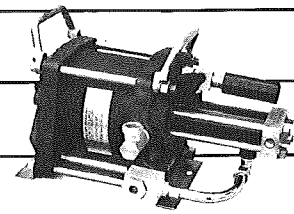




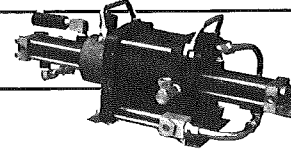
# Haskel

MILTON ROY

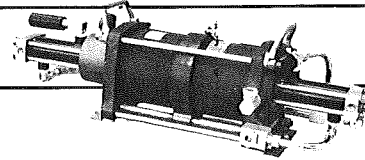


OM-3F

SINGLE AIR HEAD  
SINGLE ACTING  
SINGLE STAGE



SINGLE AIR HEAD  
DOUBLE ACTING  
OR TWO STAGE



DOUBLE AIR HEAD  
DOUBLE ACTING  
OR TWO STAGE

MODEL NO.

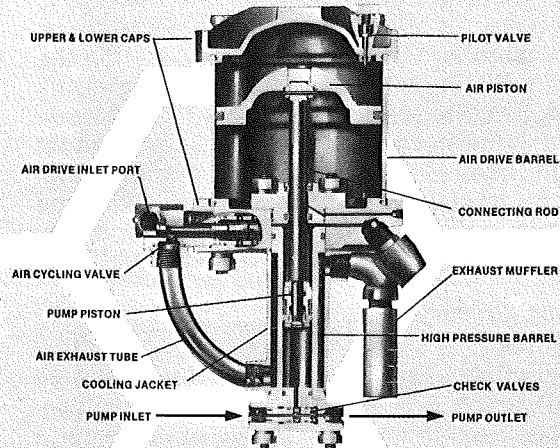
SERIAL NO.

DATE:

PLEASE PROVIDE COMPLETE MODEL NO. AND SERIAL NO. WHEN ORDERING PARTS.

## Air Driven GAS BOOSTER Compressors 5-3/4" Drive AG Series

### Operating and Maintenance Instructions



### LIMITED WARRANTY

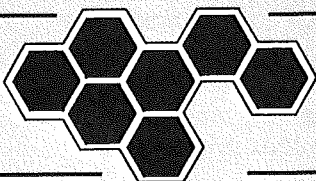
Haskel manufactured products are warranted free of original defects in material and workmanship for a period of one year from date of shipment to first user. This warranty does not include packings, seals nor failures caused by lack of proper maintenance; incompatible fluids; foreign materials in the driving media; in the pumped media; or application of pressures beyond catalog ratings. Products believed to be originally defective may be returned, freight prepaid, for repair and/or replacement to the distributor, authorized service representative, or to the factory. If upon inspection by the factory or authorized service representative the problem is found to be originally defective material or workmanship, repair or replacement will be made at no charge for labor or materials, F.O.B. the point of repair or replacement. Permission to return under warranty should be requested before shipment and include the following; the original purchase date, purchase order number, serial number, model number, or other pertinent data to establish warranty claim, and to expedite the return or replacement to the owner.

If pump has been disassembled and reassembled in a facility other than Haskel, warranty is void if it has been improperly reassembled or substitute parts have been used in place of factory manufactured parts.

Any modification to any Haskel product which you have made or make in the future has been and will be at your sole risk and responsibility and without Haskel's approval or consent. Haskel disclaims any liability, obligation, or responsibility for the modified product; and for claims, demands or causes of action for damage or for personal injury resulting from the modification and /or use of such a modified Haskel product.

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**CAUTION: HIGH PRESSURE GAS CAN BE DANGEROUS IF IMPROPERLY HANDLED.**



*Our products are backed by outstanding technical support, an excellent reputation for reliability, and world-wide distribution.*

## INTRODUCTION

The Haskel "Oil Free" gas booster compressor is an air driven, non-lubricated, reciprocating piston type gas compressor available in single acting single stage, double acting single stage, and two stage configurations. Individual models may also be used in series for multiple staging. The model number is the approximate ratio of the air drive piston(s) area to the gas piston(s) area.

