S 8002	5
Angular Contact Bearing	H 1018	H 1018	H 1018	H 1018	2
Roller Bearing	H 1020	H 1020	H 1020	H 1020	1
Bearing Seal	F 1047	F 1047	F 1047	F 1047	4
Felt Seal	F 1186	F 1186	F 1186	F 1186	2
Gasket – Coverplate	K 1001	K 1001	K 1001	K 1001	2
Drive Belt / Drive Coupling					1 set

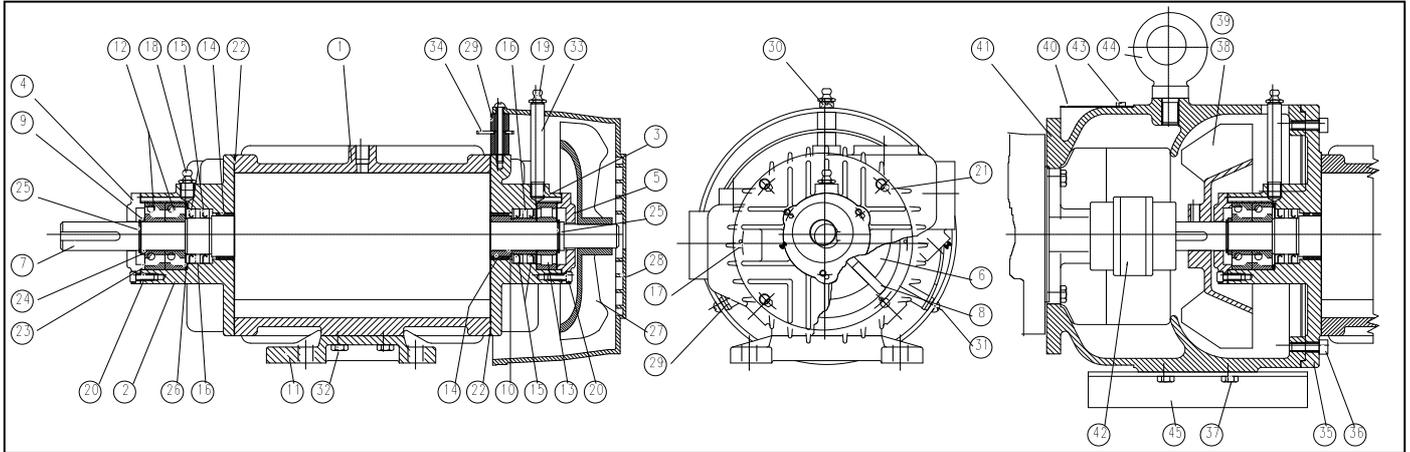
**Always quote the machine serial number when ordering spare parts.**

### After Sales Service

Contact the address or telephone number shown at the bottom of each page or our local distributor, for any after sales service, maintenance or service problems.

Contract maintenance, service exchange machines or a site visit by a Utile Engineering Service Engineer can also be arranged in the same manner.

Utile Engineering can also provide Training Programs for all your requirements, from maintenance repair to operator and supervisor training. They are structured to give specialist knowledge of our products and procedures including use of authorised spares. The enacting of the Health and Safety at Work Act focused attention on the responsibility of all parties, manufacturers, users and repairers on the repair of equipment. We strongly recommend that repairs should be carried out to the original specification using authorised replacement parts where necessary.



ITEM	DESCRIPTION	PART NUMBER				QTY
		D12	D18	D26	D32	
1	CYLINDER	S 8416	S 10128	S 10143	S 8001	1
2	COVERPLATE – D.E.	S 8474/1	S 8474/1	S 8474/1	S 8474/2	1
3	COVERPLATE – R.E.	S 8470/1	S 8470/1	S 8470/1	S8470/2	1
4	END CAP – D.E.	S 8027/1	S 8027/1	S 8027/1	S 8027/1	1
5	END CAP - R.E.	S 8027/3	S 8027/3	S 8027/3	S 8027/3	1
6	ROTOR	S 8067	S 8067	S 8067	S 8068	1
7	SHAFT	S 8469/1	S 8469/2	S 8469/3	S 8469/4	1
8	BLADE	S 2701	S 1469	S 2709	S 8002	5
9	BEARING RETAINING WASHER	S 8021	S 8021	S 8021	S 8021	1
10	SEAL SLEEVE	S 8468	S 8468	S 8468	S 8468	1
11	FOOT	S 8078	S 8078	S 8078	S 8078	1
12	ANGULAR CONTACT BEARING	H 1018	H 1018	H 1018	H 1018	2
13	ROLLER BEARING	H 1020	H 1020	H 1020	H 1020	1
14	SEAL BUSH	F 1183	F 1183	F 1183	F 1183	2
15	SEAL	F 1047	F 1047	F 1047	F 1047	4
16	FELT SEAL	F 1186	F 1186	F 1186	F 1186	2
17	DOWEL PIN	E 1000	E 1000	E 1000	E 1000	4
18	GREASE NIPPLE	J 1000	J 1000	J 1000	J 1000	1
19	GREASE NIPPLE	J 1025	J 1025	J 1025	J 1025	1
20	SOCKET HEAD CAP SCREW	G 1048	G 1048	G 1048	G 1048	6
21	SOCKET HEAD CAP SCREW	G 1014	G 1014	G 1014	G 1014	8
22	GASKET - COVERPLATE	K 1001	K 1001	K 1001	K 1001	2
23	BEARING SHIM - OUTER	K 1005	K 1005	K 1005	K 1005	TO SUIT
24	BEARING SHIM - INNER	K 1006	K 1006	K 1006	K 1006	TO SUIT
25	CIRCLIP	B 1033	B 1033	B 1033	B 1033	2
26	THRUST WASHER	B 1110	B 1110	B 1110	B 1110	1
27	FAN	W 1021	W 1021	W 1021	W 1021	1
28	FANCOWL	W 1005	W 1005	W 1005	W 1005	1
29	FAN COWL SUPPORTS	S 8443	S 8443	S 8443	S 8443	1 SET
30	ROUND HEAD SCREW	G 1153	G 1153	G 1153	G 1153	1
31	ROUND HEAD SCREW	G 1152	G 1152	G 1152	G 1152	2
32	HEX HEAD SCREW	G 1072	G 1072	G 1072	G 1072	4
33	GREASE NIPPLE EXTENSION	S 3031/2	S 3031/2	S 3031/2	S 3031/2	1
34	CIRCULAR GUARD	S 8443/1	S 8443/1	S 8443/1	S 8443/1	1

