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**Installation  
Operation  
Maintenance Instructions**

**Model 675 Series  
Centrifugal  
Blowers / Exhausters  
& Gas Boosters**

Serial Number

Site Location

Installation Date

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	<b>Page</b>
General .....	3
Technical Specification .....	3
Health and Safety .....	4
Packaging .....	5
Storage .....	5
Handling .....	5
Installation .....	5
Pre Start-up Checks .....	7
Protective Devices .....	7
Start-up .....	7
Operating Notes .....	7
Stopping Procedure .....	7
Lubrication .....	7
Maintenance .....	8
Troubleshooting .....	9
Dismantling Machine .....	9
Reassembly .....	10
Spare Parts .....	10
After Sales Service .....	10
Spare Parts List .....	11
Warranty .....	12

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## **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 675 series centrifugal gas booster has been developed based on many years of experience in the booster 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 oil drip rate.

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

## 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.

**Nameplate Data**

Machine Model eg 675/90	MODEL	Logo	Ex II 2 G	Gas/Dust G – Gas D - Dust	Protection Category 1–V.High Protection 2–High Protection 3–Normal Protection	Equipment Group I – Mines II – Surface Indus
Machine Serial Number (Always quote this in correspondence)	SERIAL No / YEAR					
Temperature Classification 450°C – T1    300°C – T2 200°C – T3    135°C – T4 100°C – T5    85°C – T6	TEMP. CLASS		ZONE RATING	Zone Rating 0 – Very High Protection - Gas Area 1 – High Protection - Gas Area 2 – Normal Protection - Gas Area		Ex Mark
				CE Marking	Contact address & numbers	Year of Manufacture

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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.

	Units	1 stage	2 stage	3 stage	4 stage	5 stage
Maximum Pressure (Air)	mbar	45	74	134	175	210
Speed – Maximum	R.P.M.	10000	10000	10000	10000	10000
Speed - Minimum	R.P.M.	4500	4500	4500	4500	4500
Volume at 35 mbar at Max. Speed (Air)	m <sup>3</sup> /hr	135	205	240	252	257
Volume at 35 mbar at Max. Speed (Nat Gas (SG=0.6))	m <sup>3</sup> /hr	--	133	215	235	238
Absorbed Power at 35 mbar at Max. Speed (Air)	kW	0.55	1.10	1.48	2.06	2.73
Absorbed Power at 35 mbar at Max. Speed (Nat Gas)	kW	--	0.73	0.87	1.32	1.72
Maximum Ambient Temperature	°C	40	40	40	40	40
Surface Temperature at Max. Press. at Max. Speed (Air)	°C					
Moment of Inertia	kg m <sup>2</sup>	0.002	0.003	0.004	0.006	0.007
Noise Level at 1 metre	db (A)	73 - 84	73 - 84	73 - 84	73 - 84	73 - 84
Weight (Bareshaft Unit)	kg	4.5	5.9	7.4	9.1	10.9

Read the installation and operating instructions carefully.

Rotating machinery and pressurised components are potentially dangerous items of equipment if not operated and maintained in the correct manner. It is imperative that all users of such equipment fully educate themselves as to the potential dangers and satisfy themselves that those 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 user staff. If there are any doubts or ambiguities concerning correct procedures, ask Utile Engineering, who will be pleased to advise, instruct or provide a service engineer. **DO NOT TAKE RISKS.**

The following, whilst not exhaustive, provide guidance as to possible sources of danger to health and safety:-

Certain machinery can generate high levels of noise which can be harmful to people exposed to it for lengthy periods of time. Various recommendations and 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.

Boosters, by their very nature, raise the pressure of a gas from one pressure level to another and 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 compressor installation with an inert gas, such as nitrogen. Special precautions are necessary for certain gases and the user must ensure that adequate procedures are drawn up and implemented.

Moving parts of machinery must not be touched and must be adequately guarded. Suitable guards are provided and must be securely retained in position at all times except when maintenance or service is being undertaken.