## DESCRIPTION

### GENERAL

The air drive piston(s) in all models are automatically cycled by a non-detented, unbalanced air valve spool that is alternately pressurized and vented by the pilot air system. This drive is directly connected to the booster section piston(s) which are designed to run dry without lubrication to supply gas free of hydrocarbon contamination. Exhaust air from the drive is used to cool the gas barrels and in 2 stage units, the gas intercooler. Some models depend on the cold air exhausting from the muffler slots directly against the gas barrel (without benefit of a cooling jacket). Therefore, the position of the exhaust muffler on these models should not be disturbed. Mufflers on models with cooling jackets may be relocated for noise or configuration convenience.

### AIR DRIVE SECTION

**Refer to detailed assembly drawing of the air drive section provided with each unit.** The air drive section consists of one or more air drive piston assemblies, an unbalanced spool type cycling control valve and pilot valves (one mounted in the valve end cap and one in the opposite end cap), a flow tube to direct drive air flow from the valve end cap to the opposite end cap, and pilot tube to connect the two pilot valves, which are in series. The drive control valve operates without springs or detents and is cycled by the pilot valves alternately pressurizing and venting the large area on the inside end of this spool valve.

The control valve, pilot valves and drive cylinder are lubricated with Haskel air drive grease, part no. 28442, at assembly. Occasional relube of the easily accessible control valve and pilot valves with this grease may be needed depending on the duty cycle of the installation.

It is recommended that only o-rings and seals of proper compounds and hardness for low friction be used in the air drive section. Haskel replacement seals are recommended.

If not otherwise installed by the factory, always install a conventional bowl type shop air filter/water separator of the same or larger pipe size on the incoming air drive plumbing and drain and maintain it regularly. **Do not use an airline lubricator of any kind.**

## GAS SECTION

**Refer to the detailed assembly drawing on the gas section(s) provided with each unit.** These sheets cover the individual parts and their installation for the gas section of the individual models. Note that **no lubrication of any kind is ever used in the gas pumping sections.** They are designed to run dry supported on the inherent low friction properties of the seal and bearing materials. The life of the gas section also depends on the cleanliness of the gas supply. Therefore, micron filtration is suggested at the gas inlet port. If compressed air or other moisture containing gas is to be pumped, the initial dew point should be low enough to prevent saturation at booster output pressure, and if any carry over of oil from the compressed air source is evident, special coalescing type filtration may be necessary.

Over the life of the moving parts, some migration of inert particles into the gas output should be expected. Therefore, a small particle filter on the high pressure line may be advisable for critical applications.

### Compression Ratio—Volumetric Efficiency

The compression ratio is the ratio of output pressure to gas supply pressure. (To calculate, use psi absolute values.) The gas pumping sections are designed to have minimum unswept or clearance volume at the end of the compression stroke. On the return (suction) stroke of the piston, output pressure in the unswept volume expands to inlet pressure. This reduces the amount of potential fresh gas intake on the suction stroke. Volumetric efficiency therefore decreases rapidly with an increase in compression ratio until the volumetric efficiency reaches zero when the unexpelled (expanded) gas completely fills the cylinder at the end of the intake stroke. A cylinder with a 4% unswept volume will reach zero efficiency at a compression ratio of approximately 25:1.

Production models of Haskel gas boosters are tested in the laboratory. Results of these tests indicate that compression ratios of up to 40:1 are possible for some models under ideal conditions. However, for satisfactory operation under production conditions in industrial applications, we recommend compression ratios (per stage) of about 10:1 or less. Operation at higher ratios may not damage the gas booster but because output flow and efficiency will be low, the use should be limited to pressurizing small volumes such as pressure gauge testing, etc.

## DESCRIPTION continued

### GENERAL

#### Cooling

Effective cooling of the gas pumping section is of paramount importance as service life of piston seals, bearings, and static seals are dependent upon proper operating temperatures. Haskel gas boosters use the exhaust air from the driving system to cool the gas barrel (and gas intercooler on the two stage models). Driving air expands during the work cycle with a significant reduction in temperature. Therefore, the exhaust air is a very efficient cooling medium.

