



OPERATING AND MAINTENANCE MANUAL

GAS BOOSTER SYSTEM

J24820

Serial No. SO5726

Compiled By: Lisa Taylor

**Supplied By: Haskel Europe Ltd
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CONTENTS

SECTION	DESCRIPTION
1	DESCRIPTION OF EQUIPMENT
2	OPERATING INSTRUCTIONS
3	PART SCHEDULE(S) AND DRAWING(S) Part Schedule & P&ID List: J24820-10 General Arrangement: J24820-20 ATEX Label: PP29532
4	PRODUCT LITERATURE/DRAWINGS Operating and Maintenance Instructions Haskel AGD-32-28881 Drawings 17275 - Installation Drg. AGD-62C & AGD-152C 51739 - Parts List AGD-32 AD-9 - Air Drive AGD-32,-62-152,-152H AGT-32/62,-62/152,-62/152H,-32/152, -32/152H GS-15 - -15 Gas Barrel 28881 - Pump Modification – External Pilot
5	SAFETY INFORMATION Safety Instructions ATEX Instructions - Boosters & Amplifiers Being Operated in Explosive Atmospheres ATEX Instructions - Accessories Being Operated In Explosive Atmospheres
6	MAINTENANCE Maintenance Instructions Warranty Information
7	HASKEL COMPONENT TEST PROCEDURES



CONTENTS

SECTION	DESCRIPTION
8	TEST REPORT
9	DECLARATION OF CONFORMITY

SECTION 1

DESCRIPTION OF EQUIPMENT

SCOPE OF SUPPLY

One Gas Booster Unit comprising of the following:-

- One Haskel Air driven Gas Booster model AGD-32-28881-ATEX.
- Air controls which include Air Filter, Air Regulator, Air Regulated Pressure Gauge and On/Off Valve.
- Gas Inlet and Outlet filters with ¼" NPT(F) connections.
- Gas Inlet and Outlet safe case panel mounted gauges.
- Adjustable automatic Pressure Switches to stop booster at minimum gas inlet and maximum gas outlet pressures.
- Adjustable high pressure output relief valve.

All mounted in a Stainless Steel frame with gauge panel.

The system is ATEX certified to Ex II 2 G c T3.



SECTION 2

OPERATING INSTRUCTIONS

Connections

1. Connect a discharge line to the 1/4"NPT (F) Gas Outlet port.
2. Connect a nitrogen bottle to the 1/4"NPT (F) Gas Inlet port.
3. Connect an air supply to the 1/2"BSPP (F) Air inlet.

Preliminary Checks

1. Ensure all the connections stated above are made.
2. Ensure the *Air Drive On/Off Valve* is closed.
3. Ensure the *Air Drive* regulator is closed.

Operation

1. Slowly turn on the nitrogen supply to allow gas to flow through the booster.
2. Allow the gas to equalise across the booster (refer to the *Inlet Pressure Gauge* and the *Outlet Pressure Gauge*)
3. Open the *Air Drive On / Off Valve*.
4. Slowly wind open the *Air Drive Regulator* clockwise to start the *Booster* cycling. Continue turning the *Regulator* clockwise until the desired outlet pressure is obtained. This will be indicated on the *Outlet Pressure Gauge*.

NOTE:

- a) The *Booster* will stop if the inlet pressure falls below 5bar, due to the presence of the *Inlet Pilot Switch*.
- b) The *Booster* will also stop when the outlet pressure reaches 285bar due to the presence of the *Outlet Pilot Switch*.

5. Once pressurisation is complete close the *Air Drive On/Off Valve* and wind closed the *Air Drive Regulator*. Turn off the nitrogen supply.

Safety Notes:

- Always ensure that testing is carried out in a safe area with adequate protection for personnel and equipment.
- Never disconnect test specimen until you are sure all pressure has been released.



SECTION 3

PART SCHEDULE(S) & DRAWING(S)



SECTION 4

PRODUCT LITERATURE/DRAWINGS

Please refer to the following website for additional information:-

www.haskel.com





OM-3F

Operating and Maintenance Instructions

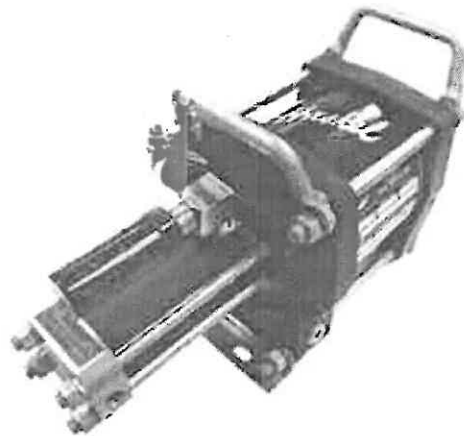
Instructions de Fonctionnement et d'Entretien