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.

NO attempt should be made to touch shafts, etc. whilst the machine is rotating. Particular care is needed when checking clearances in machines and when inserting fingers through ports to check clearances, etc. Any movement of may trap fingers

Most machines, casings and certain pipes and ancillaries become hot during. If it is possible for personnel to come into contact with such surfaces unknowingly or accidentally they should be guarded.

If, during operation, severe vibration is observed on the booster, it's prime mover, pipework, or ancillaries, 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 debris is not allowed to enter the machine. Drainage systems must also be serviced regularly to ensure that there is no liquid carryover.

Safety trips, emergency stopbuttons and other such devices 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.

During routine maintenance, coupling alignment should be checked to ensure that no damage would result from excessive misalignment.

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

After completion of servicing, all nuts, setscrews, etc must be checked for tightness

Before restarting after servicing, check all joints, etc are gas tight and carry out purging as necessary before introducing the process gas. Also, before any start-up, check that the machine inlet and outlet isolating valves are open and that the discharge non-return valve is the correct way round in the line.

Impellers on centrifugal compressors should be subject to periodic inspection to guard against undetected corrosion or erosion that could lead to failure.

## 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. Do not use 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	½" UNF	60.00 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. Where 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.

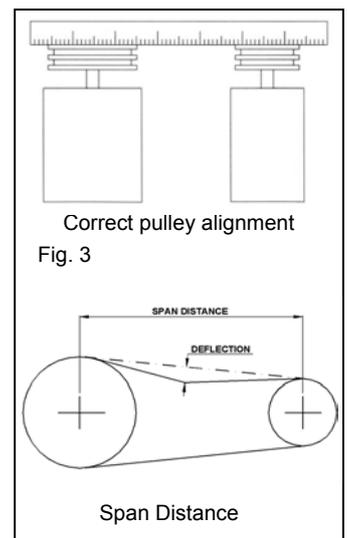
## Fitting Pulleys and Couplings

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 fittings 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 - 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. 3).
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 / rib)
J	0.25 to 0.5



## 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.
- During installation ensure that no foreign matter enters the machine or serious damage may result.
- An intake filter with diameter at least the same size as the compressor intake, should 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 machine.
- It is essential to fit a non-return valve in the pipework, preferably on the discharge 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 devices and switches 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.

### Pre Start-up Checks

Before starting the machine for the first time after installation, maintenance or after 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 6).
- ✓ 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 if fitted, remove the cone shaped mesh strainer from the inlet, clean and replace. If a large amount of debris is collected run for a further 50 hours repeating the process until the filter remains clean.

### Start-up

Proceed as follows: -

- i. When starting boosters the intake valves are fully open. Boosters should always be started load conditions.
- ii. Start the drive motor and bring the machine up to operating speed.
- iii. Check all protective devices and controls making sure they are working correctly.

### Operating Notes

- After initial running in, re-check the 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 log book indicates inadequate cooling, faulty lubrication or a dirty intake filter. The machine should be stopped and thoroughly inspected to identify the cause of the problem. The replacement time scale for filter elements cannot exactly be indicated as this is dependant on environmental and operational conditions, however a good indicator is replace the element when the pressure loss is 25-50mm WG above that of a new element.
- Regrease the bearings every 1500 hours using one shot of a grease gun with Shell Albida R2 grease. When checking for bearing and seal wear, the old grease must be removed and replaced with new.
- Check the machine internally for wear every 10,000 running hours. (see Dismantle)
- 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 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.

