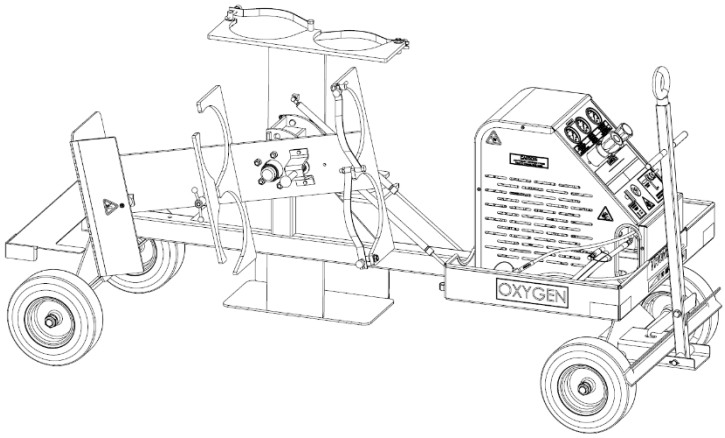
OPERATION & SERVICE MANUAL



Model: 20-4532-9000
Three Cylinder High Pressure Oxygen Cart
With Tiltable Cradles and Booster
(Remote or Hangar)

CE

02/2025 - Rev. 01

CAUTION

It is MANDATORY that this instruction manual be read and understood by all persons operating this High Pressure Oxygen Booster.

Tronair, Inc.
1 Air Cargo Pkwy East
Swanton, OH 43558

Phone: (419) 866-6301 | 800-426-6301
Web: www.tronair.com
Email: sales@tronair.com

REVISION	DATE	TEXT AFFECTED
01	02/2025	Original release

TABLE OF CONTENTS

PAGE

1.0 PRODUCT INFORMATION 1
1.1 DESCRIPTION 1
1.2 MODEL & SERIAL NUMBER 1
1.3 MANUFACTURER 1
1.4 SPECIFICATIONS/FEATURES 2
2.0 SAFETY INFORMATION 3
2.1 USAGE AND SAFETY INFORMATION 3
2.2 SAFETY 3
3.0 PREPARATION FOR USE 4
3.1 LOADING/UNLOADING CYLINDERS 4
3.1.1 Loading Cylinders 4
3.1.2 Unloading Cylinders 5
4.0 TRAINING 5
4.1 TRAINING REQUIREMENTS 5
4.2 TRAINING PROGRAM 5
4.3 OPERATOR TRAINING 5
5.0 OPERATION OF OXYGEN BOOSTER 6
5.1 FILL PROCEDURE 7
5.2 DISCONNECT PROCEDURE 8
5.3 TO READ INDIVIDUAL BOTTLE PRESSURE 8
5.4 EFFICIENT USE OF SYSTEM 8
6.0 PACKAGING AND STORAGE 9
6.1 STORAGE 9
7.0 TROUBLESHOOTING 9
8.0 MAINTENANCE 9
8.1 TRAILER 9
8.2 OXYGEN COMPONENTS 9
9.0 PROVISION OF SPARES 10
9.1 SOURCE OF SPARE PARTS 10
9.2 RECOMMENDED SPARE PARTS LISTS 10
10.0 IN SERVICE SUPPORT 10
11.0 GUARANTEES/LIMITATION OF LIABILITY 10
12.0 APPENDICES 10

This product can not be modified without the written approval of Tronair, Inc. Any modifications done without written approval voids all warranties and releases Tronair, Inc., its suppliers, distributors, employees, or financial institutions from any liability from consequences that may occur. Only Tronair OEM replacement parts shall be used.

CAUTION!

It is MANDATORY that this instruction manual be read and understood by all persons operating this High Pressure Oxygen Booster.

1.0 PRODUCT INFORMATION

1.1 DESCRIPTION

The Tronair Oxygen Cart with Booster is designed to minimize the handling of oxygen cylinders in loading and unloading, transporting and servicing process and to provide boosted compressed gas for an aircraft.

The high pressure regulator is for regulating booster output pressure from 15 - 2250 psi (115 bar).

The booster provides the capability of boosting remaining lower pressure oxygen from supply cylinders to the required higher aircraft system pressure; up to 2250 psig maximum. The booster system provides high regulated pressure output and can be driven by shop air or an on-board compressed nitrogen bottle. The transport cart allows a single operator to load full oxygen cylinders and transport them to service the aircraft, without ever having to lift the cylinders. The unique quality of this cart is the operator never has to lift a cylinder, which can weigh between 120 and 175 lbs., onto the cart. The cart has a very narrow footprint and a tight turning radius allowing for easy maneuverability.

Consumer Requirement: This Oxygen Booster utilizes a compressed air or nitrogen driven pressure amplifier, requiring 145 psig maximum air pressure input at 80 SCFM volume.

Cart may be used to supply either internal aircraft systems or portable aircraft bottles.

DANGER!

TO AVOID SERIOUS INJURY, LOSS OF LIMB OR DEATH:

1. **DO NOT use on LOW PRESSURE aircraft systems.**
2. **DO NOT use with ANY GAS OTHER THAN OXYGEN.**
3. **DO NOT exceed 2900 PSIG inlet oxygen bottle pressure into booster.**
4. **All components used in the oxygen system shall be clean, dry and free of all contamination per SAE SPEC. AIR 1176.**
5. **Servicing and/or maintenance of oxygen systems shall be done by trained and qualified personnel using approved procedures per SAE SPEC. ARP 1532.**

1.2 MODEL & SERIAL NUMBER

Reference nameplate on unit

1.3 MANUFACTURER

***TRONAIR*, Inc.**
1 Air Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
Website: www.tronair.com

1.4 SPECIFICATIONS/FEATURES

Dimensions:

Height..... 46 11/16 in (118.58 cm)
Length ..... 92 13/16 in (235.74 cm)
Width ..... 35 13/16 in (90.96 cm)
Weight ..... 970 lbs (440 kg)

Rotating Cylinder Loader/Un-Loader:

- Stable and efficient rotational motion guidance under variable weights, speeds and high load conditions keeping the cylinders in the correct location
- Struts control the rotating of the cylinders from the vertical and horizontal positions
- Accommodates cylinders 9” diameter, 56” tall and weighing less than 150 lbs
- Manufactured of high strength materials to ensure the cylinders are secure
- Locks into horizontal or vertical position by a spring loaded plunger
- Makes unloading, transporting, servicing and moving the cylinders a one person operation

Cart:

- CE Marked
- Easy, one person loading/unloading
- Accommodates 3 oxygen cylinders – up to 9” diameter, 56” tall and 150 lbs; CGA 540 connections with check valves, 2900 psi max
- Cylinders fully captured
- Accommodates 1 nitrogen cylinder - up to 9” diameter, 56” tall and 150 lbs; CGA 580 connection with check valve, 3000 psi max
- Pneumatic tires/tapered wheel bearings
- Narrow width
- Very low profile, fits under most aircraft wings
- Parking brake
- Hose compartment storage tray
- Instrument Panel
- Powder coated heavy duty steel construction
- Compact frame allows for a tight turning radius

Booster:

Output Hose .....15 ft (4.6 m) long with #4 37ºJIC female flare swivel fitting at aircraft hook-up end
Output Rating .....2250 psi (155 bar) maximum
Minimum Supply Bottle Pressure .....250 psi (17 bar)
Input to Booster Pump.....80 SCFM at 150 psi (10.3 bar) maximum
Booster High Pressure Air Pilot .....2900 psi (120 bar)
Booster High Pressure Relief .....2750 psi (189.6 bar)
All plumbing, fittings, and components are oxygen cleaned. The unit and hoses are cleaned and packaged to avoid possible system contamination.

Temperature Range:

- 0º to 200ºF (17.7º to 93.3º C)

2.0 SAFETY INFORMATION

CAUTION!

It is mandatory that this instruction manual be read and understood by all persons operating this High Pressure Oxygen Booster.

2.1 USAGE AND SAFETY INFORMATION

Information presented in this manual and on various labels, tags, and plates on the unit pertains to equipment design, installation, operation, maintenance and trouble shooting which should be read, understood, and followed for the safe and effective use of this equipment.

2.2 SAFETY

Observe all safety labels and decals on the unit prior and during use. Be aware and use caution of moving components and dangers of pressurized oxygen.

The operation, maintenance, and trouble shooting of this high pressure oxygen booster requires practices and procedures which ensure personal operator safety and the safety of others. Therefore, this equipment is to be operated and maintained only by qualified persons in accordance with this manual and all applicable local codes.

NOTE: Safety instructions specifically pertaining to this unit appear throughout this manual highlighted by the signal words WARNING, CAUTION, DANGER which identify different levels of hazard.

WARNING! — Warning is used to indicate the presence of a hazard that ***can cause severe personal injury, death, or substantial property damage*** if the warning notice is ignored.

CAUTION! — Caution is used to indicate the presence of a hazard that ***will or can cause minor personal injury or property damage*** if the caution notice is ignored.

WARNING!

TO AVOID SERIOUS INJURY OR DEATH OBSERVE THE FOLLOWING:

1. **All components used in the oxygen system must be clean, dry, and free of all contamination per SAE SPEC AIR 1176.**
2. **DO NOT use this equipment with nitrogen or gas other than oxygen.**
3. **DO NOT exceed 2900 psig bottle inlet pressure into booster.**
4. **Servicing and maintenance of the system should only be done by trained and qualified personnel using approved procedures.**
5. **It is mandatory that this instruction manual be read and understood by all persons operating this oxygen manifold.**

Pressures: Gases under pressure are a potential hazard in the form of stored energy. Accidents can occur when this energy is improperly handled. Be sure that all equipment used is compatible and designed to control the pressures encountered.

Nitrogen: Nitrogen is chemically stable, nonflammable, and does not support combustion.

Oxygen: Oxygen is an oxidizing gas and is chemically stable and nonflammable. However, oxygen does support combustion. High concentrations can accelerate the combustion of flammable materials up to and including an explosion. It is important to understand that spontaneous combustion of organic materials can occur in oxygen rich atmospheres.

Handling: Oxygen handling must be done with care to avoid any association with hydro-carbons. Especially where fuels and lubricants are present in aircraft service areas. It is imperative that oxygen systems be handled properly. Be sure to keep all protective caps in position on equipment as long as possible, and replace them as soon as possible.

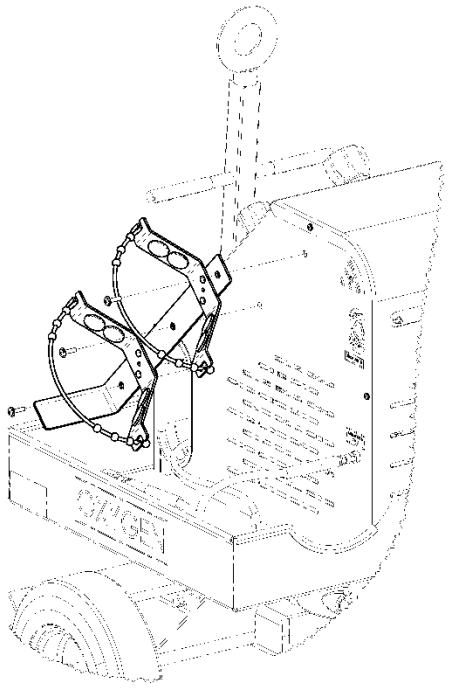
Velocity: Pressurized gas flowing at a high velocity in a piping system can propel any foreign material particles with such force that the impact friction can raise the particles temperature to a possible ignition point. It is, therefore, imperative that a high degree of cleanliness be maintained in the oxygen system at all times.

Oxygen Servicing: The following list contains additional general safety precautions that should be adhered to during the servicing process. However, always refer to the manufacturer's procedure for the airplane being serviced.

1. Always ground the system to be serviced and the servicing equipment before connecting the filler adapter.
2. Close the oxygen bottle manual shutoff valve.
3. Ensure that all aircraft electrical power is off. Do not operate electrical switches, or connect or disconnect ground power generators during the oxygen charging operation.
4. Do not service the oxygen system if fueling or other flammable fluid servicing is in process.
5. Do not charge the system too fast. Rapid charging can create a dangerous overheating condition.

2.2 SAFETY *(continued)*

SAE AIRCRAFT OXYGEN SPECIFICATION INFORMATION
For more information concerning specific SAE aircraft oxygen equipment specifications, contact:
Society of Automotive Engineers
400 Commonwealth Drive, Warrendale, PA 15096-0001



3.0 PREPARATION FOR USE

NOTE: Gas cylinders are not supplied with unit. Contact Tronair to purchase empty cylinders if necessary:
Oxygen.....PC-1124
Nitrogen PC-1107

If desired, or required by local regulation, install the included fire extinguisher bracket (H-5368) with included hardware to the side of cabinet. (See Figure)

Fire extinguisher bracket provides accommodation for a readily accessible 13.2 to 20 lbs. (6 to 9 kg) fire extinguisher for use in case of fire emergency. Unless directed by local regulation, a BC type extinguisher is recommended.

CAUTION!

Only use cylinders for which this unit was designed:
Oxygen Cylinders: 9 - 9-3/4" diameter, 2900 maximum pressure, connected with CGA 540 connectors
Nitrogen Cylinder: 9 -9-3/4" diameter, 2900 maximum pressure, connected with CGA 580 connector

CAUTION!

Maximum towing speed is 10 mph (16 km/h).

3.1 LOADING/UNLOADING CYLINDERS

3.1.1 Loading Cylinders

WARNING!

This cart is designed to carry 4 cylinders simultaneously. Failure to install all 4 cylinders will create an unstable condition. Cart must be fully loaded/unloaded before transporting.

CAUTION!

Do NOT transport cart with cradles in upright position. Always store cradles in horizontal position.

1. Place cart on flat, level surface
2. Ensure Towbar is in upright position
3. Rotate both cylinder cradles to upright position (empty cradles will require assistance to move into position), ensure locking mechanism is engaged
4. Lower bottom ramp
5. Remove bottom clamping handle assembly
6. Loosen only one top clamping knob and rotate strap away from cradle
7. Walk cylinder up ramp and into cradle, position cylinder valve outlet port to face directly forward, toward towbar
8. Rotate strap against cylinder and tighten top clamping knob
9. Repeat steps 6-8 for second cylinder
10. Install bottom clamping handle assembly and tighten
11. Raise bottom ramp into upright position and click into place
12. Repeat steps 6-11 for cylinders on opposite side
13. Once all four cylinders are secure rotate cradles to horizontal position. Ensure locking mechanism is engaged
14. Attach 3 Oxygen input hoses to Oxygen cylinders
15. Attach 1 Nitrogen input hose to Nitrogen cylinder

WARNING!

Ensure correct input hoses are installed to correct corresponding cylinders!