Betriebs- und Wartungsanleitungen

Istruzioni di Prestazione e Manutenzione

Instruções de Funcionamento e Manutenção

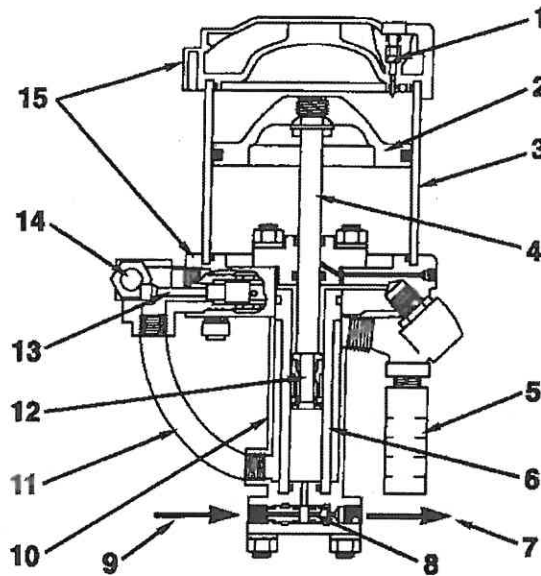
- **Air Driven Gas Booster
Compressors
5-3/4" Drive AG Series**
- **Surpresseurs d'Air
Pneumatique à Gaz
Entraînement
5-3/4" Série AG**



- **Luftdruck Gas-Booster Druckluftzylinder Kompressoren
Schalldämpfer
5-3/4" Antrieb AG Reihe**
- **Compressori Generatore a Gas Trasmissione ad Aria
Serie Trasmissione AG 5-3/4**
- **Compressores de Gás Tipo Gas Booster com Comando
Pneumático
Série AG 5-3/4"**

www.haskel.com

Air Driven Gas Booster Compressor, 5-3/4" Drive AG Series - OM-3F



- | | | |
|--------------------------|--|---------------------------------|
| 1. Pilot Valve | 13. Vanne de Cyclage d'Air | 6. Barrel Ad Alta Pressione |
| 2. Air Piston | 14. Orifice d'entree du Mecanisme a Entrainement d'Air | 7. Uscita Pompa |
| 3. Air Drive Barrel | 15. Capuchons Superieur et Inferieur | 8. Valvole Di Controllo |
| 4. Connecting Rod | | 9. Ingresso Pompa |
| 5. Exhaust Muffler | | 10. Camicia Di Raffredd |
| 6. High Pressure Barrel | | 11. Tubo Scarico Aria |
| 7. Pump Outlet | | 12. Pistone Pompa |
| 8. Check Valves | | 13. Valvola Circolazione Aria |
| 9. Pump Inlet | | 14. Porta Entrata Trasmiss Aria |
| 10. Cooling Jacket | | 15. Coperchi Sup. Più Bassi |
| 11. Air Exhaust Tube | | |
| 12. Pump Piston | | |
| 13. Air Cycling Valve | | |
| 14. Air Drive Inlet Port | | |
| 15. Upper & Lower Caps | | |
-
- | | |
|--|-----------------------------------|
| 1. Pilotventil | 1. Válvula Piloto |
| 2. Doppelter Druckluftkopf Doppelt Wirkend Oder 2-Stufig | 2. Pistão Pneumático |
| 3. Druckluftzylinder | 3. Cilindro Pneumático |
| 4. Verbindungsstange | 4. Barra de Ligação |
| 5. Schalldämpfer | 5. Silencioso |
| 6. Hochdruckzylinder | 6. Cilindro de Alta Pressão |
| 7. Pumpenausgang | 7. Saída da Bomba |
| 8. Rückschlagventile | 8. Válvulas de Retenção |
| 9. Pumpeneingang | 9. Entrada da Bomba |
| 10. Kühlmantel | 10. Camisa Refrigeração |
| 11. Abluftleitung | 11. Tubo de Escape de Ar |
| 12. Pumpenkolben | 12. Pistão |
| 13. Lufttaktventil | 13. Válvula de Circulação de Ar |
| 14. Luftdruckantr.Eingangsanschl. | 14. Entrada do Comando Pneumático |
| 15. Obere/Untere Kappen | 15. Tampas Inferior e Superior |
-
- | | |
|--|---------------------------------|
| 1. Robinets Pilotes | 1. Valvola Pilota |
| 2. Piston a Air | 2. Pistone Ad Aria |
| 3. Colonne du Mecanisme a Entrainement d'Air | 3. Barrel A Trasmisione Ad Aria |
| 4. Axe de Tirette | 4. Collegamento All'asta |
| 5. Silencieux d'Echappement | 5. Scarico Marmitta |
| 6. Colonne a Haute Pression lgh | |
| 7. Sortie de la Pompe | |
| 8. Clapets Anti-Retour | |
| 9. Entree de la Pompe | |
| 10. Enveloppe de Refroidissement | |
| 11. Tube d'echappement d'Air | |
| 12. Piston de la Pompe | |

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.

CAUTION: High pressure gas can be dangerous if improperly handled.

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. 50866, 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. 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 on the dynamic seals of 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.

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.

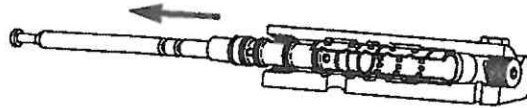


Figure 1: Insert tool in second row of holes in sleeve and if necessary, pry out with screwdriver.

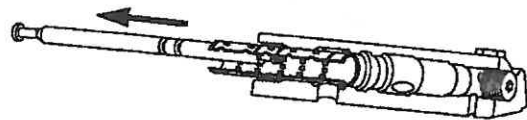


Figure 2: Pull straight out.