Shell Albida Grease	R2
Base Oil (type)	Mineral
NLGI Consistency	2
Kinematic Viscosity	
@ 40°C cSt	100
100°C cSt (IP71/ASTM-D445)	11.3
Dropping Point °C (IP132/ASTM-D566-76)	260
Maximum Operating Temperature °C (peak)	150 (180)
Minimum Operating Temperature °C	-20
Cone Penetration	
Worked @ 25°C (60 strokes) 0.1mm	266
Worked @ 25°C (100,000 strokes) 0.1mm (IP 50/ASTM-D217)	293

## 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 units environment are found.

The machine, ancillaries and surrounding area should be kept as clean as possible. Ensure all machines and associated pipework have cooled down sufficiently before touching and attempting any maintenance.

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.

Typical bolt tightening torques can be seen on page 5. 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

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. 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 oil and cleaning solutions as prescribed by law.

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

### Troubleshooting

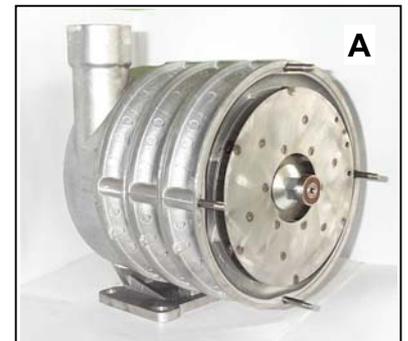
The following table shows some typical problems and the remedies.

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

SYMPTOMS	CAUSES	REMEDIES
Excessive loss of lubrication	Faulty Seal	Replace Seal
Machine revolves in wrong direction	Incorrect connection of motor terminal	Re-arrange terminal connection
Discharge air / gas temperature excessive	<ol style="list-style-type: none"> <li>1. Machine operating at higher duty than specified.</li> <li>2. Blocked intake filter.</li> <li>3. Insufficient or wrong lubrication.</li> <li>4. Unloading valve is not fully open</li> <li>5. High inlet temperature</li> </ol>	<ol style="list-style-type: none"> <li>1. Check rating.</li> <li>2. Clean intake filter.</li> <li>3. Use correct lubrication and feed rates.</li> <li>4. Open unloading valve</li> <li>5. Reduce inlet temperature.</li> </ol>
Abnormal noise, vibration or periodic knocking	<ol style="list-style-type: none"> <li>1. Worn bearing.</li> <li>2. Insufficient lubrication</li> <li>3. Impeller contacting housing</li> <li>4. Drive misalignment</li> <li>5. Excessive liquid carryover.</li> <li>6. Impeller blade damaged.</li> <li>7. Foreign matter attached to impeller blade</li> <li>8. Impeller loose.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace bearing.</li> <li>2. Increase lubrication rate</li> <li>3. Check internal clearances</li> <li>4. Realign and retension drive.</li> <li>5. Drain all points.</li> <li>6. Repair and rebalance, or replace impeller.</li> <li>7. Remove foreign object, repair impeller &amp; rebalance, or replace impeller.</li> <li>8. Tighten impeller.</li> </ol>
Pressure cannot be built up or only up to a certain extent.	<ol style="list-style-type: none"> <li>1. Slow speed.</li> <li>2. Improper belt tension.</li> <li>3. Sticking relief valve.</li> <li>4. Dirty inlet filter</li> <li>5. Impeller blade damaged.</li> <li>6. Leak in pipework.</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct speed.</li> <li>2. Adjust belt tension.</li> <li>3. Clean and replace.</li> <li>4. Clean and replace.</li> <li>5. Repair and rebalance, or replace impeller.</li> <li>6. Repair pipework.</li> </ol>
Slipping of belts	<ol style="list-style-type: none"> <li>1. Improper belt tension.</li> <li>2. Worn belt.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust belt tension.</li> <li>2. Replace with new ones.</li> </ol>
Overheating of electric motor	<ol style="list-style-type: none"> <li>1. Overloading of motor due to excessive working pressure.</li> <li>2. Worn bearings</li> <li>3. Poor ventilation</li> <li>4. Unbalanced voltage supply.</li> <li>5. Starting too frequently.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lower working pressure.</li> <li>2. Replace bearings.</li> <li>3. Check motor vent openings.</li> <li>4. Check voltage and current.</li> <li>5. Reduce amount of starts.</li> </ol>
Machine does not start	<ol style="list-style-type: none"> <li>1. Breakdown of electric current</li> <li>2. Malfunction of motor.</li> <li>3. Wrong motor connections.</li> <li>4. Motor fuse blown</li> <li>5. Motor tripped on overload.</li> </ol>	<ol style="list-style-type: none"> <li>1. Contact power company.</li> <li>2. Check motor.</li> <li>3. Check electrical connections.</li> <li>4. Replace fuse.</li> <li>5. Reset overload.</li> </ol>
Shaft partially or totally locked	<ol style="list-style-type: none"> <li>1. Faulty bearing</li> <li>2. Foreign particles in machine.</li> <li>3. Machine seized.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace bearing.</li> <li>2. Dismantle machine, remove foreign particles.</li> <li>3. Repair machine.</li> </ol>