3.1.2 Unloading Cylinders

WARNING!

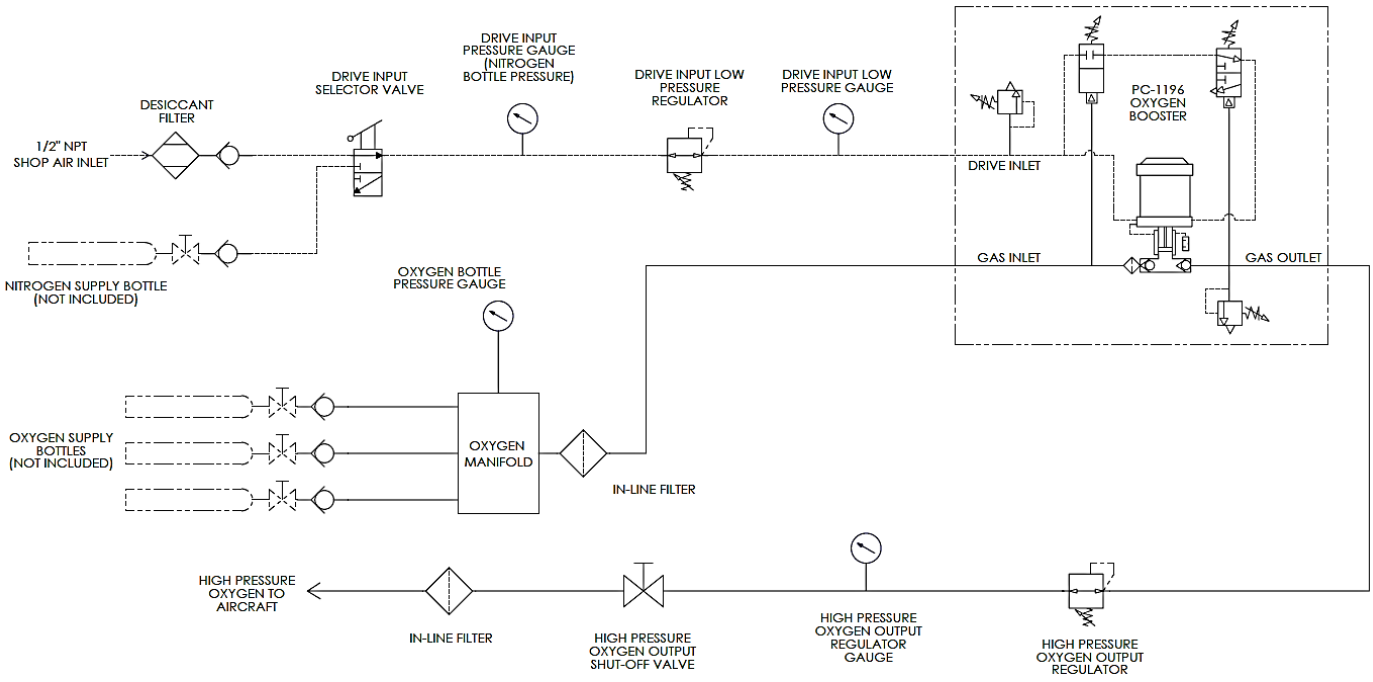
This cart is designed to carry 4 cylinders simultaneously. Failure to install all 4 cylinders will create an unstable condition. Cart must be fully loaded/unloaded before transporting.

CAUTION!

Do NOT transport cart with cradles in upright position. Always store cradles in horizontal position.

1. Place cart on flat, level surface
2. Ensure Towbar is in upright position
3. Close cylinder valves and disconnect input hoses
4. Rotate both cylinder cradles to upright position, ensure locking mechanism is engaged
5. Lower bottom ramp
6. Remove bottom clamping handle assembly
7. Loosen only one top clamping knob and rotate strap away from cradle
8. Walk cylinder down ramp
9. Repeat steps 7 & 8 for second cylinder
10. Repeat steps 5-8 for cylinders on opposite side

3.2 SCHEMATIC



4.0 TRAINING

Read this entire manual prior to operation of the unit. All personnel using this Oxygen Cart should understand and follow this manual and receive training. We encourage our customers to call Tronair to discuss any operating or testing requirements.

4.1 TRAINING REQUIREMENTS

The employer of the operator is responsible for providing a training program sufficient for the safe operation of the unit.

4.2 TRAINING PROGRAM

The employer provided operator training program should cover safety procedures concerning use of the unit in and around the intended aircraft at the intended aircraft servicing location.

4.3 OPERATOR TRAINING

The operator training should provide the required training for safe operation of the unit.

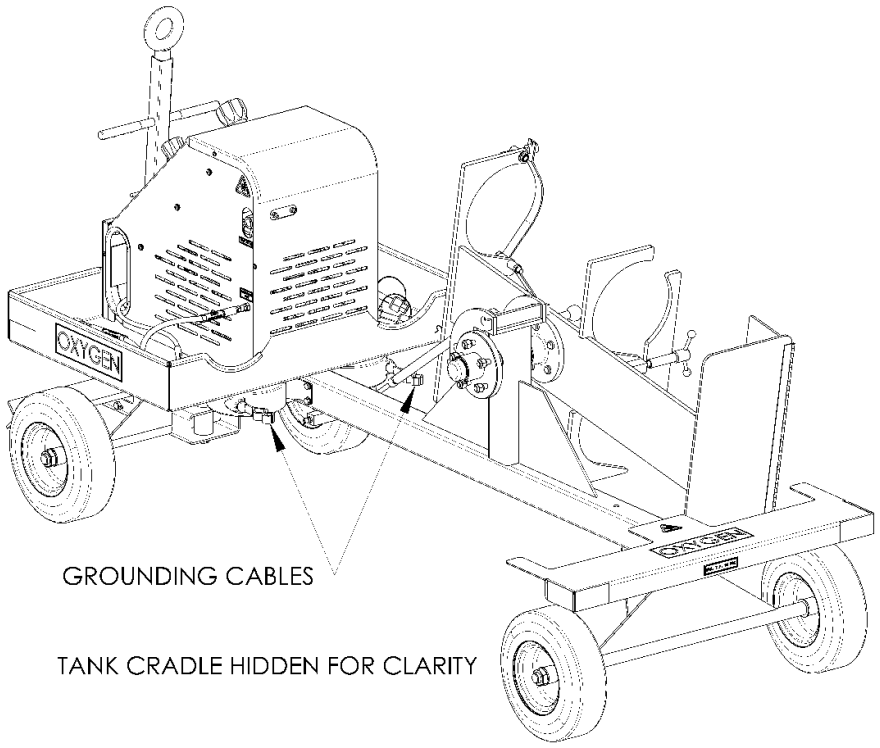
NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained technician.

5.0 OPERATION OF OXYGEN BOOSTER

WARNING!

If there are any differences between the following instructions and the aircraft maintenance manual, the aircraft maintenance manual will take precedence.

1. Attach one static discharge cable clamp to aircraft static ground. (See aircraft maintenance manual if any questions.)
2. Attach other static discharge cable clamp to earth static ground. (See aircraft maintenance manual if any questions.)
3. Be sure all valves and controls are in the closed or “OFF” position.



WARNING!

To Avoid Serious Injury, Loss of Limb, or Death:
1. DO NOT use high pressure Oxygen on aircraft components designed for low pressure Oxygen.
2. DO NOT use to service Nitrogen systems or components
3. DO NOT exceed 2900 psi inlet pressure.
4. Servicing and maintenance of product systems shall be done by only trained and qualified personnel using approved procedures.

WARNING!

Be sure fill line is secured prior to purging the unit. This will prevent the hose from “whipping” if too much oxygen is allowed to flow through the unit.

Booster Drive Input

If using Shop Air Supply:
1. Close high pressure oxygen output valve
2. Turn Booster Drive Selector Valve to "SHOP AIR"
3. Connect shop air supply to 1/2" female NPT port as indicated.

If using on-board compressed Nitrogen cylinder:
1. Close high pressure oxygen output valve
2. Turn Booster Drive Selector Valve to "NITROGEN BOTTLE"
3. Verify Nitrogen input hose connections and CGA 580 connections to Nitrogen cylinder.

WARNING!

Never connect oxygen cylinders to nitrogen input hose!

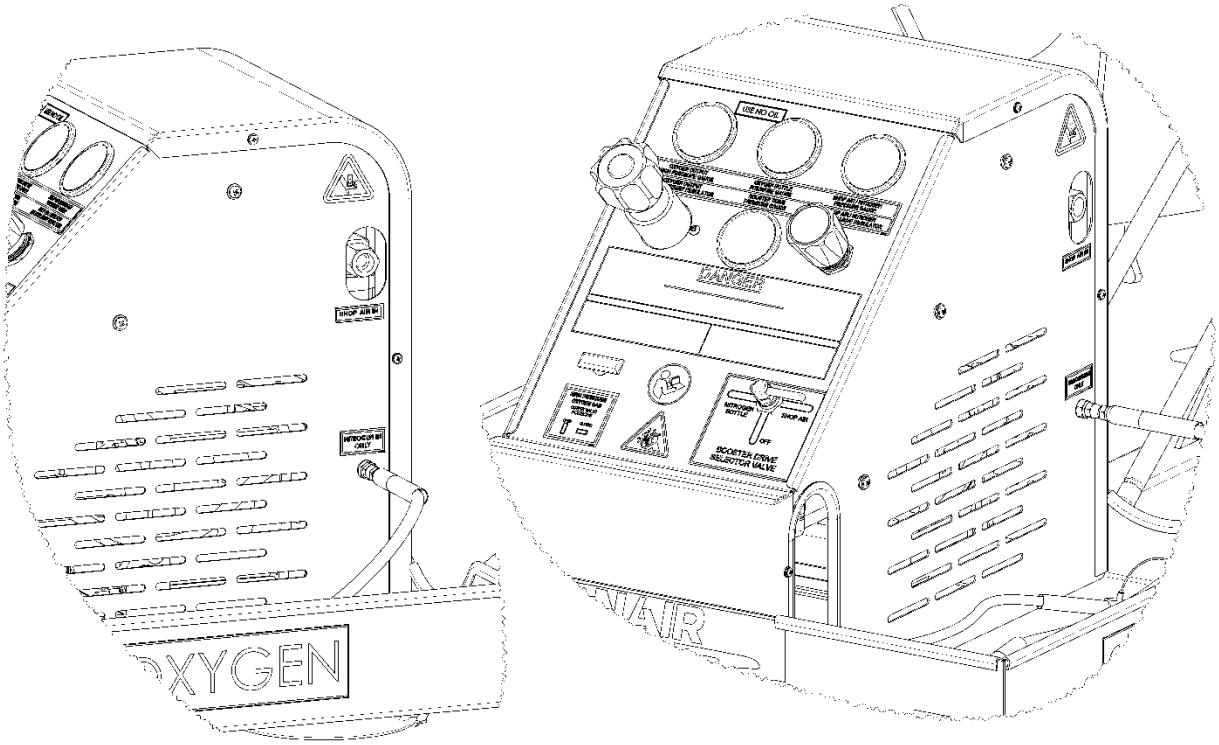
5.1 FILL PROCEDURE

Pressures: Gasses under pressure are a potential hazard in the form of stored energy. Accidents can occur when this energy is improperly handled. Be sure that all equipment used is compatible and designed to control the pressures encountered.

Nitrogen: Nitrogen is chemically stable, nonflammable, and does not support combustion.

Oxygen: Oxygen is an oxidizing gas and is chemically stable and nonflammable. However oxygen does support combustion. High concentrations can accelerate the combustion of flammable materials up to and including an explosion. It is important to understand that spontaneous combustion of organic materials can occur in oxygen rich atmospheres.

Handling: Compressed gas handling must be done with care. The rapid expansion of compressed gas from a high pressure source to an area of low pressure, can produce cryogenic temperatures which cause severe burns.



1. Reduce output pressure regulator to minimum pressure (counter clockwise)
2. Remove cap from high pressure oxygen output hose and immediately loosely connect hose to aircraft component
3. **SLOWLY** open shut off valve on the oxygen bottle
4. Adjust output pressure regulator for 50 – 100 psig on output pressure gauge
5. Open high pressure oxygen gas output valve slightly to purge output hose
6. Close high pressure oxygen gas output valve
7. Tighten output hose to aircraft component
8. Read aircraft system oxygen pressure required
9. Adjust output pressure regulator to required pressure
10. Slowly open high pressure oxygen gas output valve to fill aircraft component
11. Close high pressure oxygen gas output valve
12. Allow system to cool and recheck aircraft oxygen pressure prior to disconnecting. Repeat stems 12 & 13 if necessary

5.1 FILL PROCEDURE *(continued)*

If non-standard ambient temperatures are present at the time of oxygen system recharging, refer to Table 1 to determine the proper filling pressure for oxygen cylinders.

TABLE 1

At Temperature Degrees F	Fill to Working Pressure Multiplied by Figure Below
110	1.10
105	1.0875
100	1.075
95	1.0625
90	1.05
85	1.0375
80	1.025
75	1.0125
70	1.000
65	0.9875
60	0.975
55	0.9625
50	0.95
45	0.9375
40	0.925

EXAMPLE: Ambient Temperature = 90° F, Working pressure is 1800 PSIG:
Charge Pressure = (1800) x (1.05) = 1890 PSIG

5.2 DISCONNECT PROCEDURE

WARNING!

When the aircraft fill line is pressurized or when oxygen is flowing through the system, the fill line hose will "whip" if not secured.

1. Close the shut off valves on the oxygen bottle
2. Open high pressure oxygen gas output valve
3. Turn Booster Drive Selector Valve to "OFF"
4. Reduce high pressure output regulator to minimum pressure
5. SLOWLY disconnect the output hose from the aircraft to bleed remaining pressure within the system
6. Immediately reinstall the cap on the output hose
7. Close high pressure oxygen gas output valve
8. Disconnect shop air supply as applicable, Nitrogen cylinder should remain connected to Nitrogen input hose

5.3 TO READ INDIVIDUAL BOTTLE PRESSURE

1. Close high pressure oxygen gas output valve
2. Turn Booster Drive Selector Valve to "OFF"
3. **SLOWLY** open a bottle shutoff valve
4. Read pressure on bottle supply pressure gauge
5. Close bottle shutoff valve
6. Open high pressure oxygen gas output valve and slightly adjust pressure regulator to bleed off system pressure
7. Repeat procedure for other bottles

5.4 EFFICIENT USE OF SYSTEM

Maximum oxygen may be removed from supply bottles if aircraft are serviced from the lowest pressure bottle first. In this manner, the most oxygen may be removed from each bottle. Even bottles with relatively low pressures may be used to service aircraft if the aircraft has a depleted system (250 psi minimum).