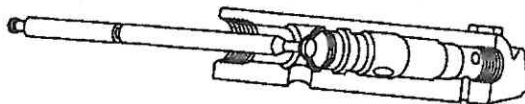


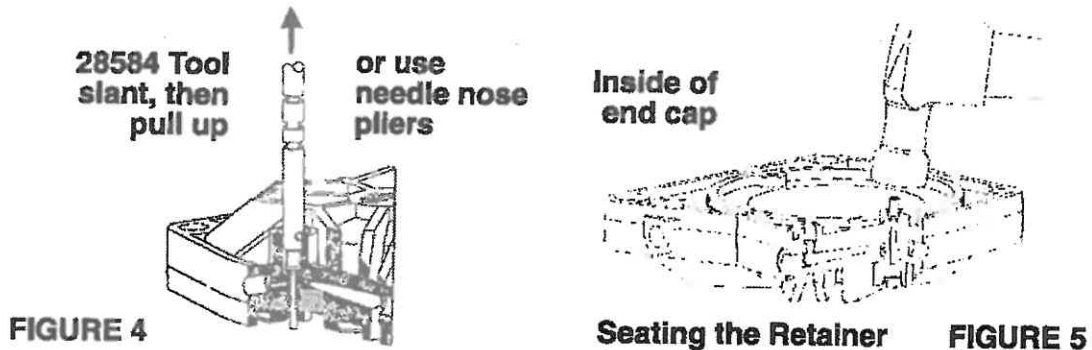
Figure 3: Insert bumper hook through center of bumper and pull straight out.

3. Replace any 568020 o-rings or the bumper/spacer if damaged, worn or swollen.
4. Lubricate o-rings with light coat of Haskel 50866 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.

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 50866 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.



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 (4) 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 50866 Haskel lubricant. Re-assemble 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 (crosswise) torque tie rods to a maximum torque of 16-18 ft-lbs.

Operating and Maintenance Instructions

CE Compliance Supplement

SAFETY ISSUES

- a. Please refer to the main section of this instruction manual for general handling, assembly and disassembly instructions.
- b. Storage temperatures are 25°F – 130°F (-3.9°C – 53.1°C).
- c. Lockout/tagout is the responsibility of the end user.
- d. If the machine weighs more than 39 lbs (18 kg), use a hoist or get assistance for lifting.
- e. Safety labels on the machines and meanings are as follows:



General Danger



Read Operator's Manual

- f. In an emergency, turn off the air supply.
- g. Warning: If the pump(s) were not approved to ATEX, it must NOT be used in a potentially explosive atmosphere.
- h. Pressure relief devices must be installed as close as practical to the system.
- i. Before maintenance, liquid section(s) should be purged if hazard liquid was transferred.
- j. The end user must provide pressure indicators at the inlet and final outlet of the pump.
- k. Please refer to the drawings in the main instruction manual for spare parts list and recommended spare parts list.

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LIMITED WARRANTY

Haskel manufactured products are warranted free of original defects in material and workmanship for a period of one year from the date of shipment to first user. This warranty does not include packings, seals, or 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 of replacement to the owner.

If unit has been disassembled or 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.

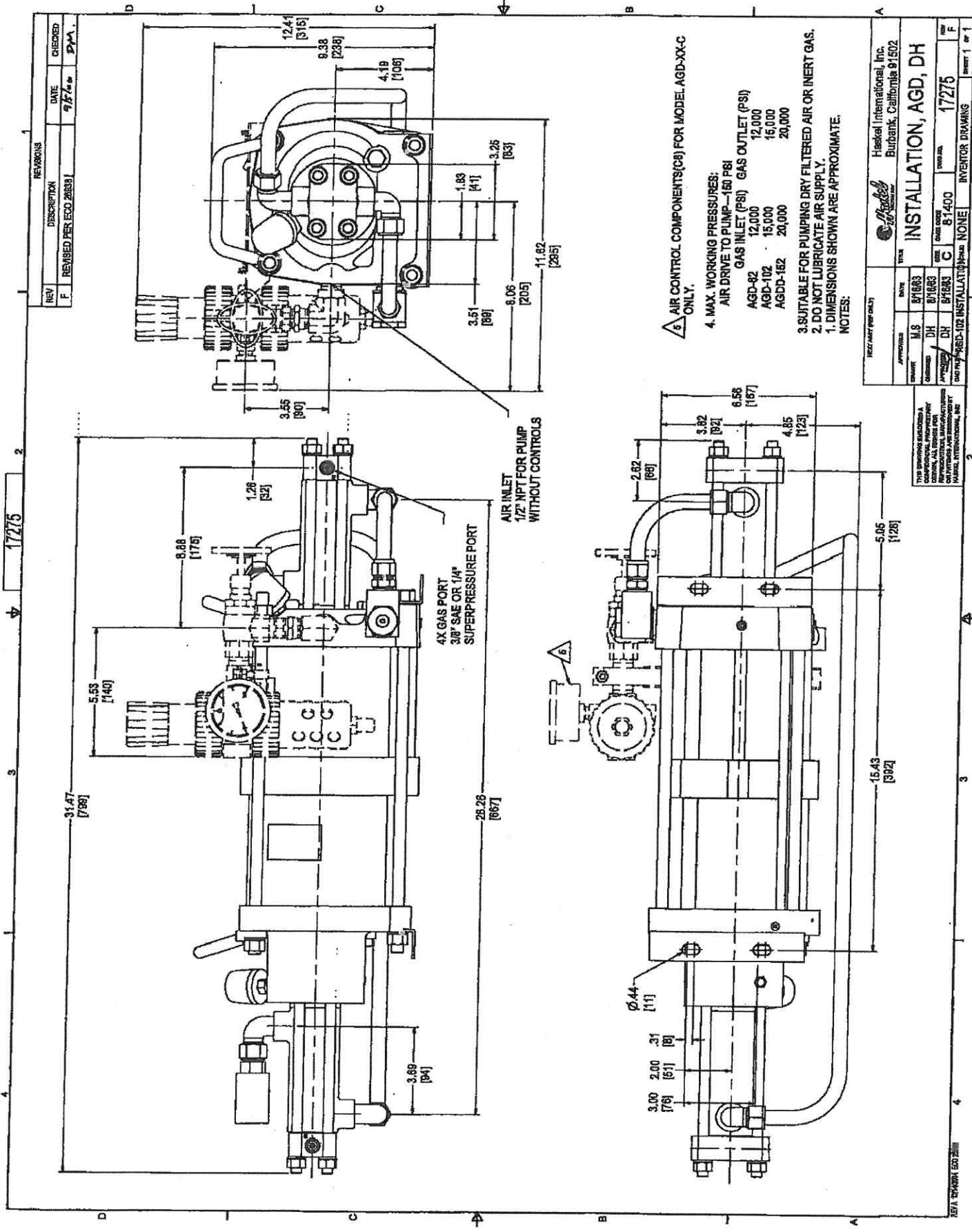
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REV	DESCRIPTION	DATE	CHECKED
F	REVISED PER ECO 28831	7/7/68	DJA