In theory, compression ratios above 3:1 with most gases produce temperatures above the allowable limits for the seals. In practice, however, the heat of compression is transferred to the air cooled gas barrel and adjacent metal components during the relatively slow speed of the piston on the compression stroke and these components will stay within allowable temperature limits. Laboratory tests indicate that maximum temperatures occur between compression ratios of 5:1 and 10:1 and have shown that exhaust air cooling is adequate even when the booster is running at full speed.

The gas discharge temperature may run as high as approximately 150°F above ambient temperature. Under certain severe operating conditions, it may be necessary to slow down the cycling of the gas booster to prevent overheating. It is very difficult to predict exactly when overheating may occur. To test, install a thermocouple approximately 1 inch from the discharge port of the gas pumping section. Temperatures above 300°F at this point will shorten piston seal life considerably.

#### MAINTENANCE

##### Air Valve Section

Remove spool or sleeve in the following manner:

1. Remove air exhaust fitting located in cycling valve end cap. Pull out spool; inspect 568017 o-rings. **Relube; reinstall; retest before further disassembly.**
2. If necessary, remove sleeve and bumper (rubber faced spacer at inside end of sleeve) with tool P/N 28584 as shown in figures 1, 2, and 3.
3. Replace any 568020 o-rings or the bumper/spacer if damaged, worn or swollen.
4. Lubricate o-rings with light coat of Haskel 28442 lubricant.
5. Use lubricant liberally to hold bumper/spacer to sleeve with rubber side facing sleeve.

6. Push lubricated sleeve and bumper into end cap bore, all the way in one quick motion. (If bumper drops off sleeve too soon, remove, regrease and repeat.)
7. Install spool.
8. Replace exhaust fitting.

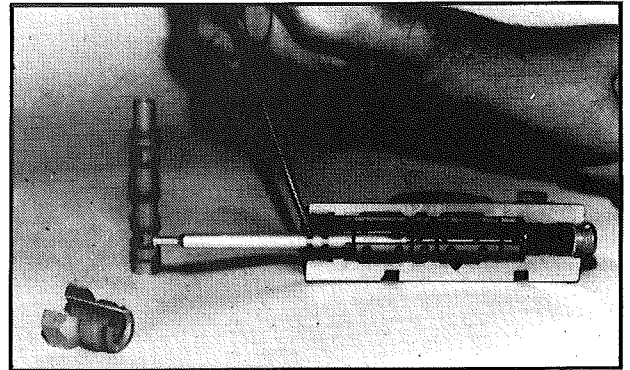


Figure 1. Insert tool in second row of holes in sleeve and if necessary, pry out with screwdriver.

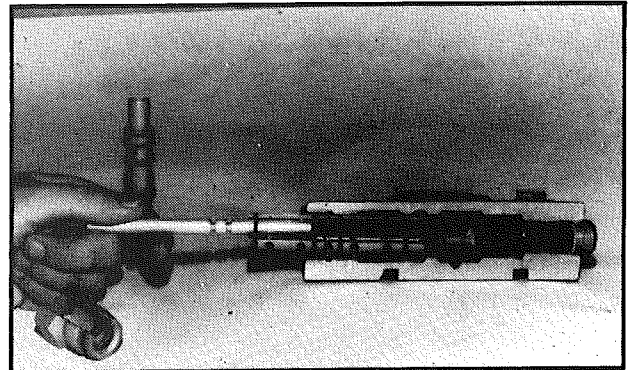


Figure 2. Pull straight out.

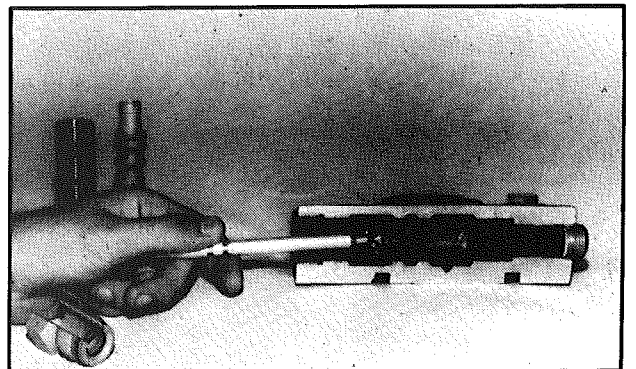


Figure 3. Insert bumper hook thru center of bumper and pull straight out.