6.0 PACKAGING AND STORAGE

6.1 STORAGE

- Store the unit in a clean, dry area when not in use.
- Be sure that all hoses are capped and the unit is covered with lint free covering for the duration of unit storage to ensure complete oxygen system cleanliness for future aircraft system recharging.

7.0 TROUBLESHOOTING

Refer to Appendix I and Appendix II

8.0 MAINTENANCE

The operation, maintenance, and trouble shooting of this unit require practices and procedures, which ensure personal operator safety and the safety of others. Therefore, this equipment is to be operated and maintained only by qualified persons in accordance with this manual and all applicable local codes. Maintenance is only to be done by qualified persons.

All maintenance personnel must be familiar with the cautions and warnings associated with high pressure oxygen and high pressure oxygen systems as outlined in *Section 3 - Safety* of this manual prior to performing any maintenance on the unit.

8.1 TRAILER

- The inlet shop air filter should be inspected every 300 - 600 hours of service or every two years, whichever comes first. The sintered bronze filter element can be cleaned using soap and water. The element should be dried with shop air blown from the inside out. The element may be cleaned multiple times before replacing, depending on cleanliness of operating environment. The replacement air filter element is available from Tronair, part number PC-1145.
- Maintain 45 to 50 psi tire pressure.
- Grease wheel bearings quarterly.
- Lubricate minimum quarterly:
  - Wheel bearings
  - Front truck hub bearings
  - Tilting cylinder cradle hubs and locking pins
  - Cylinder clamps and hardware
  - Cylinder ramps
  - Towbar pivot and latch
- Generally, keep the entire unit clean and free from contaminants. Visually inspect for any system leaks or damage. Correction of any problems prior to unit operation is imperative for safe operation.

8.2 OXYGEN COMPONENTS

WARNING!

OXYGEN EQUIPMENT IS NOT FIELD OR CUSTOMER SERVICEABLE!

OEM repair or replacement is recommended.

- The gauges on this unit should be inspected and calibrated annually to ANSI grade A accuracy, to maintain and ensure accuracy.
- Manifold inlet hoses should be inspected weekly for signs of cracking or kinking, replace as necessary.
- Inspect oxygen manifold output hose prior to each use for signs of cracking or kinking, replace as necessary.
- Replace inlet and output filters after 2000 hours of use (Z-7011).

9.0 PROVISION OF SPARES

9.1 SOURCE OF SPARE PARTS

Spare parts may be obtained from the manufacturer:

TRONAIR, Inc.
1 Air Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
Website: www.tronair.com

For Spare Parts, Operations & Service Manuals or Service Needs:
Scan the QR code or visit Tronair.com/aftermarket

9.2 RECOMMENDED SPARE PARTS LISTS

Reference the following page(s) for Replacement Parts and Kits available.

10.0 IN SERVICE SUPPORT

Contact Tronair, Inc. for technical services and information.

11.0 GUARANTEES/LIMITATION OF LIABILITY

Tronair products are warranted to be free of manufacturing or material defects for a period of one year after shipment to the original customer. This is solely limited to the repair or replacement of defective components. This warranty does not cover the following items:

a) Parts required for normal maintenance
b) Parts covered by a component manufacturers warranty
c) Replacement parts have a 90-day warranty from date of shipment

If you have a problem that may require service, contact Tronair immediately. Do not attempt to repair or disassemble a product without first contacting Tronair, any action may affect warranty coverage. When you contact Tronair be prepared to provide the following information:

a) Product Model Number
b) Product Serial Number
c) Description of the problem

If warranty coverage is approved, either replacement parts will be sent or the product will have to be returned to Tronair for repairs. If the product is to be returned, a Return Material Authorization (RMA) number will be issued for reference purposes on any shipping documents. Failure to obtain a RMA in advance of returning an item will result in a service fee. A decision on the extent of warranty coverage on returned products is reserved pending inspection at Tronair. Any shipments to Tronair must be shipped freight prepaid. Freight costs on shipments to customers will be paid by Tronair on any warranty claims only. Any unauthorized modification of the Tronair products or use of the Tronair products in violation of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately void any warranty, express or implied.

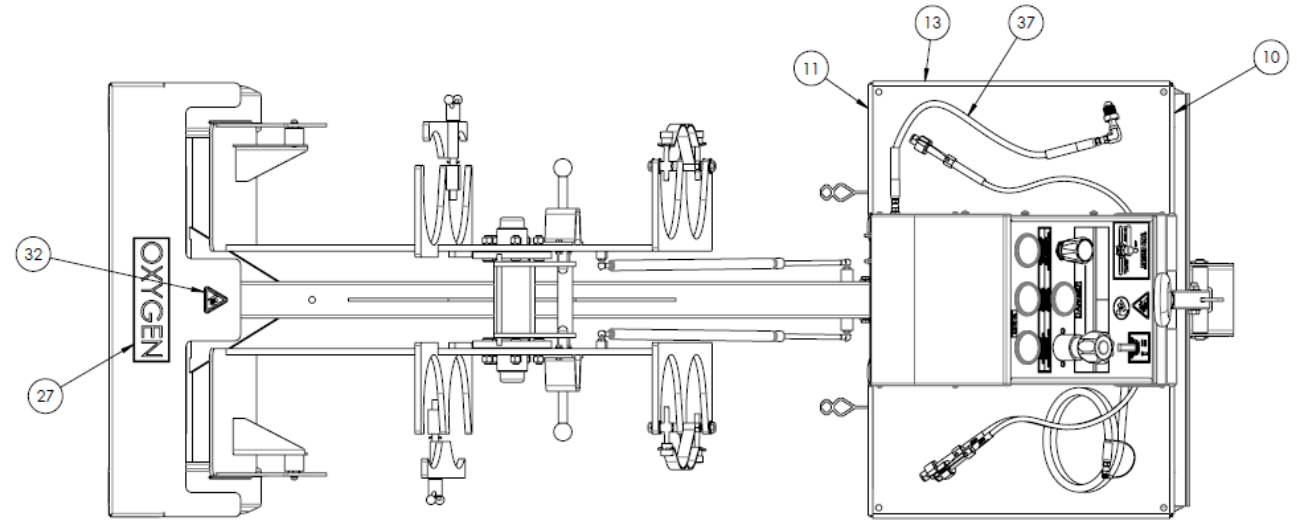
The obligations of Tronair expressly stated herein are in lieu of all other warranties or conditions expressed or implied. **Any unauthorized modification of the Tronair products or use of the Tronair products in violations of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately *void any warranty, express or implied* and Tronair *disclaims any and all liability for injury (WITHOUT LIMITATION and including DEATH), loss or damage arising from or relating to such misuse*.**

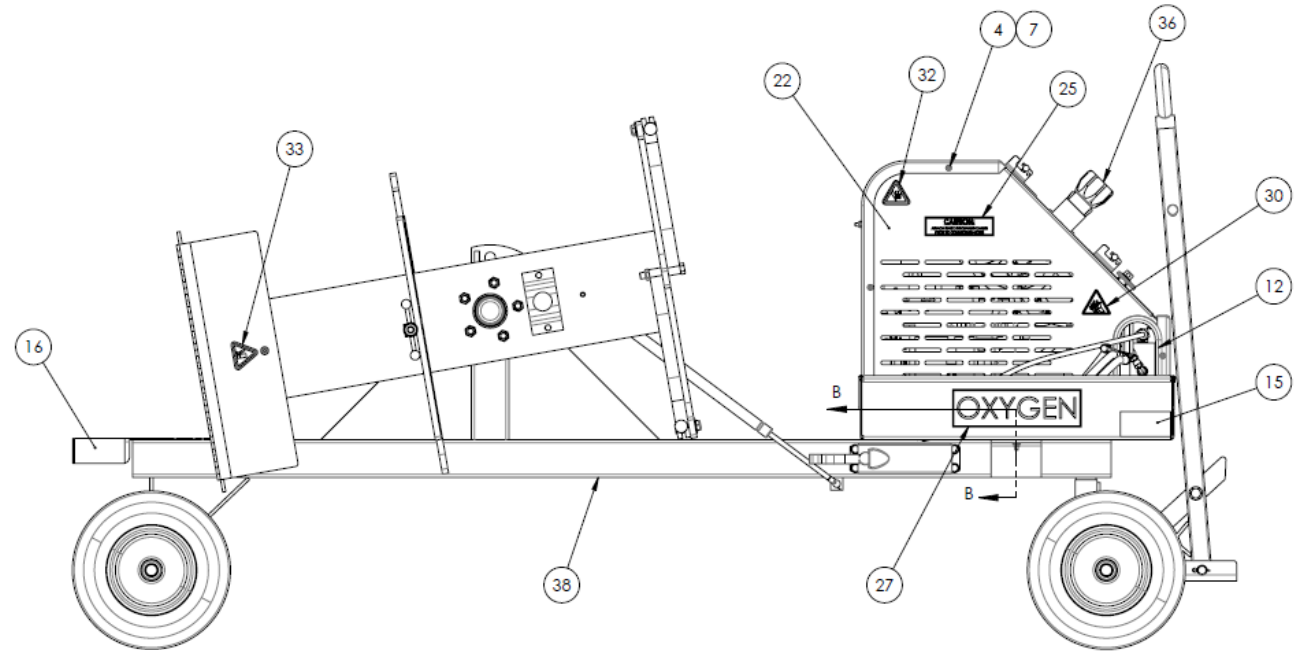
12.0 APPENDICES

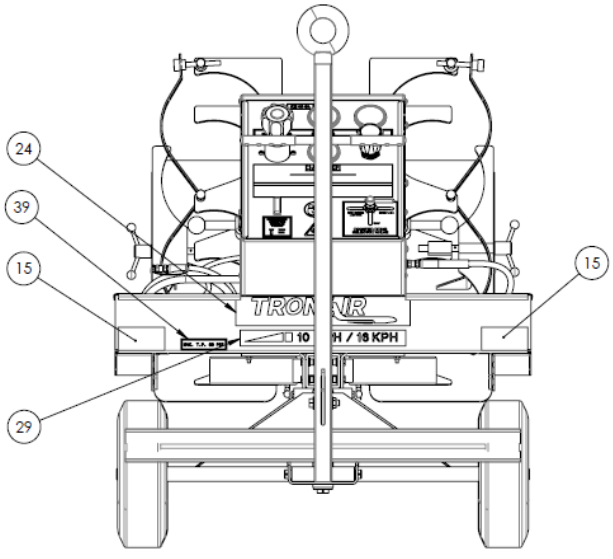
APPENDIX I Haskel Gas Booster
APPENDIX II Tescom (44-1100 Series) Safety, Installation, Operations & Service
APPENDIX III Instrument Certification Notice
APPENDIX IV Declaration of Conformity

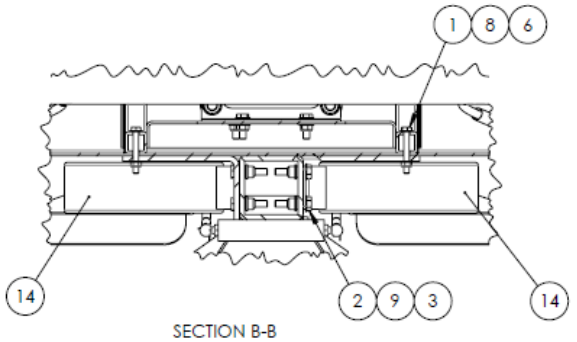
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.