4. MAX. WORKING PRESSURES:
 AIR DRIVE TO PUMP—160 PSI
 GAS INLET (PSI) GAS OUTLET (PSI)
 AGD-82 12,000 12,000
 AGD-102 15,000 15,000
 AGDD-152 20,000 20,000

3. SUITABLE FOR PUMPING DRY FILTERED AIR OR INERT GAS.
 2. DO NOT LUBRICATE AIR SUPPLY.
 1. DIMENSIONS SHOWN ARE APPROXIMATE.

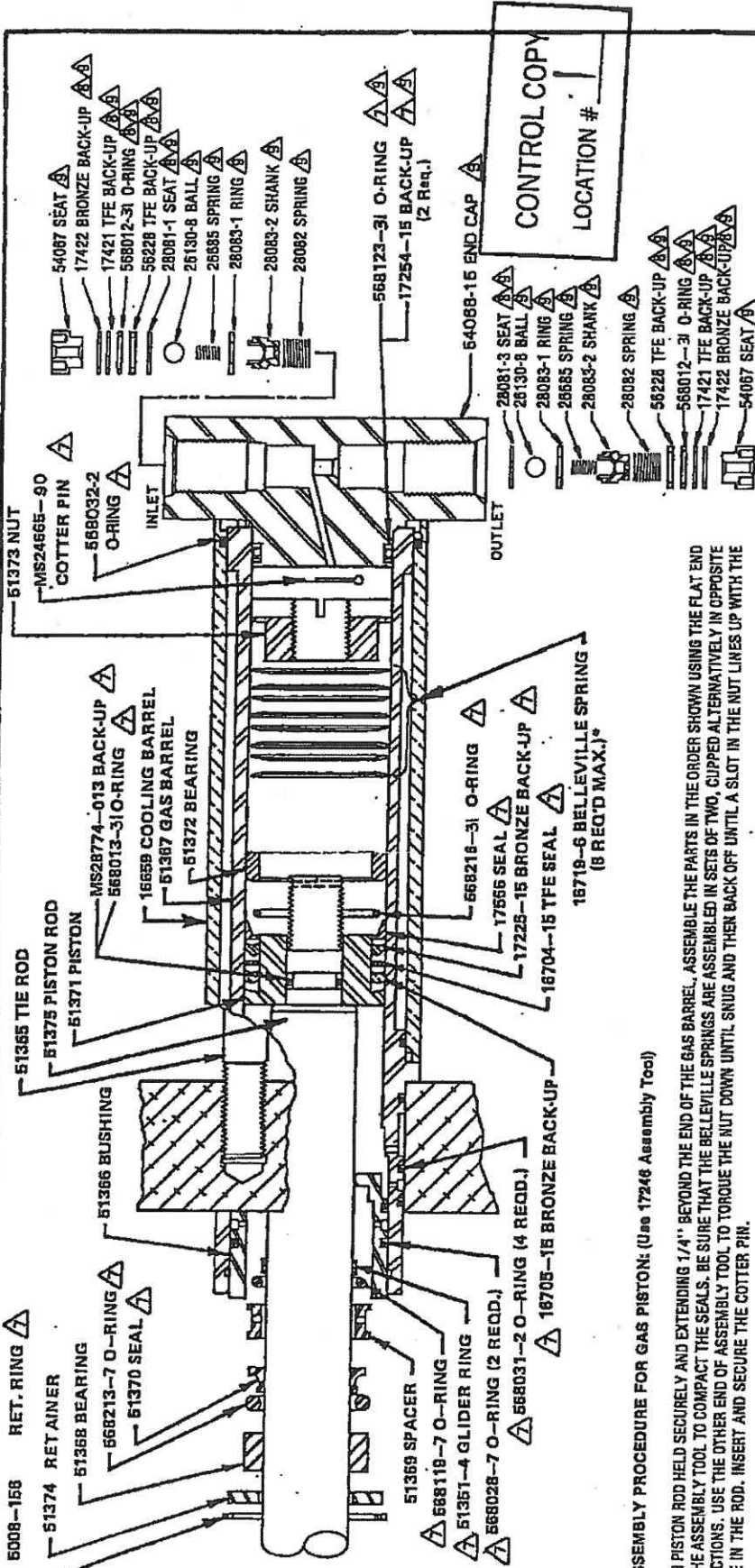
NOTES:

REV	DESCRIPTION	DATE	CHECKED
F	REVISED PER ECO 28831	7/7/68	DJA

APPROVED	DATE	TITLE	DESIGNED BY	DATE	SIZE	SCALE	INVENTOR DRAWING
DH	8/16/63	INSTALLATION, AGD, DH	DH	8/16/63	C	1:1	17275
APPROVED	DATE	TITLE	DESIGNED BY	DATE	SIZE	SCALE	INVENTOR DRAWING
DH	8/16/63	INSTALLATION, AGD, DH	DH	8/16/63	C	1:1	17275

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GS-15



CONTROL COPY
LOCATION # 1

ASSEMBLY PROCEDURE FOR GAS PISTON: (Use 17246 Assembly Tool)

WITH PISTON ROD HELD SECURELY AND EXTENDING 1/4" BEYOND THE END OF THE GAS BARREL, ASSEMBLE THE PARTS IN THE ORDER SHOWN USING THE FLAT END OF THE ASSEMBLY TOOL TO COMPACT THE SEALS. BE SURE THAT THE BELLEVILLE SPRINGS ARE ASSEMBLED IN SETS OF TWO, CIPPED ALTERNATIVELY IN OPPOSITE DIRECTIONS. USE THE OTHER END OF ASSEMBLY TOOL TO TORQUE THE NUT DOWN UNTIL SNUG AND THEN BACK OFF UNTIL A SLOT IN THE NUT LINES UP WITH THE HOLE IN THE ROD. INSERT AND SECURE THE COTTER PIN.

*NOTE: WHEN PROPERLY TIGHTENED, THE 51373 NUT SHOULD SOLIDLY CONTACT THE 51371 PISTON AND BE APPROXIMATELY FLUSH WITH THE END OF THE 51375 ROD. (IF NECESSARY, USE FEWER 16719-6 SPRINGS TO ACHIEVE THIS.)

ASSEMBLY PROCEDURE FOR GAS CHECK VALVES: (Use 16875 Assembly Tool)

1. PLACE OUTLET PORT IN THE UPRIGHT POSITION. INSERT SEAT, BALL, RING, SMALL SPRING, SHANK AND LARGE SPRING UNTIL SEATED PROPERLY. IT IS IMPORTANT THAT THESE PARTS ARE IN PROPER POSITION BEFORE CONTINUING. SLIDE ONE SET OF PACKINGS (BRONZE, THIN TFE BACK-UP, O-RING, THICK TFE BACK-UP) IN THE ORDER SHOWN ONTO SEAT FITTING THE THICK TFE BACK-UP WILL PROVIDE SUFFICIENT GRIP TO RETAIN THE PACKINGS DURING INSERTION. THEN, USING ASSEMBLY TOOL, SCREW SEAT IN UNTIL IT IS SNUG (APPROXIMATELY 5/8" BELOW END CAP FACE). USING A THIN ROD, DEPRESS BALL THROUGH INLET PORT TO VERIFY PROPER MOVEMENT.

2. PLACE INLET PORT IN UPRIGHT POSITION. INSERT LARGE SPRING, SHANK, RING, SMALL SPRING, BALL AND SEAT INTO PORT UNTIL SEATED. IT IS IMPORTANT THAT THE PARTS ARE IN PROPER POSITION BEFORE CONTINUING. SLIDE ONE SET OF PACKINGS (BRONZE, THIN TFE BACK-UP, O-RING, THICK TFE BACK-UP) IN THE ORDER SHOWN ONTO SEAT FITTING. THE THICK TFE BACK-UP WILL PROVIDE SUFFICIENT GRIP TO RETAIN THE PACKINGS DURING INSERTION. THEN, USING THE ASSEMBLY TOOL, SCREW THE SEAT IN UNTIL IT IS SNUG (APPROXIMATELY 5/8" BELOW END FACE). CHECK THAT THE BALL IS FREE TO MOVE BY DEPRESSING IT WITH A THIN ROD FROM THE INLET END.

△ INDICATES PARTS IN SEALS KIT
51544-15

△ INDICATES PARTS IN SEALS KIT
17325

△ INDICATES PARTS IN END CAP
ASSEMBLY 51544-15

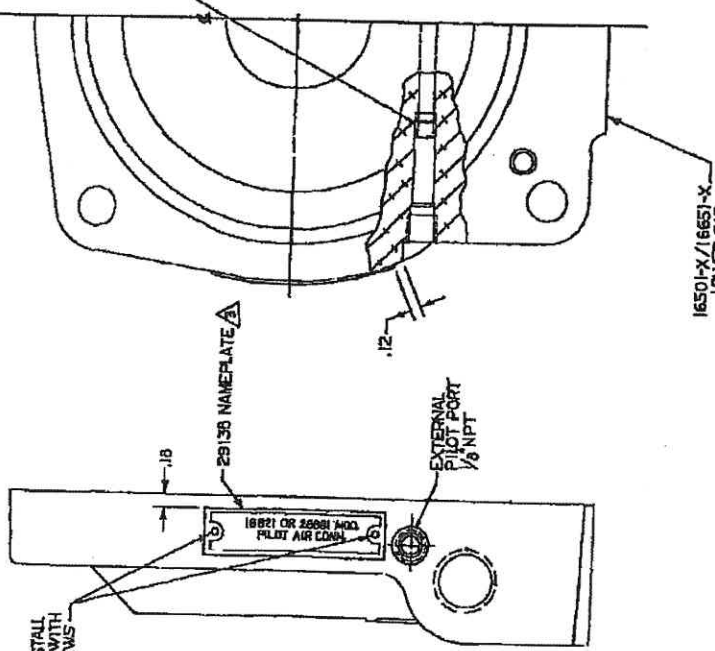
REV	DESCRIPTION	DATE	DESP	BY	APP
N	REMOVED DRAW NUMBER FROM 17325. ECO 7354.	1/2/90		WLF	WLF
M	REMOVED 51371-31 & 17246-15 FROM 17325-15 SEAL KIT. ECO 5156	3/4/91	2	WLF	WLF
L	51371-31 WAS 51371-22. 51371-31 WAS 51371-22. ECO 5155.	3/4/91	2	WLF	WLF
K	51371-31 WAS 51371-22 AND 51371-31 WAS 51371-21 SEE EN 1544-1	2/9/91	2	JP	JP