### 1. To Dismantle

- 1.1 Remove the four cap nuts (23) and pull off the inlet casing (2) complete with the inlet flange (see photo A).
- 1.2 Grip the drive pulley firmly and remove the lock nut (13), which has a left-hand thread. Removal of this will 'jack off' the inlet casing bearing (25) fitted to 4 and 5 stage machines only.
- 1.3 The interstage casings (1), impellers (11), and spacing collars (7) can now be removed (see photo B).
- 1.4 To remove the shaft (6) with bearings (17), first remove the drive pulley, then undo three screws (15) to release the end cap (5). Lift out the thrust washer (18), the shaft can now be pushed out towards the pulley end with bearings attached (see photo C).
- 1.5 To renew the shaft seal (12) first remove circlip (16) then drive out towards the inner side complete with seal ring (10).
- 1.6 Clean the mechanical parts carefully.

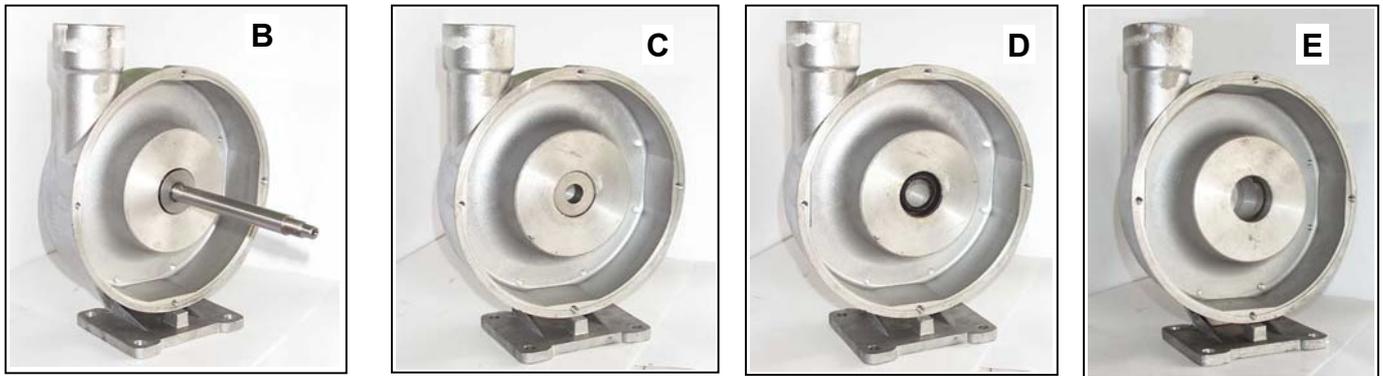


## 2. To Re-assemble

Use Dow Corning Silastoseal 738RTV or equivalent as a jointing compound on faces of volute casing (3) and interstage casings (1) and inlet casing (2) to seal against gas leakage. Proceed as follows:

- 2.1 Position circlip (16) in volute casing (3) (see photo D).
- 2.2 Fit seal (12) into the volute casing from the inner side, taking care not to damage the sealing lip, fit with the spring side facing the impeller. Ensure that the seal is pressed in approx. 2mm below the inner face of the volute casing to give clearance for the seal ring flange (see photo E).
- 2.3 Insert the seal ring (10) (see photo C).
- 2.4 Position the two main bearings (17) on the shaft (6) using a mandrel press, the outer bearing should have the seal side facing the pulley end of the shaft and the inner bearing has no seal. Pack the recess between the bearings approximately half full with grease before pressing the shaft assembly from the pulley side into the housing (see photo C). Ensure the thrust washer (18) is replaced before fitting end cap (5).
- 2.5 Fit shaft key (26), slide impellers (11), spacing collars (7) and interstage casings (1) onto shaft, and firmly tighten left-hand nut (13) press inlet casing bearing (25) (4-5 stage machines) onto the shaft (see photo A).
- 2.6 Finally refit the inlet casing (2) and inlet flange (20). Replace nuts and washers (23 & 24).
- 2.7 Ensure the machine turns freely.

Leak test after assembly with nitrogen or air at a max. pressure of 0.3 bar (4.3 psi)



## 3. 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
	1 stage	2 stage	3 stage	4 stage	5 stage	
Ball Bearing – Drive End	H 1085	H 1085	H 1085	H 1085	H 1085	2
Oil Seal - Bearing Seal	F 1044/V	F 1044/V	F 1044/V	F 1044/V	F 1044/V	1
Ball Bearing – Inlet Casing	-----	-----	-----	H 1080	H 1080	1
Gasket – Inlet Flange	K 1106	K 1106	K 1106	K 1106	K 1106	1
Drive Belt						1

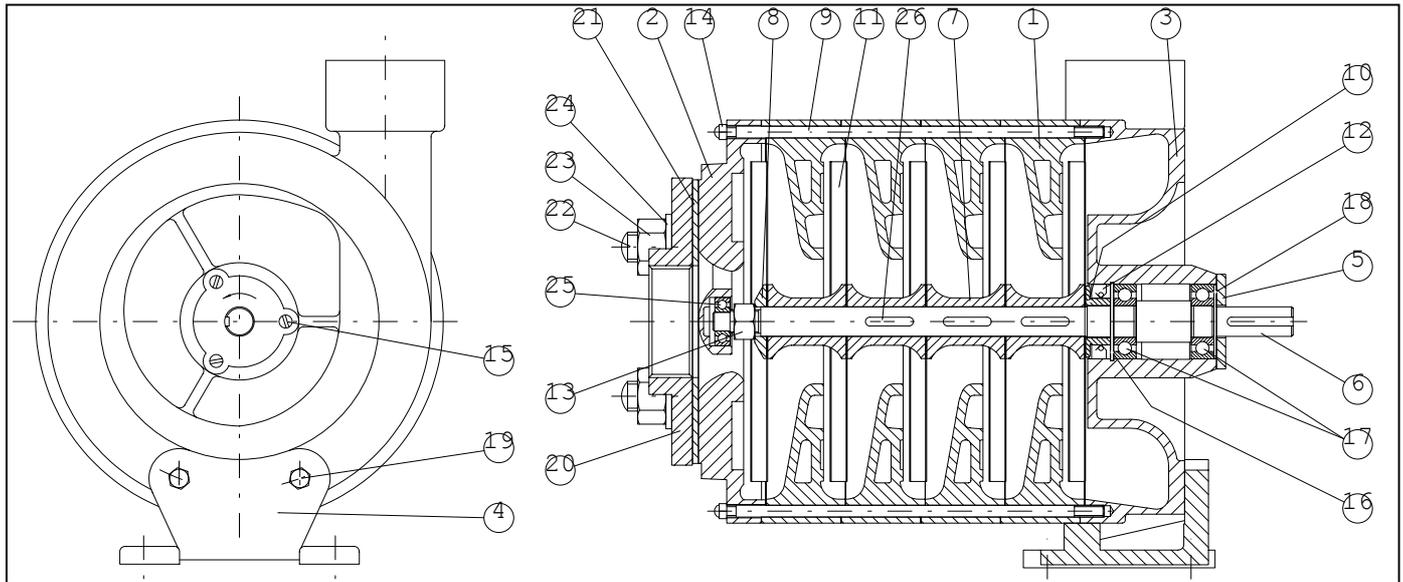
**Always quote the machine serial number when ordering spare parts.**