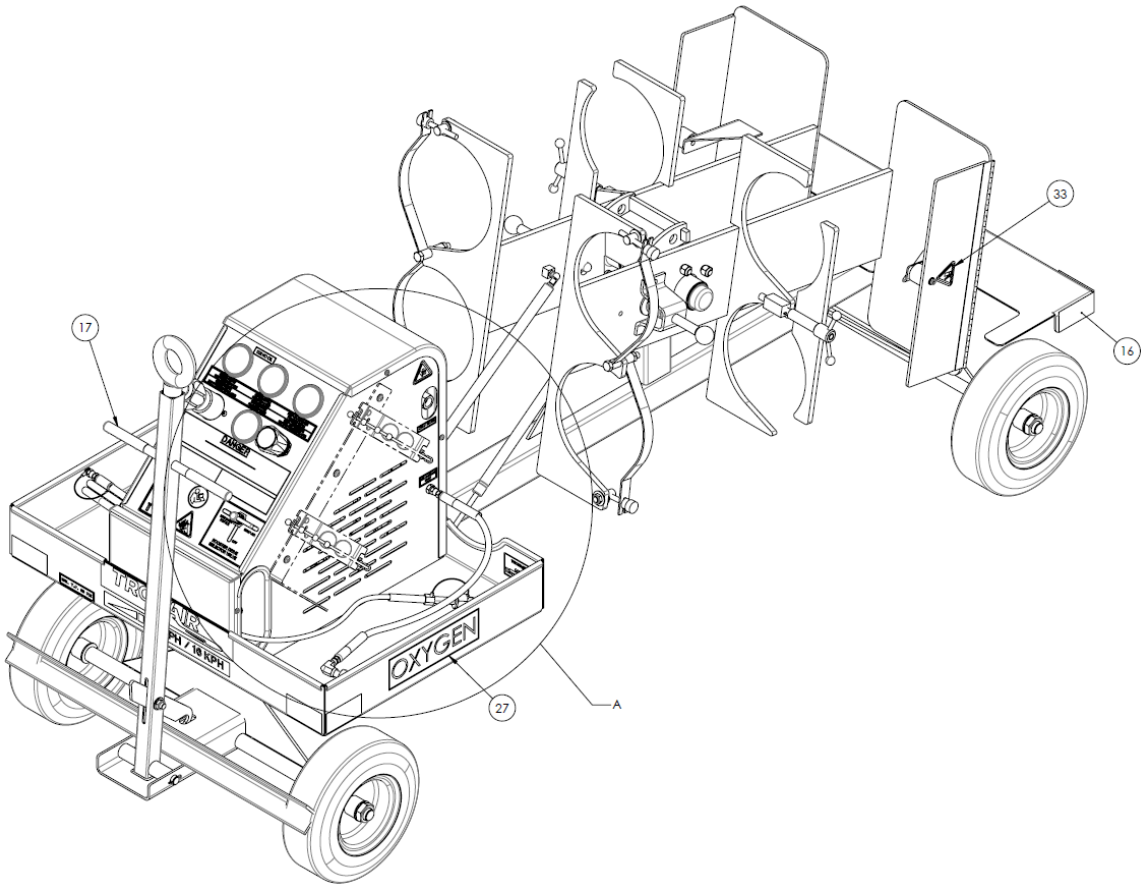


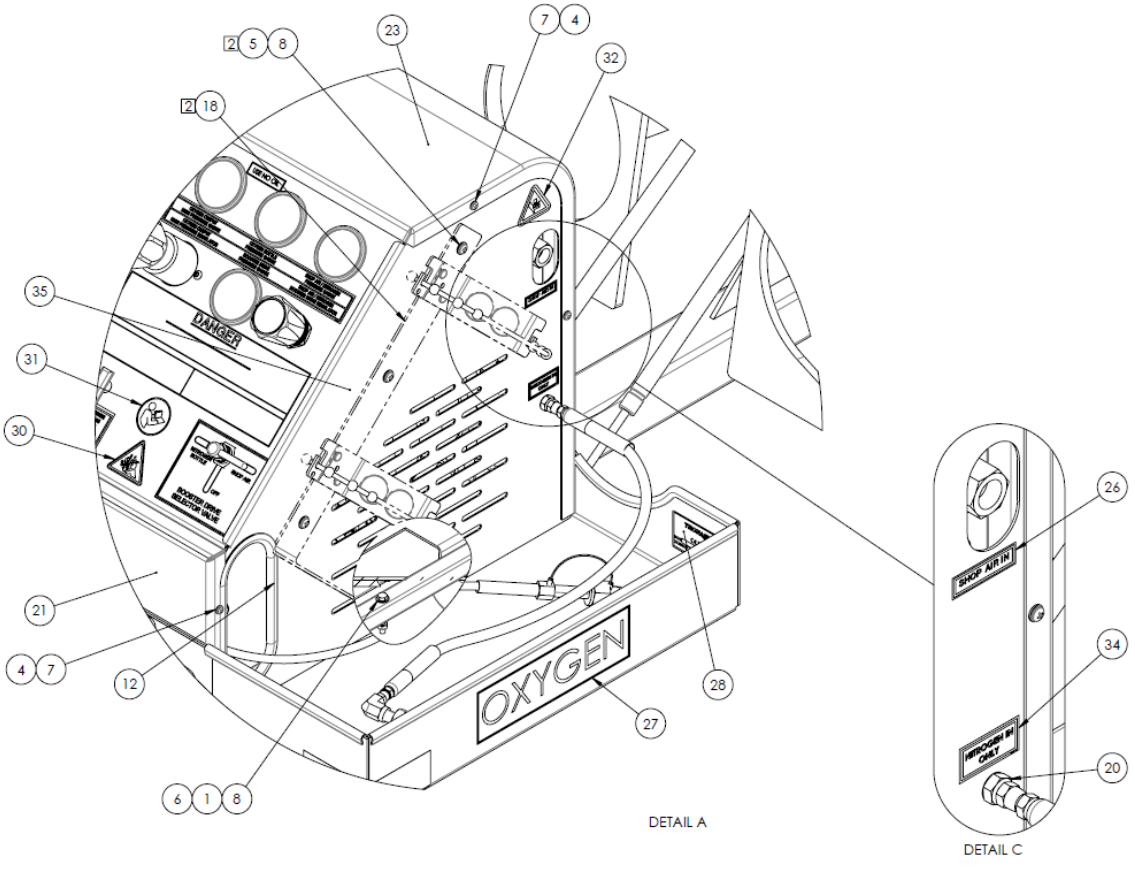


SECTION B-B

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.





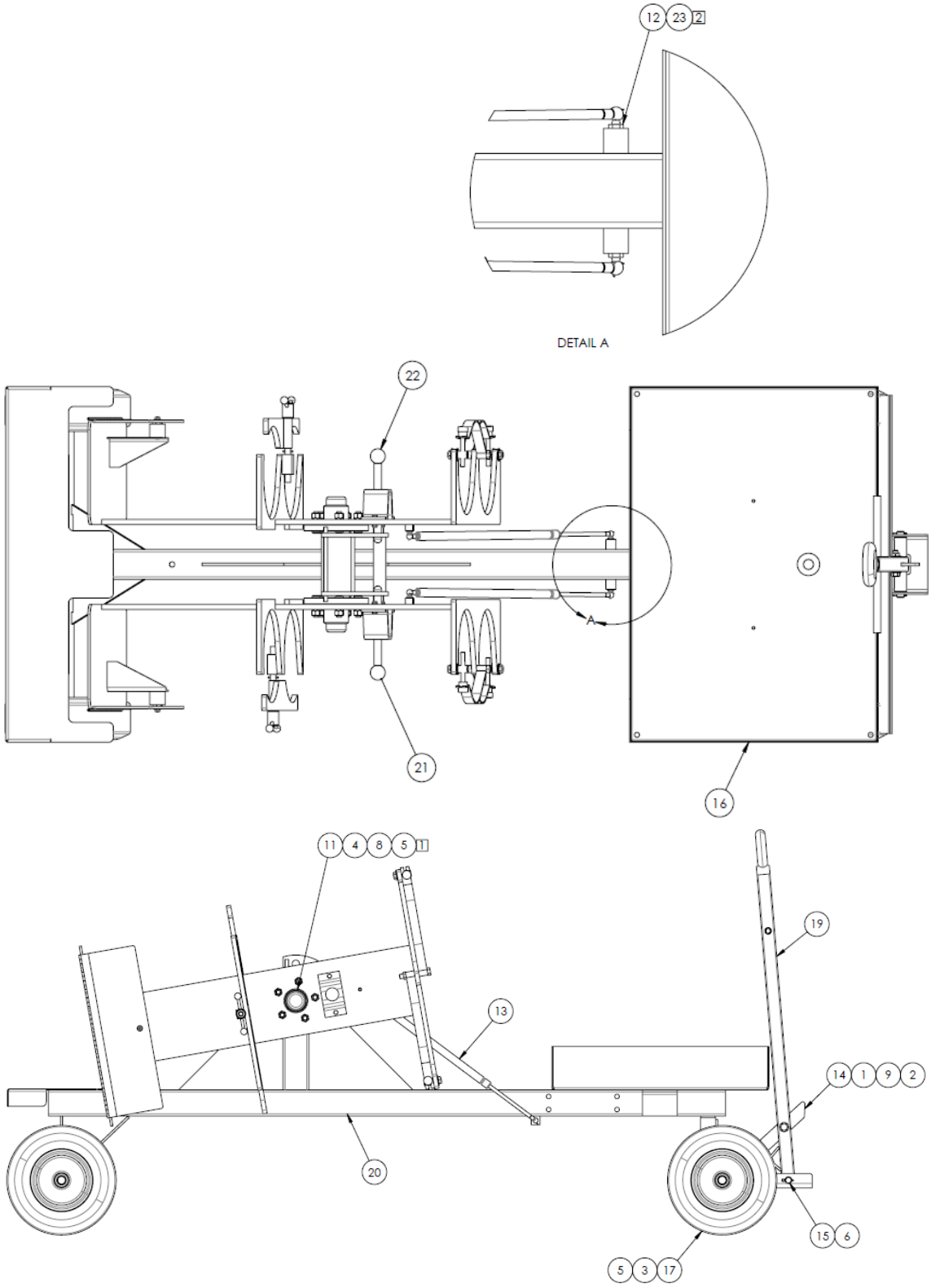
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	G-1112-105020	BOLT, 1/4-20 X 2.0" LG SST HEX HD	2
2	G-1112-106012	BOLT, 5/16-18 X 1-1/2" LG. SST HEX HD	8
3	G-1440-1060-S	NUTSERT, THICK WALL 5/16-18	8
4	G-1497-103110	SCR, 10-32 X 1.00 RD HD PH SS	6
5	G-1497-105010	SCREW, 1/4-20 X 1.0" LG. SST ROUND HD PH	3
6	G-1501-1050	STOPNUT, 1/4-20 ELASTIC S.S.	2
7	G-1503-1030N	FLATWASHER. #10 SST NARROW	6
8	G-1503-1050N	FLATWASHER. 1/4 SST NARROW	7
9	G-1503-1060N	FLATWASHER. 5/16 SST NARROW	8
10	H-1082-02-10.5	TRIM, EDGE	2
11	h-1082-02-11.5	TRIM, EDGE	2
12	H-1082-02-20.0	TRIM, EDGE	2
13	H-1082-02-24.5	TRIM, EDGE	2
14	H-1186	REEL, STATIC DISCHARGE	2
15	H-2806*004.00	REFLECTOR, YELLOW	4
16	H-2807*004.00	REFLECTOR, RED	4
17	H-3592	GRIP, HANDLE	2
18	H-5368	BRACKET, FIRE EXTINGUISHER	1
20	N-2061-01	BULKHEAD UNION WITH NUT	1
21	S-2653-00	PANEL, FRONT	1
22	S-4829-00	PANEL, SIDE COVER (P)	1
23	S-4876-01	PANEL, TOP/BACK COVER (P)	1
24	V-1033	LABEL, TRONAIR	1
25	V-1170	LABEL, CAUTION, STATIC REELS	1
26	V-1249	LABEL, SHOP AIR IN	1
27	V-1469	LABEL, OXYGEN	3
28	V-1779	LABEL, SERIAL CE NON-ELECT	1
29	V-1850	LABEL, MAX. TOW	1
30	V-1958	LABEL, ISO RELEASE PRESSURE	2
31	V-1986	LABEL, READ MANUAL	1
32	V-1999	LABEL, ISO HAND CRUSH	3
33	V-2000	LABEL, ISO FOOT CRUSH	2
34	V-3105	LABEL, NITROGEN IN ONLY	1
35	Z-12725-00	WELDMENT, SIDE PANEL (P)	1
36	Z-12728	ASY, OXYGEN BOOSTER	1
37	Z-12731	ASSY, NITROGEN SUPPLY HOSE	1
38	Z-12734	ASSY, 4-BOTTLE TILT OXY CART	1
N/S	V-1392	LABEL, MAX T.P. 50PSI	2

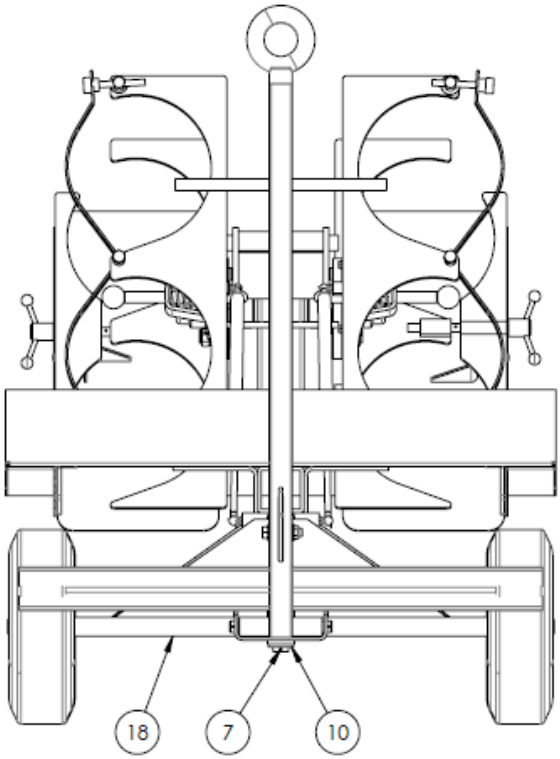
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Parts List

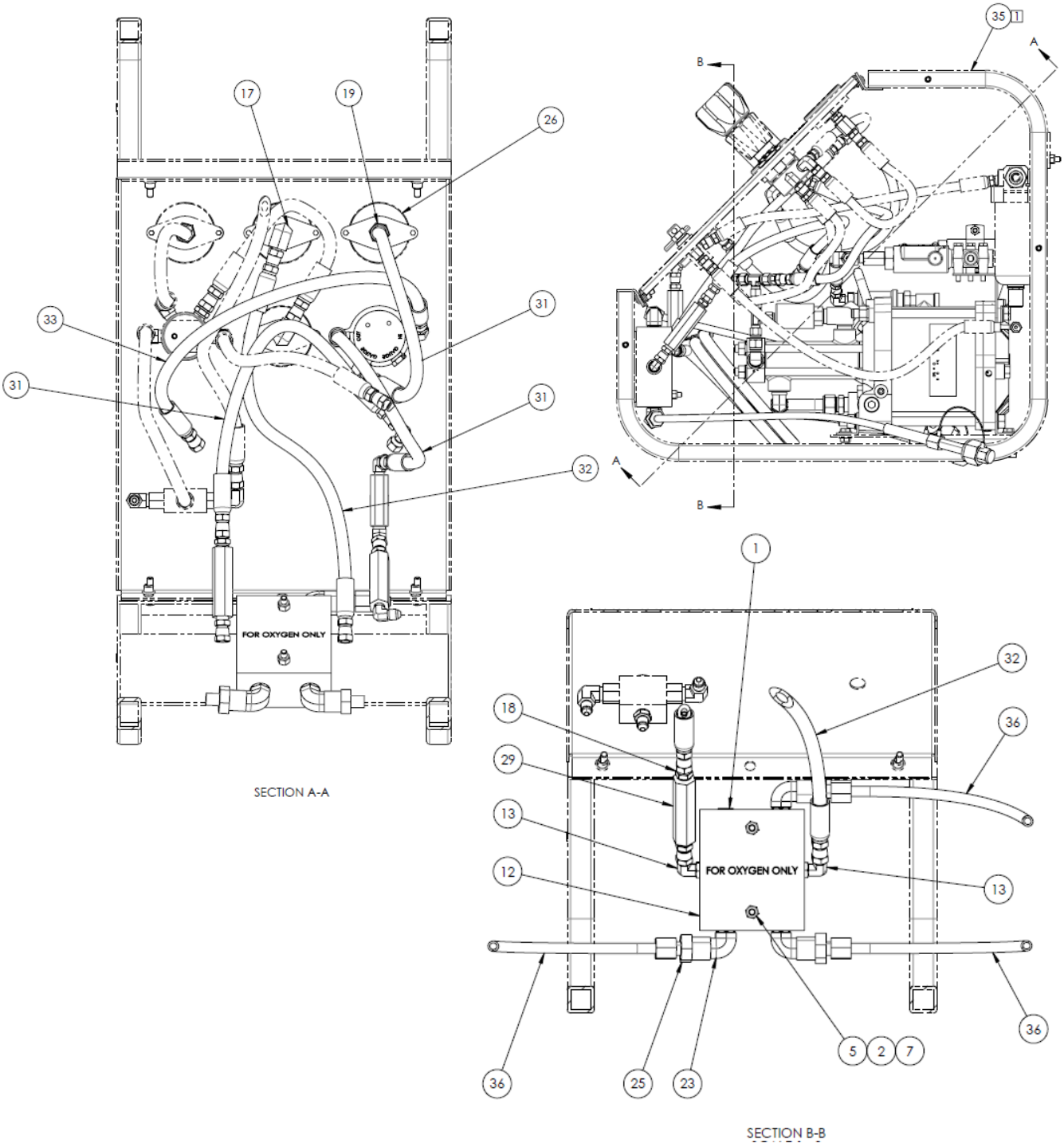
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
1	G-1112-109522	BOLT, 1/2-20 X 2-1/4" SST HEX HD	1
2	G-1203-1095	JAMNUT, 1/2-20 ELASTIC	1
3	G-1203-1120	JAMNUT, 1-14 ELASTIC	4
4	G-1230-01	NUT, AXLE 1	2
5	G-1283	WASHER, SPINDLE	10
6	G-1301-02	PIN, 1/8 X 1 LG COTTER	2
7	G-1301-03	PIN, 1/8 X 1.5" LG. COTTER	1
8	G-1301-11	PIN, 3/16 X 1-1/2 LG COTTR	2
9	G-1503-1090N	FLATWASHER, 1/2 NARROW S.S.	2
10	H-2019-76	BEARING, FLANGE	2
11	H-3424	HUB, #3500	2
12	H-3666	STUD, BALL	2
13	H-3687	DAMPENER	2
14	J-5501	LEVER	1
15	R-2096	PIN, TOWBAR	1
16	S-2625-00	HOSE TRAY(P)	1
17	U-1144	ASSEMBLY, WHEEL W/SEAL	4
18	Z-8099-00	WELDMENT, FRONT TRUCK (P)	1
19	Z-8173-00	WELDMENT, TOWBAR (P)	1
20	Z-8233-00	WELDMENT, 4-BOTTLE OXYGEN CART (P)	1
21	Z-8236	ASSEMBLY, RIGHT SIDE CYLINDER SUPPORT	1
22	Z-8237	WELDMENT, LEFT SIDE CLYINDER SUPPORT	1
23	H-3668	CLIP, RETAINING	4