—15 GAS BARREL

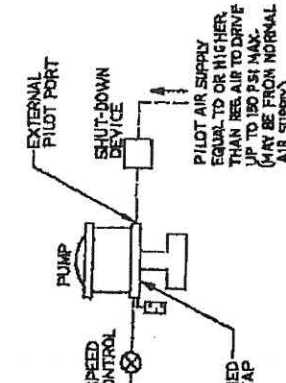
SHEET 3 OF 3

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DRILL & INSTALL NAMEPLATE WITH DRIVESCREWS



60010-15 HOLLOW HEX PLUS LOGITITE INTO PLAGE (BLUE)



TYPICAL SCHEMATIC

REVISIONS			
LTR.	DESCRIPTION	DATE	BY
C	REVISED & REDESIGNED REVISED NOTE 1	10/1/81	CHK
D	ADDED EQUAL TO OR HIGHER THAN REG. AIR TO DRIVE UP TO 150 PSI MAX.	10/1/81	GLF
E	REVISED NOTE 1, 60010-15 HOLLOW HEX PLUS WAS TAKEN TO SAME LENGTH SET SCREW	10/1/81	GLF
F	ADDED 29136 NAMEPLATE 3 PARTS 1651-X	10/1/81	GLF
G	ADDED 16501-X/16651-X LOWER CAP	10/1/81	GLF
H	CHARACTERISTICS REMOVED FROM 2 (NOTE 2) MIS REMOVED IN STEP 2, ETC. 60010-15	10/1/81	WLF

28881

THESE PARTS ARE INCLUDED IN 28881-2 FIELD CONVERSION KIT

CAPS WERE BETWEEN AUGUST 1976 AND APRIL 1983 HAD 1/4"-28 UNF-2B THREAD AND SHOULD BE PLUGGED WITH 1/4"-28 X .50 LONG SET SCREW AND SET WITH LOGITITE SEALANT.

THIS DRAWING DEPICTS THE MODIFICATION TO A STANDARD PUMP ASSEMBLY FOR EXTERNAL PILOT WITH THIS MODIFICATION THE PUMP CYCLING MAY BE STOPPED BY USING A DEVICE TO SHUT OFF PILOT AIR SUPPLY AS SHOWN IN TYPICAL SCHEMATIC ABOVE.

NOTES:

ITEM NO.	QTY.	ITEM NO.	DESCRIPTION
PARTS LIST			
DRAWING: 28881-2			
CONTRACT NO.			
HARBEL ENGINEERING & SUPPLY CO. 1000 W. 10TH ST. MILWAUKEE, WISCONSIN 53233 U.S.A.			
TITLE PUMP MODIFICATION- EXTERNAL PILOT			
DRAWN BY: JESSISON			
CHECKED BY: JESSISON			
APPROVED BY: JESSISON			
MATERIAL			
NOTED			
TREATMENT			
FINISH			
SIZE CODE IDENT. NO. (DWG. NO.)		28881	
SCALE FULL		SHEET 1 OF 2	

THIS DRAWING PROPRIETARY AND NOT BE LOANED, REPRODUCED, COPIED, OR PATENTED AND RESERVED BY HASKEL, INC.

REVISIONS

1.	NOT BE REPRODUCED OR DISTRIBUTED WITHOUT PERMISSION OF HASKEL, INC.	1.	NEW SHOP PRACTICE
2.	DESCRIPTION	DATE	BY
3.	SEE SHEET 1, ECO 52556	7/24/98	W.P.F.
4.	SEE SHEET 1, ECO 69398	11/07/98	W.P.F.

28881 EXTERNAL PILOT MODIFICATION

BRIEF SUMMARY: THE 28881 EXTERNAL PILOT MODIFICATION IS USED TO STOP THE PUMP/BOOSTER FROM CYCLING BY USE OF AN EXTERNAL SHUTDOWN DEVICE (PRESSURE SWITCH, PILOT SWITCH, ETC.). THIS MODIFICATION IS USED IN LIEU OF SHUTTING OFF THE MAIN AIR DRIVE SUPPLY.

CAUTION: HIGH PRESSURE AIR, GAS, OR LIQUID CAN BE DANGEROUS IF NOT PROPERLY HANDLED.

FIELD CONVERSION: FOR FIELD CONVERSION KIT, ORDER PART NO. 28881-2.