## 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	1 STAGE		2 STAGE		3 STAGE		4 STAGE		5 STAGE	
		PART No.	QTY	PART No.	QTY	PART No.	QTY	PART No.	QTY	PART No.	QTY
1	INTERSTAGE CASING	-----	-----	S 7000	1	S 7000	2	S 7000	3	S 7000	4
2	INLET CASING	S 7141	1	S 7141	1	S 7141	1	S 7141	1	S 7141	1
3	VOLUTE CASING	S 7051	1	S 7051	1	S 7051	1	S 7051	1	S 7051	1
4	FOOT	S 7014	1	S 7014	1	S 7014	1	S 7014	1	S 7014	1
5	END CAP	S 7005	1	S 7005	1	S 7005	1	S 7005	1	S 7005	1
6	SHAFT	S 7007/1	1	S 7007/2	1	S 7007/3	1	S 7072/1	1	S 7072/2	1
7	SPACING COLLAR	-----	-----	S 7009	1	S 7009	2	S 7009	3	S 7009	4
8	SPINNER WASHER	S 7012	1	S 7012	1	S 7012	1	S 7012	1	S 7012	1
9	STUD OR GRUB SCREW	G 1091	4	S 7020/2	4	S 7020/3	4	S 7020/3	4	S 7020/4	4
10	SEAL RING	S 7034	1	S 7034	1	S 7034	1	S 7034	1	S 7034	1
11	IMPELLER	S 7042	1	S 7042	2	S 7042	3	S 7042	4	S 7042	5
12	OIL SEAL	F 1044/V	1	F 1044/V	1	F 1044/V	1	F 1044/V	1	F 1044/V	1
13	LOCK NUT	B 1031	1	B 1031	1	B 1031	1	B 1031	1	B 1031	1
14	CAP NUT	-----	-----	B 1029	4	B 1029	4	B 1029	4	B 1029	4
15	C'SK HEAD SCREW	G 1052	3	G 1052	3	G 1052	3	G 1052	3	G 1052	3
16	CIRCLIP	B 1030	1	B 1030	1	B 1030	1	B 1030	1	B 1030	1
17	BALL BEARING	H 1085	2	H 1085	2	H 1085	2	H 1085	2	H 1085	2
18	THRUST WASHER	B 1027	1	B 1027	1	B 1027	1	B 1027	1	B 1027	1
19	SOCKET HEAD CAP SCREW	G 1066	2	G 1066	2	G 1066	2	G 1066	2	G 1066	2
20	INLET FLANGE	M 1053	1	M 1053	1	M 1053	1	M 1053	1	M 1053	1
21	GASKET	K 1106	1	K 1106	1	K 1106	1	K 1106	1	K 1106	1
22	STUD	D 1024	4	D 1024	4	D 1024	4	D 1024	4	D 1024	4
23	NUT	B 1062	4	B 1062	4	B 1062	4	B 1062	4	B 1062	4
24	WASHER	U 1006	4	U 1006	4	U 1006	4	U 1006	4	U 1006	4
25	BALL BEARING	-----	-----	-----	-----	-----	-----	H 1080	1	H 1080	1
26	KEY	-----	-----	-----	-----	-----	-----	N 1016	1	N 1016	3
27	GREASE NIPPLE (NOT SHOWN)	J 1000	1	J 1000	1	J 1000	1	J 1000	1	J 1000	1



**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			