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

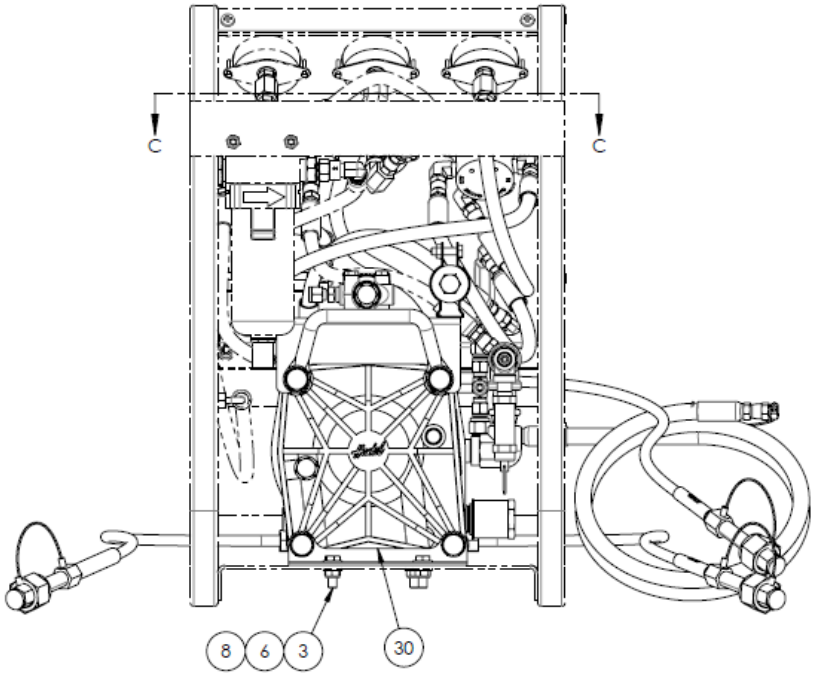


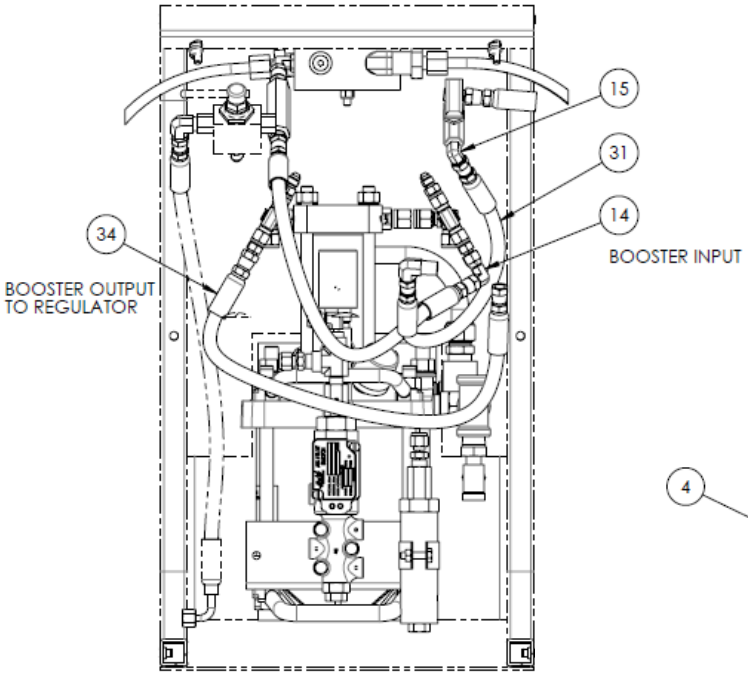
SECTION A-A

SECTION B-B

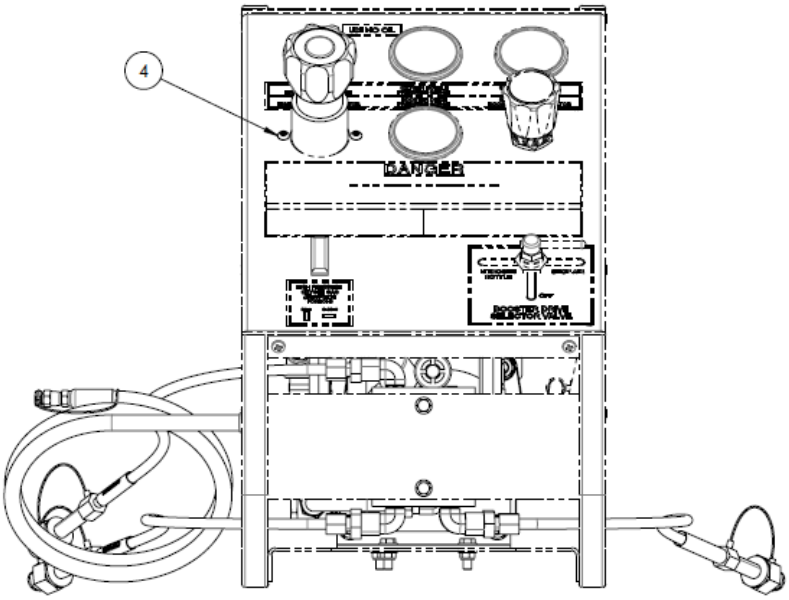
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



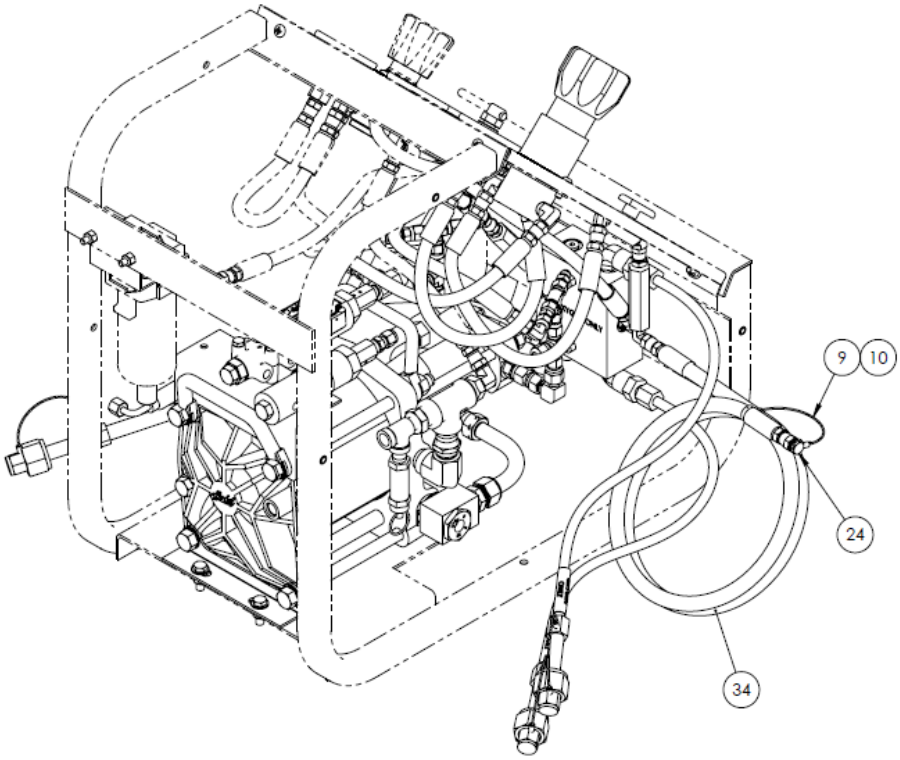


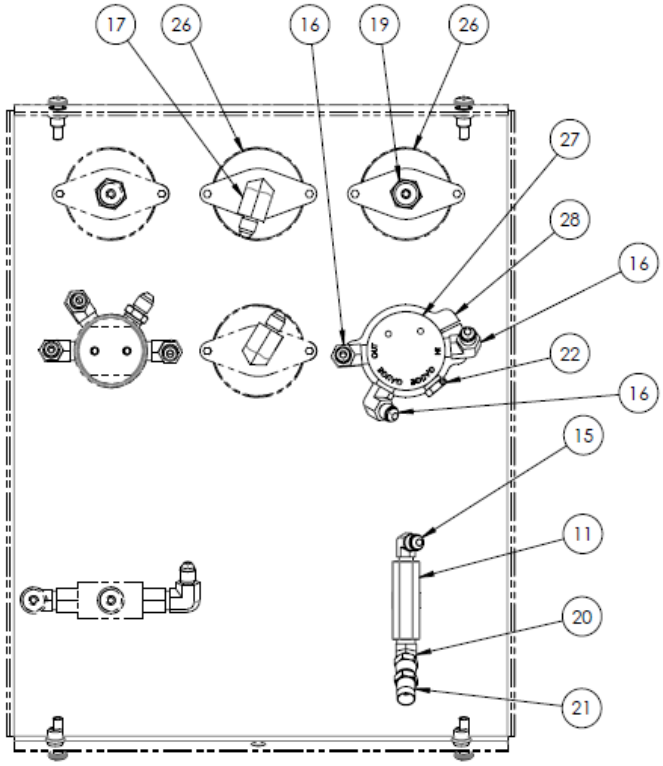
SECTION C-C



Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.





Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	717-090	SOCKET HEAD PLUG, 1/4 SAE O-RING	1
2	G-1100-105026	BOLT, 1/4-20 X 2-3/4" LG HEX HD GR 5	2
3	G-1100-106510	BOLT, 5/16-24 X 1.0" LG. HEX HD GR 5	4
4	G-1154-105206	SCREW, 1/4-20 X 3/4" LG. SOC BUTT. HD CAP	2
5	G-1202-1050	STOPNUT, 1/4-20 ELASTIC	2
6	G-1202-1065	STOPNUT, 5/16-24 ELASTIC	4
7	G-1250-1050N	FLATWASHER, 1/4 NARROW	2
8	G-1250-1060N	FLATWASHER, 5/16 NARROW	8
9	H-1389	CABLE, NYLON COATED	1
10	H-1390	FERRULE	1
11	HC-2243	VALVE, BALL (SST)	1
12	J-3554	MANIFOLD, OXYGEN	1
13	N-2001-03-S-B	ELBOW, STRAIGHT THREAD	2
14	N-2002-03-SS	ELBOW, SWIVEL NUT	1
15	N-2005-03-SS	ELBOW, MALE	2
16	N-2005-04-SS	ELBOW, MALE	3
17	N-2006-04-SS	ELBOW, FEMALE -4 NPT X -4 37° SST	1
18	N-2009-04-SS	CONNECTOR, MALE, #4 (SS)	1
19	N-2010-04-SS	CONNECTOR, FEMALE	1
20	N-2021-03-SS	ELBOW, 45° 1/4 MALE NPT X 1/4 MALE 37°	1
21	N-2030-01-SS	SWIVEL, #4 JIC X 1/4 NPT	2
22	N-2206-03-SS	PLUG, HEX HEAD	1
23	N-2255-02-SS-B	ELBOW, MALE PIPE	3
24	N-2741	PLUG, MODIFIED	1
25	N-2763	ADAPTOR, OXYGEN	3
26	PC-1044-02	GAUGE, PRESSURE OXYGEN CLEANED	2
27	PC-1062-02	REGULATOR, OXYGEN CLEANED	1
28	PC-1103	CLAMP, REGULATOR MOUNTING	1
29	PC-1136	FILTER, IN-LINE	2
30	PC-1196	BOOSTER, OXYGEN	1
31	TF-1043-24-12.0	ASSEMBLY, HOSE	1
32	TF-1043-24-16.0	ASSEMBLY, HOSE	1
33	TF-1043-24-18.0	ASSEMBLY, HOSE	1
34	TF-1043-24-180	HOSE, ASSEMBLY	1
35	Z-12727	ASSY, BOOSTER DRIVE	1
36	Z-12729	ASSY, OXYGEN SUPPLY HOSE	3

TRONAIR®

APPENDIX I

Haskel Gas Boosters excerpt

Haskel®

an Accudyne Industries brand

Pressure on Demand

Pneumatic and Hydraulic Driven Gas Boosters

Why Use a Haskel Gas Booster

Haskel pneumatic and hydraulic driven gas boosters offer a flexible and efficient source for delivering high pressure gases.

Oxygen or High Purity Cleaning: Haskel boosters are noted for their cleanliness and can handle pure gases such as oxygen without risk of any contamination. (Special cleaning required – advise factory.) Haskel's oxygen cleaned products are certified per Mil Spec 1330. Refer to the Knowledge Library Link on the Haskel website, www.haskel.com, for the Oxygen Usage - Best Practice Guide.

Multi-Staging Capability: For higher flow rates and pressures, beyond the capability of a single gas booster, one or more boosters of the same ratio may be plumbed in parallel and then in series with one or more boosters of the same ratio.

High Flow Rates at High Pressures: When high flow rates at high pressures are needed, the booster can charge a receiver to an even higher pressure level, thus storing a volume of gas available for rapid release at a constant pressure through a pressure reducing valve.

Cost Savings: Most industrial gases are commonly delivered at pressures of 2,000 – 2,600 psi in steel cylinders. If the gas is to be used well below the supply pressure, the pressurized supply is easily piped and controlled to the point of use with simple valving. However, if the end use requires the gas to be used at higher pressures than the supply it will have to be boosted. Gas Boosters can utilize all the gas from a supply source such as cylinders, and boost the gas to whatever pressures (and flows) are required by the application; thus utilizing all the gas volume from the supply source.