## MAINTENANCE continued

### Pilot System

1. Remove hex o-ring sealed plug.
2. Remove spring and 27375 pilot stem (figure 4).
3. Inspect pilot stem and seat for foreign material. Replace stem if shank is bent or scratched.
4. Replace stem if molded seat is damaged.
5. Apply 28442 lubricant and reassemble in the reverse manner.

**Note:** Unless excessive leakage occurs, it is not advisable to replace the o-ring seal for the shank of the stem. This requires disassembly of the air section. If replacement is required, care must be taken in installing the Tru-Arc retainer concentrically as shown in figure 5. Use the 27375 pilot stem valve as seating tool. Place the rubber valve face against the retainer and tap the top of the valve lightly with a light hammer to **evenly** bend the legs of the retainer.

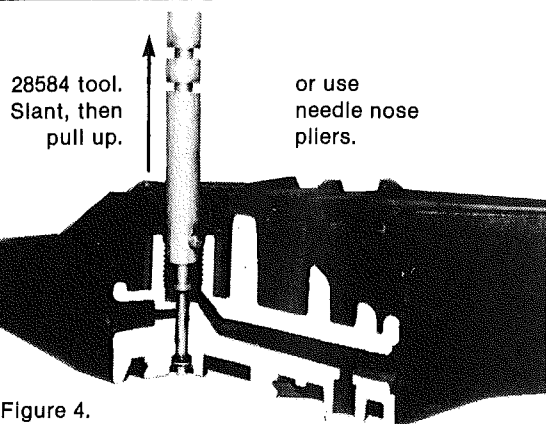


Figure 4.

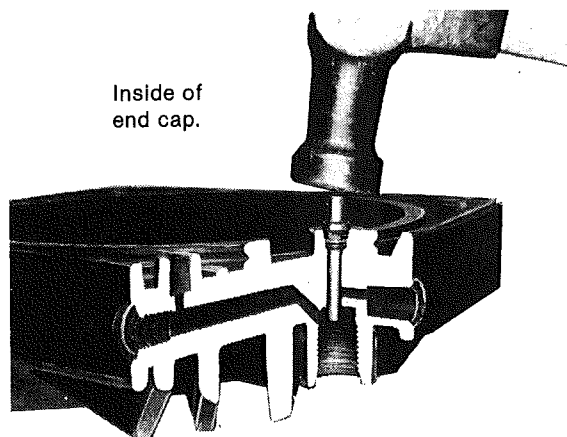


Figure 5.

Seating the retainer.

### Test Procedure for Pilot Control Valves - 27375:

After relube of the spool and reassembly, if the drive cycles erratically, the following test procedure will determine which of the pilot valves is faulty.

1. Remove the 17658-2 1/8" pipe plug in the upper end cap.
2. Install 0—160 psi pressure gauge.
3. Apply air pressure to the air drive inlet.  
Gauge will read zero pressure if **lower** pilot valve has not been actuated. Gauge will read full pilot air pressure if **upper** pilot valve has not been actuated. Correct pilot valve action will cause gauge to immediately rise or fall from zero to pilot air pressure. A slow **increase** in gauge reading indicates leakage past the seat of the pilot valve in the valve end cap. A slow **decrease** in pressure indicates leakage past the seat of the opposite pilot valve. Examine and replace as required. Check also for external air leaks at plugs.
4. If drive takes 1 stroke and stops, this is probably due to either pilot valve stem being too short. See the assembly drawing for description of procedure to determine proper stem length.

### For Disassembly and Repair of Air Drive Section and Air Piston:

1. Remove four tie bolts.
2. Remove air barrel and static seal o-rings.
3. Remove seal on air piston.
4. Remove air piston and rod assembly in air drive section.
5. See applicable assembly drawing. Note that the air drive seals and bearings **for the rods** are part of the **gas section** seal kit.
6. Inspect, replace and install all internal parts in air drive section per assembly drawing.
7. Relubricate air barrel with 28442 Haskel lubricant. Reassemble drive in reverse order of disassembly instructions. Care must be taken in disassembly and assembly that the flow and pilot tube o-rings be on the flow and pilot tubes prior to assembly. Alternately (cross-wise) torque tie rods to a maximum torque of 16-18 foot pounds.

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