INSTALLATION INSTRUCTIONS

REQUIRED TOOLS: 3/16" & 5/32" HEX WRENCHES (ALLEN WRENCHES)
 1 1/16" SOCKET OR OPEN-END WRENCH
 28584 HASKEL TOOL OR NEEDLE NOSE PLIERS

- PROCEDURE:**
- (1) VENT ALL PRESSURE FROM THE PUMP/BOOSTER.
 - (2) REMOVE THE 17568-2 PLUG (1/8 NPT). IT IS LOCATED ON THE LOWER AIR CAP (AIR/CYCLING VALVE CAP) OPPOSITE THE AIR DRIVE INLET PORT.
 - (3) REMOVE THE 16510 PILOT STEM PLUG (11/16), 16513 SPRING, AND THE PILOT STEM. THEY ARE ALL LOCATED ON THE LOWER AIR CAP. USE THE 28584 HASKEL TOOL OR NEEDLE NOSE PLIERS TO REMOVE THE PILOT STEM.
 - (4) USE THE 5/32" HEX WRENCH (ALLEN WRENCH) TO INSTALL THE 60010-15 HOLLOW HEX PLUG. APPLY A THREAD LOCKING ADHESIVE (BLUE LOCTITE OR EQUIVALENT) TO THE THREADS. TIGHTEN THE PLUG SECURELY TO PREVENT LEAKAGE. ALLOW SUFFICIENT TIME FOR THE ADHESIVE TO DRY.
 - (5) RE-INSTALL THE PILOT STEM, SPRING, AND PLUG (REMOVED IN STEP 3).
 - (6) CONNECT AN AIR SUPPLY, WITH PRESSURE EQUAL TO OR GREATER THAN THE MAIN AIR DRIVE PRESSURE, UP TO 150 PSI TO THE 1/8 NPTF PORT. THIS WILL ALLOW PILOT AIR TO STOP THE PUMP/BOOSTER. IF THE PILOT PRESSURE IS LESS THAN THE MAIN AIR DRIVE PRESSURE, THE PUMP/BOOSTER MAY OPERATE ERRATICALLY.

CONTROL COPY
 LOCATION # 1

MACH. TOLERANCES	UNLESS OTHERWISE SPECIFIED
DRAWN	W.L.F. 7/9/98
CHECKED	W.L.F.
APPRO.	B.L. 7/98
TITLE	EXTERNAL PILOT
DATE	7/9/98
SCALE	AS SHOWN
PROJECT	28881
SHEET	2 OF 2

CONTRACT NO.	HASKEL INC. 100 EAST BRANTLEY PLACE MCKINNEY, TEXAS 75069
DATE	7/9/98
TITLE	PUMP MODIFICATION
EXTERNAL PILOT	
SIZE	ONE HALF, NO. 1509
SCALE	AS SHOWN
SHEET	2 OF 2

28881-1

SECTION 5

SAFETY INFORMATION





Safety Instructions

CAUTION: HIGH PRESSURE MEDIA CAN BE DANGEROUS IF IMPROPERLY HANDLED

Most accidents which occur during the operation and maintenance of machinery are a result of failure to observe basic safety rules or precautions. Failure to observe the precautions below may be considered dangerous practice or misuse of the system.

1. GENERAL

- 1.1. Never operate hand valves which are not properly secured to a bracket or firm support. Always ensure pipelines, valves, pressure gauges and other high pressure units are properly secured.
- 1.2. Never remove or tamper with safety devices guards or insulation materials
- 1.3. Never tighten H.P. couplings under pressure. Never slacken them as a means of "Letting off" pressure.
- 1.4. Never pressurise rapidly because air and gases are particularly dangerous when pressurised in a small cavity. Where possible, always purge or bleed a pipeline before pressurizing and raise pressure slowly. (N.B. shock pressure testing requires special safety protection)
- 1.5. Never have lengths of unguarded, unsupported H.P. tubing which can be trodden on, fallen on, tripped over or merely vibrate in sympathy with a pump or other machinery.
- 1.6. Never feel for leaks with a naked hand. Always think and look before touching pipework.
- 1.7. Never use compressed air to clean loose dirt from clothing.
- 1.8. Never operate any equipment unless its function and operation is fully understood.
- 1.9. Remember the differential angle on male to female sealing cones is important. Always ensure it exists and is the right way round i.e. male 58° - 59°, female 60° - 61°. Never lap the two mating parts together. Always ensure bleed holes are drilled through.



- 1.10. Remember dirt in a hydraulic or pneumatic system is a hazard and prevents the correct operation of the system.
- 1.11. All H.P. large capacity testing must be done in the safety of the test cell with expert supervision. The method of testing must be shown on the drawing for the job.
- 1.12. Ensure correct lifting gear is used and it is tested and approved to local safety regulations.
- 1.13. Local noise regulation must be observed, Ear defenders should be used if noise level is greater than 85 dB.
- 1.14. Always clean any oil spills.
- 1.15. Avoid having to complete work on high pressure equipment against a delivery deadline.

2. BEFORE INSTALLATION:

- 2.1 Study the technical data received with the unit. Do not hesitate to call your distributor or Haskel on any question.
- 2.2 Review the maximum system pressure that might be encountered at: Drive input - media input and media output.
 - 2.2.1 Be certain that the data confirms the unit to be rated for those pressures at all three connections.
 - 2.2.2 Be certain that your connecting piping, fittings, gauges, and accessories are rated properly at all three ports and that relief valve or burst disc protection is provided for any potential over pressure.
- 2.3 Review the compatibility of the media with all components and piping (particularly oxygen gas where each component exposed to the gas should be specifically labelled for oxygen service).