If the application requires a pressure greater than common supply cylinder pressures, a booster can often be justified not only because of utilization of the gas, but also because it will eliminate the need to purchase the gas in special higher pressure more costly supply cylinders such as 3,600 or 6,000 psi.

Pneumatic Driven Gas Booster Features

- Reliable, easy to maintain, compact and robust
- No heat, flame or spark risk
- Infinitely variable cycling speed and output
- Pneumatic driven models do not require electrical connection
- Easy to apply automatic controls
- No limit or adverse affect to continuous stop/start applications
- Seal systems designed for long working life
- No airline lubricator required
- Hydrocarbon free – separation between air and gas sections
- Pressures to 39,000 psi (2690 bar)
- Built-in cooling (most models)
- Standard & custom systems available
- Suitable for most gases
- Single, double acting, and two-stage models
- Ability to stall at any predetermined pressure and hold the fixed pressure without consuming power or generating heat

Introduction to Pneumatic Driven Gas Boosters

Theory of Operation

Haskel Gas Boosters consist of a large area reciprocating air drive piston directly coupled by a connecting rod to a small area gas piston. The gas piston operates in a high pressure gas barrel section. Each gas barrel end cap contains high pressure inlet and outlet check valves. Varying applications require many different booster and horse power (HP) combinations. Haskel can assist with HP and Cooling requirements and provide circuitry assistance on the following issues: PID Control - review and advisement, electrical control, and heat exchanger recommendations. General HPU recommendations and guidelines are available from Haskel drawing 87100-TAB. The air drive section includes a cycling spool and pilot valves that provide continuous reciprocating action when air is supplied to the air drive inlet. The ratio between the area of the air drive piston and the gas driven piston is indicated by the number in the model description and approximates the maximum pressure the gas booster is capable of generating.

Isolation of the gas compression chambers from the air drive section is provided by three sets of dynamic seals. The intervening two chambers are vented to atmosphere. This design prevents air drive contamination from entering the gas stream.

Cooling is provided by routing the cold exhausted drive air through an individual jacket surrounding the gas barrel.

Check valves also allow for the equalization of upstream and downstream pressure prior to boosting, therefore the gas booster only needs to "raise" the upstream pressure to the required pressure and does not have to raise it from atmospheric pressure.

Operating temperatures for Gas Booster

There are two distinct sections: the air drive section and the gas barrel section.

Air Drive Section- Standard Air Drive Seals should perform reliably within a temperature range of (25°F to 150°F) (-4°C to 65°C). Lower temperatures will cause air/gas leakage; higher temperatures reduce seal life. Haskel recommends a minimum Class 4 air quality per ISO 8573.1 standards. For operation at extremely low temperatures, consult factory.

Gas Barrel Section- Low temperatures normally have little effect on the operation of standard parts and seals. The heat from the compressing gas helps to balance out an acceptable temperature.

Maximum average acceptable temperature 115°C (240°F).

Haskel gas boosters are used for boosting most all commonly available industrial gases. However, the gas should be "Dry Gas", (no moisture content.) Some gases cannot be pumped with standard boosters, e.g. pure Oxygen or Hydrogen. Depending on the gas and application, e.g. Dry Gas Seal applications, some boosters will require special seals, materials of construction, venting, special cleaning and other considerations. Knowing the specific gas is also necessary to determine gas compressibility at the desired pressure. Compressibility is a factor used in calculating flow rates at different pressures or filling times into a vessel.

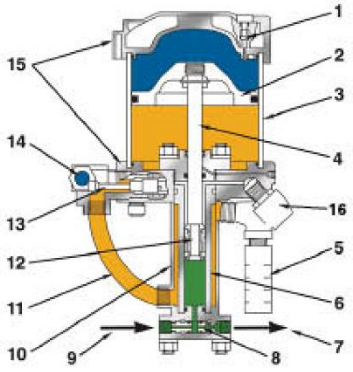


Figure 1

Figure 1: Example of Single Stage, Single acting Booster

1. Pilot Valve
2. Air Piston
3. Air Drive Barrel
4. Connecting Rod
5. Exhaust Muffler
6. High Pressure Barrel
7. Booster Outlet
8. Check Valves
9. Booster Inlet
10. Cooling Jacket
11. Air Exhaust Tube
12. Gas Piston
13. Air Cycling Valve
14. Air Drive Inlet Port
15. Upper & Lower Caps
16. Vent Port Breather

Gas booster compressors are suitable for transfer and pressurization of:

1. Nitrogen (N_2)
2. Helium (He)
3. Breathing Air (N_2O_2)
4. Nitrous Oxide (N_2O)
5. Carbon Dioxide (CO_2)
6. Neon (Ne)
7. Argon (Ar)
8. Sulphur Hexafluoride (SF_6)
9. Oxygen (O_2)*
10. Carbon Monoxide (C)**
11. Hydrogen (H_2)**
12. Methane (CH_4)**
13. Ethylene (C_2H_4)**
14. Deuterium (D_2)**
15. Natural Gas (CH_4)** *(often contains high proportion of CO_2 & N_2)*

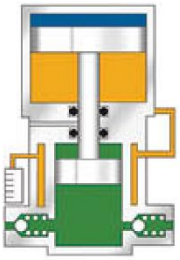
Note: Liquefied gases (propane, CO_2, nitrous oxide, halons, etc.) can be boosted as a liquid or gas in controlled applications.

** Oxygen (O_2)- maximum safe working pressure 345 bar (5000 psi).*

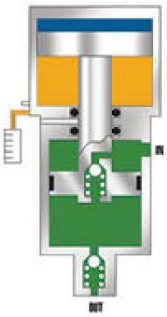
*** For these gases (10-15), the gas booster must be operated in a safe and well ventilated area and vent(s) piped to controlled environment.*

Pneumatic Driven Gas Booster Configurations

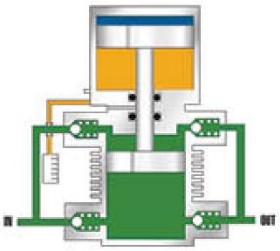
Single acting, single stage boosters are the smallest and lightest with pressures to 39,000 psi.
Double acting, single stage provides twice the delivery of a single acting single stage booster.
Two stage models are used for high gas compression ratios.



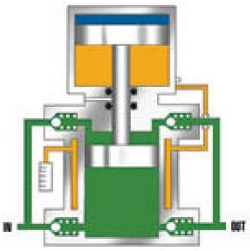
Model AG
Single Stage, Single Acting



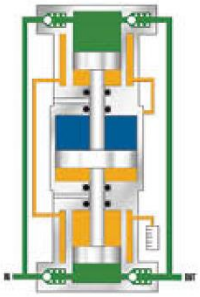
Model AG
Single Stage, Single Acting, Flow Thru Piston



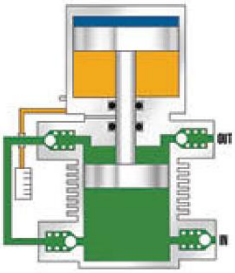
Model AGD
Single Stage, Double Acting, Cooling Fins



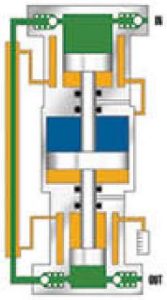
Model AGD-4 (only)
Single Stage, Double Acting, Cooling Jacket



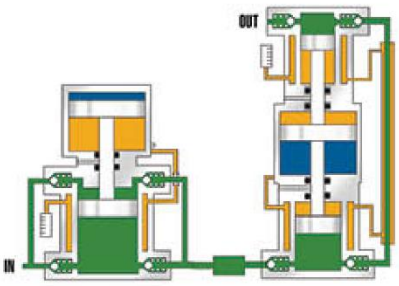
Model AGD
Single Stage, Double Acting, Cooling Jackets



Model AGT
Two Stage, Cooling Fins



Model AGT
Two Stage, Cooling Jackets



Model AGD-4 feeding into Model AGT-x/x

Multi stage - Two boosters. More than one booster of the same ratio may be used for each stage.

Blue=Compressed Air *Yellow=Exhaust Drive Air* *Green=Gas Media*

AG-50 High-ratio gas booster, single stage, single acting

AGD-30 - Medium-ratio gas booster, single stage double acting, single air head

AGT-30/75- Two stage gas booster single air head, cooling jacket

Metric Conversion Table

Multiply	By	To Obtain
PSI	0.0703	Kg/Cm2
SCFM	0.0283	Cu. Meters/min.
Inches	25.4	Millimeters
Pounds	0.453	Kilograms

Selecting a Pneumatic Driven Gas Booster

Air driven gas boosters have seven significant operating parameters that determine their selection for any application. These are as follows:

1. Maximum discharge pressure?
2. Flowrate
   - a. Is it constant?
     - i. What is flowrate required?
   - b. Is it filling a vessel?
     - i. What is vessel size (water volume)?
     - ii. What is fill time required?
3. Supply
   - a. Is it at constant pressure?
   - b. Is it decreasing?
     - i. What is initial pressure?
     - ii. What is the minimum pressure?
4. Air drive pressure available?
5. Air drive volume available?
6. What is the gas?
7. What is the application?

The selection of the proper booster for any application starts with determining which booster "series" will provide the amount of flow and pressure required. The ability of the booster to *generate pressure* is a function of the drive pressure, multiplied by the nominal booster ratio. The ability to *generate flow* is a function of the quantity of air available to drive it, the displacement per cycle of the booster, and volumetric efficiency.

Within each booster series, there are standard materials of construction available. For applications involving aggressive gases, such as Hydrogen, Helium and CO2, some material substitutions are required.

Single Acting Single Stage "AG" boosters provide economical means of boosting pressure for testing or small components and similar applications where volume is small and efficiency is not important. Control of maximum outlet pressure is accomplished with the use of an air drive pressure regulator. Maximum outlet pressure is drive area ratio multiplied by air pressure.

Double Acting Single Stage "AGD" boosters not only pump twice the volume of a Single Acting, Single Stage Booster per cycle, but also require less air drive since the inlet gas pressure is assisting the air drive in each direction, providing a substantial portion of the required driving force. These models provide efficient means of boosting large volumes of gas at low to medium compression ratios. Maximum outlet pressure is drive area ratio times air drive pressure PLUS gas supply pressure.

Two-Stage "AGT" boosters provide efficient means of boosting to a high gas compression ratio since the ratio per stage is low. Maximum outlet pressure with these models is drive area ratio multiplied by air drive pressure plus supply pressure multiplied by the area ratio of the two gas pistons.

Since these models have interconnected gas pistons, they multiply supply pressure during the "interstage" stroke by the area ratio of the two gas pistons. If supply pressure is too high, the booster may have "interstage stall" at an outlet pressure substantially less than that obtainable on the "output" stroke. This limitation does not apply if outlet pressure is less than the "maximum supply" times the area ratio of the two gas pistons. Remember, this condition only applies to two stage models.

Specific performance information for your application may be obtained by referring to the **Sample Performance Chart** on page 8 of this catalog, or from a Haskel distributor. To locate a Haskel distributor near you, view the Distribution link on our website at www.haskel.com, or contact Haskel direct.

Model Number Configuration

8 - AGT - 15/75 - C - 28881

- **8** — Nominal Diameter of Air "Driven" Piston (Inches). Used if diameter is other than 5-3/4" (standard).
- **AGT** — Base Model
  AG=Single Stage, Single Acting
  AGD=Single Stage, Double Acting
  AGT=Two Stage
- **15/75** — Area Ratio – Nominal XXX/XXX (on AGT models) shows nominal area ratio for both first and second stages
- **C** — Air controls Installed
  1. Air Drive Filter
  2. Regulator w/gage
  3. Shut off/speed control valve
- **28881**

C	Controls: airline filter, reg w/gauge and manual start/stop
C8	On 5-3/4" drive 1/2 NPT
C13	On 8" or 14" drive 3/4 NPT
17800	Electrical stroke counter provision (includes BZE0-2RQ) micro switch
25721	Mechanical stroke counter-installed (6 digit)
28881	External pilot modification - for 5-3/4" series
29125	External pilot modification - for 8" or 14" series
29370	Three way cycling spool for 5-3/4" series and 14" series
29702	Single stroke modification for 5-3/4" series and 14" series pump
50341	5-3/4" low permeability seals for CO2 gas service
50606	8" low permeability seals for CO2 gas service
51050	Extreme service cycling modification for 5-3/4" series pump
54312	Extreme service cycling modification for 8" or 14" series
56011	Vent purge with 15 psi relief - single end models
56011-2	Vent purge with 15 psi relief for 5-3/4", 8" or 14" series
57875	Panel with regulator for mounting remote APS
54827	Level II cleaning and certification of gas sections.
59888	Cycle Timer
80802	Viton air drive
86337	Extended life air drive seals
82500	ATEX Modification

Sample Gas Booster Flow Rate Performance (SCFM)

Flow and Pressure Performance:

Sample performance shown below is used for general reference only; consult Haskel Technical Sales or your Haskel Representative for specific performance information.