ADDITIONAL AND ALTERNATIVE ITEMS FOR FLANGE MOUNTED MACHINES

35	COVERPLATE – D.E.	S 8471/1	S 8471/1	S 8471/1	S8471/2	1
36	SOCKET HEAD CAP SCREW	G 1060	G 1060	G 1060	G 1060	6
37	HEX HEAD SCREW	G 1063	G 1063	G 1063	G 1063	4
38	FAN	S 8012/2	S 8012/2	S 8012/2	S 8012/2	1
39	HOLLOW SOCKET SET SCREW	G 1005	G 1005	G 1005	G 1005	1
40	GUARD	S 2866/1	S 2866/1	S 2866/1	S 2866/1	1
41	COUPLING RING (F130 FLANGE)	S 8013	S 8013	S 8013	S 8013	1
	COUPLING RING (B56 FLANGE)	S 8014	S 8014	S 8014	S 8014	1
	COUPLING RING (F115 FLANGE)	S 8015	S 8015	S 8015	S 8015	1
42	COUPLING (2KW – 3KW)	P 1011	P 1011	P 1011	P 1011	1
	COUPLING (0.5KW – 1.5KW)	P 1010	P 1010	P 1010	P 1010	1
43	CHEESE HEAD SCREW	G 1017	G 1017	G 1017	G 1017	3
44	EYEBOLT	A 1013	A 1013	A 1013	A 1013	1
45	FOOT	S 8161	S 8161	S 8161	S 8161	1

GAS COMPRESSORS / BOOSTERS • GAS & AIR MIXING SYSTEMS • AIR BLOWERS & VACUUM PUMPS

The Utile Engineering Co. Ltd. Irthlingborough, Northamptonshire, NN9 5UG, ENGLAND

Telephone: + 44 (0) 1933 650216 Facsimile: + 44 (0) 1933 652738 Email: sales@utileengineering.com [www.utileengineering.com](http://www.utileengineering.com)



Warranty Claim Conditions

Utile offers a 12-month warranty against faulty parts and workmanship. This does not include components used in the production of packages, where the appropriate manufacturers warranty applies.

- 1. The warranty period commences from the first day that the operator receives the machine.
2. The warranty covers defective parts or workmanship used in the manufacture of the machine.
3. The operator must notify the company promptly of any failure (using the appropriate procedure - indicated below).

Please note: The company is not liable for any claim where: -

- 1. Damages or delay or any other consequential cost associated with the alleged defect, are incurred.
2. Malfunction caused by fair wear and tear, abnormal conditions of use, accident, neglect or misuse of equipment, or improper storage.
3. Deviation from operating specifications or other special terms of sale.
4. Improper operation, maintenance or repair.
5. Damage resulting during shipment or installation by other than company authorised personnel.
6. Freight charges for goods returned to the company's premises.

No allowances will be made for repairs or alterations carried out without the company's written consent or approval.

Claim form

To make a claim complete the form below and send, phone, fax or email us at the address at the bottom of the page.

Warranty Claim Form
Your Details
Name:
Company Name:
Company Address:
Telephone:
Fax:
E-mail:
Machine Details
Serial Number:
Model:
Site Location:
Supplier Name:
Installers Name:
Date Commissioned:
Name of Person responsible for Maintenance:
Operating Hours a Day:
Duty Details
Speed: Gas Flow: Pressure:
Further Information