3. INSTALLATION:

- 3.1 Inspect all connections before tightening for any contaminants. Remove any foreign materials. If system is for oxygen gas, follow specific special inspection and cleaning procedures to ensure removal of any hydrocarbon contamination.
- 3.2 Fasten unit securely to mounting surface before tightening piping connections.
- 3.3 Stop and inspect any indication of cross-threading or galling (particularly stainless steel to stainless steel fittings).



4. OPERATION:

- 4.1 Be certain you have an understanding of the complete system before operating. Question anything that is unclear.
- 4.2 Always open media inlet and outlet valves before opening drive valve.
- 4.3 Open all valves slowly.
- 4.4 Presume that ALL installations will eventually leak due to vibration, wear or accident.
- 4.5 Consider ALL gases (except air) to be potentially hazardous if confined in a closed area. Therefore, operate only in a well ventilated area.

For use of pressure test equipment we recommend you refer to the following documents.

Safety in Pressure Testing GS4 (ISBN0717616290)
2006/42/EC Machinery Directive
97/23/EC Pressure Equipment Directive



ATEX INSTRUCTIONS BOOSTERS & AMPLIFIERS BEING OPERATED IN EXPLOSIVE ATMOSPHERES

**IN OPERATON THE COMPRESSION RATIO SHOULD
NEVER BE ALLOWED TO EXCEED THE FOLLOWING**

5:1 FOR -1.0 TO -15 (-32) GAS BARREL

9:1 FOR -30 (-62) GAS BARREL

20:1 FOR -75 & -152 (-233) GAS BARREL

1. ALL Boosters & Amplifiers seals should be replaced with NEW seals at yearly intervals OR 2000 hours which ever is sooner.
2. Full inspection should be conducted and any wearing parts replaced.
3. ALL Springs and Bearings to be replaced at yearly intervals OR 6,500 hours which ever is sooner.
4. Boosters & Amplifiers returning into service should be 'as new condition'.
5. A Relief Valve should be fitted after the Booster OR a System Safety valve in accordance with PED Directive 97/23/EC.
6. All ATEX boosters servicing must be carried out by a competent person.



ATEX INSTRUCTIONS

ACCESSORIES BEING OPERATED IN EXPLOSIVE ATMOSPHERES

1. ALL seals and Bearings should be replaced at yearly intervals with new OR at 6,500 hours whichever is sooner.
2. Full inspection should be conducted and any wearing parts replaced as above.
3. ALL springs to be replaced at yearly intervals or 6,500 hours whichever is sooner.
4. Accessories returning into service should be 'as new condition.
5. All ATEX accessories servicing must be carried out by a competent person.

SECTION 6
MAINTENANCE



MAINTENANCE

MAINTENANCE INSTRUCTIONS

The equipment could be operating in a comparatively hostile environment and although it is designed to operate under these conditions, regular maintenance is essential. The following daily, weekly, three monthly and yearly schedules should be set up for cleaning and maintaining the various sections of the equipment. The daily activities listed below may be undertaken by the operator. All other activities should be carried out by the maintenance department. Many of these weekly and monthly checks can be carried out without affecting the operation, but where operation must be interrupted it is essential that the schedule is rigorously applied and not delayed for short term operating advantage.

FAILURE TO CARRY OUT MAINTENANCE MAY RESULT IN SERIOUS SYSTEM FAILURE AND INVALIDATION OF YOUR WARRANTY.

Daily

Check all joints for leaks and take the appropriate action.

Weekly

Check all joints visually for leakage, particularly those joints which are subject to pressure. Wipe down all valve bodies and apply a light film of oil to stems and handles of infrequently used valves where necessary, to avoid possible corrosion and future tightness of operation.

Every three months

Check individual filters (where applicable) and clean if necessary – if after three checks the filters are found to be clean – check only every six months. Check for leaks from valve glands on any flow control valves and isolating valves (where applicable) – adjust if necessary. If the valve still leaks remove and replace packing.

Every two years

Clean all valves replace any 'O' rings and seats in regulators and replace any gland packing in the valves. Once complete refit and Hydrotest.

Testing

When maintenance procedures or repairs have necessitated dismantling or adjustment of sections of the equipment, it is essential that those sections are



tested for correct functioning before the system is returned to the operator (Refer to Operating Instructions).

Particular attention should be paid to leaks and the correct pressures indicated on the system gauges with fluctuations kept to a minimum.

Removal/Replacement

Where it is necessary to remove components for repair, adjustment or replacement refer to operation and Maintenance manual for details of circuit and components.

Safety Precautions

Never attempt to remove any part unless pressure has been isolated and the unit vented.

Always wear gloves and protective eyewear when working on any part of the equipment where chemicals may be present.

If chemicals are ingested or contact your eyes/skin, seek medical help immediately.

Ensure all threads are lubricated on assembly to prevent galling.

Haskel Service

In order to maintain the quality of your system we can offer full maintenance and service facilities. Telephone or write to our service department for full details of:

- Installation.
- Commissioning.
- Preventative maintenance contracts.
- Emergency breakdown call-out service.
- Supply of spare parts.
- Upgrading and modification facilities.
- Calibration with fully certified equipment.
- Customer training.

Service Department
Haskel Milton Roy
North Hylton Road
Sunderland
SR5 3JD

Tel: 0191 5491212
E-Mail: repairs@haskel.co.uk