Cubic Meters Per Minute = SCFM x 0.0283

Catalog Number	PA=90 psi			
	Qa	Ps	Po	Q
AG-4	25	200	300	6.2
	25	120	300	3.8
	25	80	300	2.3
	25	40	300	1
AG-7	21	240	600	3.4
	21	180	600	2.5
	21	120	600	1.6
	21	60	600	0.7
AG-15	30	600	1200	6.2
	30	500	1200	5.1
	30	400	1200	4
	30	300	1200	3
AG-30	40	1300	2000	9.4
	40	1000	2000	7.2
	40	700	2000	4.9
	40	400	2000	2.6
AG-50	35	1700	4000	6
	35	1300	4000	4.5
	35	900	4000	3
	35	500	4000	1.7
AG-62	25	2000	5000	5.2
	25	1500	5000	3.9
	25	1000	5000	2.5
	25	500	5000	1.1
AG-75	30	2000	6000	3.8
	30	1500	6000	2.9
	30	1000	6000	1.8
	30	500	6000	0.8
AG-102	32	4000	8000	8.5
	32	3000	8000	8
	32	2000	8000	4
	32	1000	8000	2
AG-152	20	6500	13000	3.8
	20	5000	13000	3
	20	3500	13000	2.3
	20	2000	13000	1.3
AG-233	20	10000	20000	3.2
	20	8000	20000	2.8
	20	6000	20000	2.4
	20	4000	20000	1.8
AG-303	40	12500	24000	6
	40	10000	24000	5
	40	7500	24000	3.5
	40	5000	24000	2.5
AGD-1.5	30	100	200	18.2
	30	75	160	15.1
	30	50	140	10
	30	25	100	6.2
AGD-4	30	500	800	33
	30	350	600	25.4
	30	200	400	16
	30	50	200	4.5
AGD-7	30	700	1300	16
	30	500	1000	18.8
	30	300	800	11.2
	30	100	500	4
AGD-14	48	2100	3000	80
	40	1500	2500	48.4
	32	900	2000	22.5
	40	300	1000	10.4
AGD-15	40	2100	3000	50.3
	40	1500	2400	36.1
	40	900	1800	21.5
	40	300	1200	6.7
AGD-30	40	2850	4200	35.6
	40	2250	4200	25.5
	40	1550	3200	19
	40	850	2800	9.6
AGD-32	50	2950	4400	57.7
	40	2250	4400	33.2
	28	1550	4000	15.4
	33	850	3200	9.7
AGD-50	50	3000	6000	24
	50	2300	6000	12
	45	1600	5000	10
	30	900	5000	4

Catalog Number	PA=90 psi			
	Qa	Ps	Po	Q
AGD-62	50	4000	7500	35.6
	41	3250	7500	23.6
	25	2500	7500	11
	45	1000	5000	8
AGD-75	45	5000	10000	21.5
	45	3000	8000	14.3
	50	2000	6000	11.3
	50	1000	5000	5.5
AGD-102	52	8000	12000	26
	52	6000	12000	20
	52	4000	10000	16
	35	2000	10000	6
AGD-152	40	11000	22000	19.1
	25	7000	20000	6.6
	40	5000	16000	12.1
	52	3000	12000	10.7
AGD-152H	30	12000	24000	15.5
	40	10000	21000	18.3
	40	7000	18000	15
	40	5000	16000	12.1
AGT-4	20	100	400	2.7
	20	75	400	2
	20	25	200	1.2
	20	5	200	0.55
AGT-7/15	35	200	1500	4.4
	25	120	1500	1.8
	35	80	1000	2.1
	35	40	1000	1.1
AGT-7/30	32	150	3000	2.6
	40	100	2500	2.3
	40	75	2000	1.9
	40	50	2000	1.2
AGT-14/32	54	400	3000	5.8
	56	240	3000	3.7
	54	200	2400	3
	58	160	2000	2.6
AGT-14/62	54	350	6000	5.0
	56	275	5000	4.2
	54	175	4000	2.6
	58	125	4000	2.4
AGT-15/30	40	900	4000	9.7
	40	500	3000	5.8
	40	300	2000	3.9
	40	100	2000	1.2
AGT-15/50	42	400	5000	3.7
	42	250	5000	2.3
	55	150	4000	2
	55	100	4000	1.2
AGT-15/75	48	230	6000	2.7
	42	150	6000	1.4
	55	110	4000	1.5
	55	70	4000	0.8
AGT-30/50	50	850	5000	8
	50	600	5000	3.5
	62	350	4000	2
	62	100	4000	0.8
AGT-30/75	48	1300	8000	8.4
	25	700	8000	2.3
	45	400	6000	2.4
	55	100	4000	0.69
AGT-32/62	45	1700	7500	14.3
	28	1300	7500	6.7
	56	900	5000	9.8
	45	500	5000	4.3
AGT-32/102	35	1200	9500	5.1
	45	600	9500	3.3
	48	550	6500	3.3
	56	375	6500	2.6
AGT-32/152	23	450	15000	1.6
	52	250	10000	2.1
	50	150	10000	1
	55	50	3000	0.46
AGT-62/102	55	1600	10000	8
	55	1200	10000	4.5
	50	800	10000	3
	60	400	9000	1.5

Catalog Number	PA=90 psi			
	Qa	Ps	Po	Q
AGT-62/152	30	2400	18000	6.6
	35	1400	15000	4.6
	47	900	12000	4
	51	400	10000	1.8
AGT-62/152H	23	2500	19000	4.8
	25	1800	17000	4.1
	20	1200	16000	2
	20	800	15000	1.3
8AGD-1	75	130	180	128
	75	110	180	91
	75	90	160	76
	75	70	140	60
8AGD-2	75	130	250	56
	75	110	200	55
	75	90	200	41
	75	70	200	29
8AGD-2.8	70	500	700	109
	70	300	500	65
	90	200	400	55
	90	100	300	28
8AGD2-2.8	100	500	700	215
	100	300	500	131
	125	200	400	106
	125	100	300	54
8AGD-5	70	600	900	96
	70	450	800	66
	65	300	700	37
	65	100	500	12
8AGD-14	75	1000	2000	55
	75	800	1800	44
	75	500	1200	33
	75	200	1000	11
8AGD-30	75	2500	4000	76
	75	1800	3500	52
	75	1200	2800	36
	65	600	1800	18
8AGD-60	75	4000	7500	53
	75	2800	6800	36
	75	1800	5200	26
	65	1000	3800	14
8AGD-150	75	10000	18000	38
	75	8000	16000	33
	75	6000	14000	28
	65	4000	12000	20
8AGT-5/14	75	150	1200	12
	70	90	1000	8
	50	60	800	6
	40	30	400	3
8AGT-5/30	60	60	2800	1.4
	75	40	2400	0.7
	75	30	1800	0.9
	75	20	1500	0.5
8AGT-14/30	75	700	3500	19.7
	75	400	3000	10.4
	75	250	2500	6.6
	75	100	1800	2.7
8AGT-14/60	57	250	6000	3.7
	75	200	5500	3.5
	75	100	4500	1.2
	75	50	3000	0.31
8AGT-30/60	75	1700	7500	23
	75	1300	6800	17
	75	900	5000	13.8
	75	500	4000	7.8
8AGT-60/150	71	2500	18000	14.2
	75	1500	15000	9.4
	75	1000	12000	7
	75	500	8000	4
14AGD-315	150	16000	32000	25.3
	150	13000	28000	23
	150	9000	24000	18.1
	150	5000	18000	10.2
14AGT-125/315	115	4100	32000	14.9
	133	3100	28000	13
	150	2200	24000	10
	150	1000	18000	4.2
4AG-25	2	2000	2250	0.75
	2	1500	2250	0.6
	2	1000	2250	0.5
	2	500	2250	0.2

LEGEND

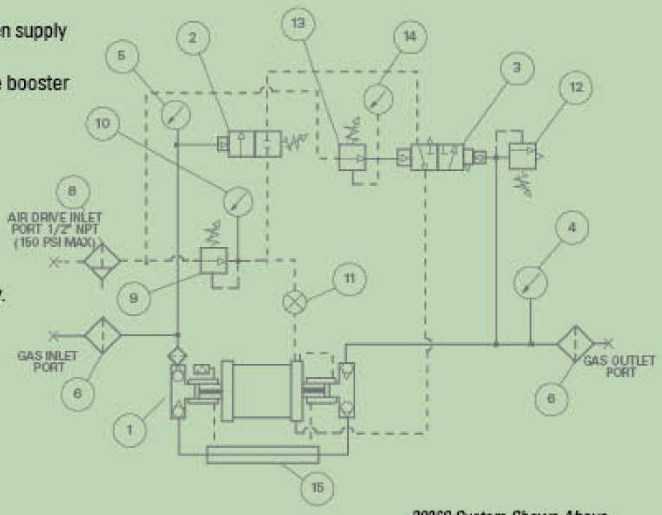
Pa = Air Drive Pressure
Ps = Gas Supply Pressure
Qa = Air Drive Quantity
Po = Gas Outlet Pressure
Q = Gas Outlet Flow Rate

Inert Gas Booster Systems

Haskel's ability to incorporate and interface electronic controls into systems provides precise compression and control of gases.

Standard system components are:

1. Booster with External Pilot Modification to enable use of external components to start/stop the booster.
2. Adjustable Air Pilot Switch (inlet) – used to stop the booster when supply pressure falls to adjusted set point.
3. Adjustable Remoteset Air Pilot Switch (outlet) – used to stop the booster when outlet pressure reaches adjusted set point.
4. Pressure Gauge indicates outlet boosted pressure.
5. Pressure Gauge indicates inlet gas pressure supply
6. Gas Filter used to stop any ingested contamination from entering the booster (e.g. while changing out a gas supply bottle)
7. Roll Bar Frame (not shown) used for mounting booster and other components.
8. Air Filter - inline filter (20-40 micron) for maintaining air drive quality.
9. Adjustable Air Regulator used to set the Air Drive Pressure (0 - 150 psi max)
10. Air Pressure Gauge indicates the Air Drive Pressure
11. Manual On/Off Valve and Speed Control Valve used to adjust cycling speed that the booster cycles
12. Relief Valve used to protect the booster & other components from over pressurization
13. Adjustable Remoteset Pilot Regulator used to adjust the set point for the Remoteset Air Pilot Switch
14. Pressure Gauge used to indicate the Adjustable Remoteset Regulator adjusted pressure
15. Interstage Cooler – a tube & shell cooler used to reduce the boosted gas temperature (part of the booster)



29068 System Shown Above

Charging Systems

Charging systems provide a fast, efficient and economical method of charging, or "topping up" gas pressures. Charging units ensure that the optimum use is made of commercially bottled gases down to as low as 150 psi or vaporized liquid (cryogenic) supplies while producing pressures as high as 39,000 psi depending on gas type. Units are standard or custom-built in a variety of configurations, samples of which are illustrated here.

26968 Oxygen Booster System

Oxygen booster systems for filling oxygen cylinders. An efficient, safe and economical system for oxygen handling.

(A) Outlet stall (max gas outlet pressure is: Air drive psi x 30 Plus 2x gas inlet psi)
(B) Interstage stall (Max gas inlet pressure is air drive psi x 15 if outlet exceeds air drive psi x 30. If it does not, max gas inlet is air drive psi x 30)
(C) If less air flow is available, outlet gas rates will decrease about in proportion

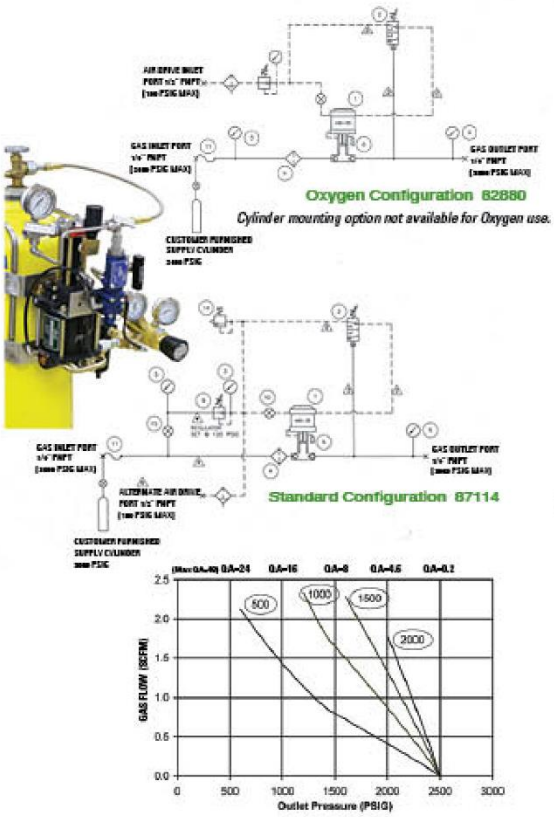
26968 Sample Performance

Oxygen Gas Pressure - PSI		Oxygen Outlet Gas Flow - SCFM		
		Air Drive PSI		
Inlet	Outlet (B)	60	80	100
250	1500	3.5	4.0	4.0
250	2000	2.1	2.1	3.6
250	3000	(A)	(A)	2.5
1000	1500	8.7	14.7	15.0
1000	2500	(B)	9.7	13.7
1000	3500	(B)	9.6	13.6
1500	2000	(B)	14.7	20.7
1500	2500	(B)	(B)	16.1
1500	3000	(B)	(B)	(B)
2000	2500	(B)	(B)	21.6

Performance based on indicated Air Drive PSI @ 50 SCFM (C)

Mini Charging Booster

Designed and Manufactured to achieve an affordable and effective gas transfer and charging unit. Standard configuration includes cylinder mounting bracket.



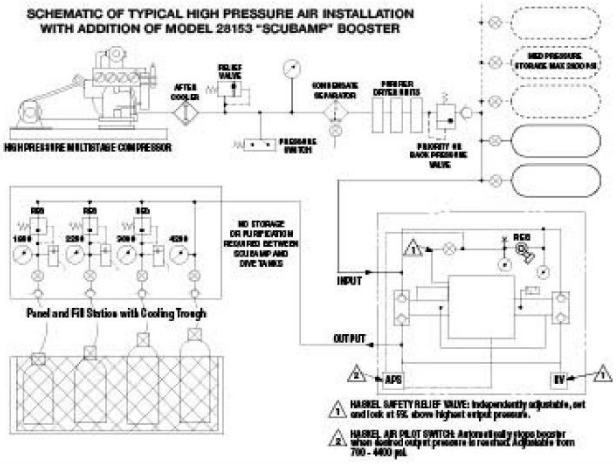
ScubAmp

Used by Dive Shops to boost medium pressure breathing air from storage air direct to dive tanks to reach maximum fill pressure rapidly. With the use of a ScubAmp, existing air compressor systems can stay within their 200-2500 psi normal operating range.

TYPICAL FILL TIMES

From Pressure in Storage (After Equalizing in Dive Tank)	To Nominal Tank Size and Pressure			
	83 cu. Ft. to 3000 psi	71.2 cu. Ft. to 2475 psi	71.2 cu. Ft. to 2250 psi	80 cu. Ft. to 4400 psi
2500 psi	12 sec.			60 sec.
2250 psi	28 sec.	14 sec.		90 sec.
2000 psi	39 sec.	22 sec.	12 sec.	
1500 psi	75 sec.	50 sec.	35 sec.	

Performance based on 100 psi air drive @ 50 SCFM.



Gas Transfer, Test & Charging Carts

Typical gases used are O2, N2, He, Ar & Air used for transfer, charging, testing, calibration or tool operation.

Console Controlled Test Systems

Test console housing pneumatic Gas Booster selected to meet test parameters of the customers specification. Gas pressures can be produced up to 39,000 psig.

Natural Gas Vehicle Fueling Systems

Natural Gas Boosting System with Storage eliminates the need for mechanical compressors where high pressure and low pressure Natural Gas sources are available.

Gas Cylinder Test Rigs

Hydrostatic and cylinder stretch test rigs for inspection and testing of all gas cylinder and pressure vessels, including oxygen, nitrogen, carbon dioxide and halon bottles.

Hydraulic Driven Gas Boosters

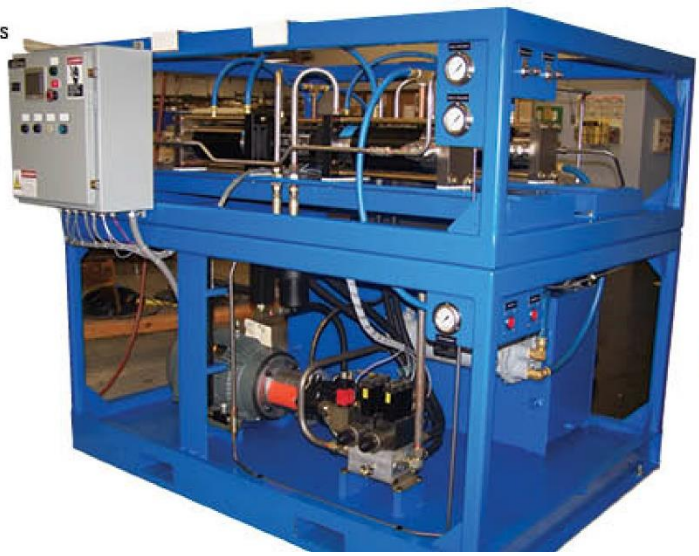
For flow rates that typically go beyond the capability of pnematic driven boosters.

Haskel's gas booster product line began with hydraulic driven gas boosters. Their gas compression technology has been proven in critical applications such as Fuel Cell / Hydrogen, Photovoltaic, Semiconductor, Specialty Gases, and more.

Capable of boosting a variety of gases, Haskel's broad range of Hydraulic Driven Gas Boosters offer complete flexibility for your gas compression and transfer needs. The key design elements incorporated in this range are based on the Haskel technology that has been combined with cutting edge hydraulic drive control to provide a complete solution, from plug-in electrical supply to reliable gas output pressure and flow.

Applications

- Hydrogen Filling Stations
- Charging high-pressure gas cylinders and receivers
- Gas assisted plastic injection molding
- Hydraulic accumulator charging
- Charging air bag storage vessels
- Missile and satellite launch and guidance systems
- Component testing
- Laser cutting and welding
- Oilfield high volume gas testing
- Automotive hoses and component gas testing
- Hot isostatic pressing
- Inert/specialty gas transfer
- Biogas charging
- Extending pressure
- Gas blanketing



Designs

Single-Stage Double Acting Models

- Available in 7 models with flow rates to **400 scfm** and maximum supply and outlet pressures to **16,000 psig**
- Designed for high flow and low-to medium compression ratios

Two-Stage Models

- Available in 8 models with flow rates to 45 scfm. Maximum supply pressure 6000 psig. Maximum outlet pressure to 16,000 psig
- Modular construction for easy gas section maintenance
- Adapts to multiple units in parallel or in series driven by one power source

Hydraulic Driven Gas Booster Model Number Configuration

100	HGT	6	-	85/50	-	EX
Design Series	Design Type	Stroke Length		Ratio		Switch
100 120	HGT = 2 Stage HGD = Double Acting	6 10		xx / xx		-NP (No Proximity Switch) -PS (Proximity Switch; Inert Gas Service) -EX (Explosion Proof Switch)

Optional Features (normally provided by Haskel distributor or system integrator)

- Motor starter
- Inlet pressure control loop
- Temperature control loop
- Water chiller - Cooling loop
- Remote operator station
- Heater hydraulic reservoir
- Noise attenuating panels

Varying applications require many different booster and horse power (HP) combinations. Haskel can assist with HP and Cooling requirements and provide circuitry assistance on the following issues: PID Control - review and advisement, electrical control, and heat exchanger recommendations. General HPU recommendations and guidelines are available from Haskel drawing 87100-TAB.

Features

- Stainless Steel/Monel gas barrel construction
- Oil Free, gas section non-lubricated operation
- Integrated cooling barrels on each gas section
- Isolation between hydraulic and gas sections to prevent contamination.
- 6in. and 10in. stroke models
- Proximity switch control to automate cycling
- Able to accept high supply pressures

Benefits

- Capable of flow rates up to 8 x higher than air driven models
- Modular construction for easy gas section maintenance
- Will not rust like other carbon steel manufactured units
- Non-contaminating gas compression
- Minimizes gas temperature rise from compression
- Suitable for ultra pure gas compression
- Broad range of flows and pressures
- Smooth stroke direction changeover and cycle rate control
- Multiple gas boosters can be driven by one power source
- Steady state cycle control to maximize seal life
- High efficiency for continuous operation

LEGEND
HP = Horsepower Input based on Max. Hyd. Pressure 2500 psig
Ps= Gas Supply Pressure (PSI)
Po= Gas Outlet Pressure(PSI)
CPM= Cycles Per Min. (18 max 120 series, 25 max. 100 series)
Q=Gas Outlet Flow Rate (SCFM)

Part Number	Hydraulic Driven Gas Booster Specifications										Sample Performance				
	Supply Pressure Minimum		Supply Pressure Maximum		Outlet Pressure Maximum		Maximum Compression Ratio	Displacement Cycle		Cycles Per Minute	Hydraulic Pressure : 2500 PSI				
	PSIG	BAR	PSIG	BAR	PSIG	BAR		Cubic Inches	Milliliters		HP Input	Ps	Po	CPM	Q
100HGD6-145	50	3.5	1850	127	1850	127	6	312	5106	25	22.4	150	900	25	39.0
											27.0	250	1200	25	64.5
											28.2	500	1500	25	131.2
											27.2	1050	2000	25	280
100HGD6-115	50	3.5	2750	189	2750	189	6	191	3128	25	22.0	200	1400	25	30.5
											26.6	275	1800	25	41.7
											27.3	725	2300	25	115
											27.7	1200	2800	25	193
100HGD6-85	100	7	6000	413	6500	448	6	107	1760	25	16.9	500	2000	25	44.1
											27.4	690	3500	25	59.0
											28.5	1800	4750	25	159
											27.2	3200	6000	25	272
100HGD6-50	100	7	9000	620	13500	930	6	40	657	25	19.3	1200	6000	25	37.4
											24.0	1600	8000	25	49.4
											27.2	2500	10000	25	78.3
											27.2	4500	12000	25	129
120HGD10-165	50	3.5	1850	127	1850	127	6	716	11728	18	25.1	75	550	18	36.0
											43.4	175	1100	18	77.7
											44.4	250	1200	18	111
											42.4	300	1200	18	133
120HGD10-85	100	7	6000	413	6500	448	6	179	2931	18	24.2	800	2500	18	87.6
											27.0	1200	3200	18	131
											40.4	1300	4600	18	129
											39.5	2500	5800	18	265
120HGD10-50	100	7	9000	620	13500	930	6	68	1111	18	29.6	1400	7000	18	55.3
											35.4	1800	9000	18	70.5
											41.2	2200	11000	18	85.4
											48.0	2800	13500	18	107
100HGT6-145/85	50	3.5	1850	127	6500	448	104	156	2556	25	16.8	250	2200	25	33.6
											20.4	300	2800	25	40.0
											23.7	400	3500	25	52.8
											27.3	500	4000	25	65.7
100HGT6-145/50	50	3.5	1850	127	6500	448	280	156	2556	25	27.1	150	3200	25	18.9
											28.0	150	3800	25	18.9
											28.4	150	4950	25	18.8
											28.6	150	5500	25	18.8
100HGT6-115/85	50	3.5	2750	189	6500	448	64	95	1556	25	19.0	250	2200	25	21.1
											23.1	300	2800	25	25.1
											25.7	400	3500	25	33.2
											29.8	500	4000	25	41.3
100HGT6-115/50	50	3.5	2750	189	13500	930	171	95	1556	25	14.6	175	3500	25	14.1
											14.7	175	4000	25	14.1
											17.4	175	5000	25	14.0
											20.8	250	6000	25	11.5
100HGT6-85/50	100	7	6000	413	13500	930	96	53	868	25	17.5	300	5000	25	13.8
											22.6	400	7000	25	31.0
											24.8	500	8000	25	22.6
											28.7	750	10000	25	33.7
120HGT10-165/85	50	3.5	1850	127	6500	448	144	358	5866	18	28.8	175	2800	18	39.8
											33.8	200	3500	18	45.2
											43.4	200	4500	18	45.1
											46.3	250	5000	18	55.8
120HGT10-165/50	50	3.5	1850	127	13500	930	386	90	1474	18	47.2	100	4000	18	22.2
											47.1	100	5000	18	22.1
											51.8	110	7000	18	24.1
											52.2	110	8000	18	24.6
120HGT10-85/50	100	7	6000	413	13500	930	96	34	557	18	31.4	300	7000	18	16.9
											32.4	600	8000	18	33.2
											38.3	700	10000	18	38.6
											48.4	900	13500	18	49.4

REFER TO PAGES 33 - 35 FOR DIMENSIONAL DRAWINGS OF ALL MODELS

Applications for Pneumatic and Hydraulic Driven Gas Boosters and Gas Booster Systems

General Applications

- Condenser Leak Detection
- Gas Transfer Circuit Breakers
- Aircraft Jacking
- Helicopter Pop Floats
- Autoclaving - Low Pressure
- Hot Isostatic Presses
- Automotive Air Bag Vessel Filling
- Helium Leak Pressure Testing
- Blow Molding
- Boost Pressures from N2/O2 Generators
- Breathing Air Systems
- Laser Cutting (Ar, N2,O2, He)
- CFC Recovery
- Leak Detection Systems
- Charging Gas Suspensions
- Missile Test Systems
- Cooling with Helium in Pilot Plants
- Nitrogen Injection for Molding Machines
- Cryostat Testing (Nitrogen and Argon)
- Nitrogen Accumulator Charging
- Die Cushion Cylinder Charging
- Oxygen Life Support Bottles
- Escape Chute Charging – Co2 Charging
- Oxygen Boosting
- Fuel Cells; Mobile, Portable and Stationary
- Power Valve Actuation/Hold Dump Valves Closed
- Gas Assisted Injection Molding (GAIN)
- Gas Charging for Aircraft Tire Inflation
- Pressure Testing of Hydraulic Systems – Skydrol
- Gas Pressure and Leak Testing
- Super Critical Fluid Extraction
- Gas Reclaim - Low Pressure
- Testing Brake Calipers
- Cylinder Hydro Test

Hydrogen Applications

Haskel Manufactures the most extensive range of gas handling solutions for gas transfer or boosting applications, including **Hydrogen**. **Hydrogen** use products include Pneumatic or Hydraulic Driven Gas Boosters, Diaphragm Compressors, and BuTech High Pressure Valves and Fittings, that are Hydrogen rated to over 20,000 psig.

- Hydrogen Infrastructure
- Hydrogen Fueling & Filling Stations
- Hydrogen Compression, Storage & Transfer
- Fuel cell: Mobile, Portable & Stationary
- Boosting H2 Generator Outlet Pressure
- Hydrogen Purification
- Hydrogen Generation
- Hydrogenation
- PTA manufacture
- Polysilicon manufacture
- Petroleum recovery and refining
- Hydrogenation reactions
- Cylinder filling for storage from H2 generation
- R&D lab gas distribution
- Power generation (used as a coolant)
- Semiconductor manufacturing

Pneumatic Driven Gas Boosters for Hydrogen Applications

Booster Model	Supply Pressure	Flow SCFM @ psi*	Pressure Limit (psi)	Hydrogen System Model #
AG-62	1000	4.21 @ 4800	9,000	86979
AG-75	1500	3.81 @ 6000	12,000	86980
AG-152	2000	3.02 @ 12000	15,000	86981
AGD-7	150	6.85 @ 710	2,500	86982
AGD-15	500	10.68 @ 1700	4,000	86983
AGD-30	750	8.12 @ 3150	9,000	86984
AGD-32	750	10.75 @ 3150	4,000	86985
AGD-62	1000	6.97 @ 5800	9,000	86986
AGD-75	1500	6.18 @ 7500	12,000	86987
AGD-152	2000	5.07 @ 14000	15,000	86988
AGT-7/15	100	2.63 @ 1410	2,500/4,000	86989
AGT-7/30	100	2.30 @ 2820	2,500/9,000	86990
AGT-14/62	250	5.8 @ 4000	2,500/9,000	86991
AGT-15/30	500	5.88 @ 3400	4,000/9,000	86992
AGT-15/75	250	2.34 @ 7250	4,000/12,000	86993
AGT-30/75	500	2.70 @ 7250	9,000/12,000	86994
AGT-32/62	1000	8.08 @ 6800	4,000/9,000	86995
AGT-32/152	350	1.93 @ 13750	4,000/15,000	86996
AGT-62/152	1000	3.80 @ 14500	9,000/15,000	86997

Based on 100 psi Drive Pressure and 48 SCFM (Pa-100, Qa=48)

Booster Model	Supply Pressure	Flow SCFM @ psi*	Pressure Limit (psi)	Hydrogen System Model #
8AGD-14	150	9.20 @ 980	5,000	87219
8AGD-30	750	14.26 @ 3150	5,000	87201
8AGD-60	1000	9.47 @ 5800	9,000	87185
8AGT-14/30	500	10.73 @ 3400	5,000	87226
8AGT-14/60	250	3.87 @ 6000	9,000	87225
8AGT-30/60	1000	10.4 @ 6800	9,000	87224

Based on 100 psi Drive Pressure and 95 SCFM (Pa-100, Qa=95)

Selecting Your Accessories

Haskel can either provide accessories separately or supply them fitted to form a complete package suited to your application. Additionally, Haskel can fit customer nominated accessories. Our accessories catalog is available and our technical support team is always ready to advise you on the most suitable choice of accessories for your application.

A full range of high-pressure regulators, valves, switches and ancillary equipment is available to suit all our gas boosters.

- Air pilot switches
- Air pilot valves
- Regulating relief valves
- Directional control and release valves
- Hydraulic accumulators, gas receivers and storage cylinders
- High pressure valves, fittings and tubing
- Plenum chambers
- Port adapters
- Pressure Regulators
- Gauge snubbers
- Filters
- Stainless steel check valves
- Intensifiers with integral checks for cycling
- Capillary type gauge snubbers

Please ask for your copy of our latest accessories brochure.

Regulating Relief and Back Pressure Control Valves

Provide over pressure protection on any high pressure low flow gas or liquid system. (See system accessory catalog.)

Air Pilot Switches

These pressure switches produce a pneumatic signal up to 150 psi at any sensing pressure within their adjustment range.

Gas Receivers

Gas receivers in 10,000 and 20,000 psi series. Eleven models from 20 to 897 cu. in. displacements. (See system accessory catalog.)

Filters

- 5 Microns
- 6000 psi, 30,000 psi 2 models 1/4' NPT and 1/4" S.P. tube
- S.S. or paper elements

Stainless Steel Check Valves

- Constructed throughout of 316 series stainless steel for high corrosion resistance.
- A PTFE semi soft seat for higher contamination tolerance without leakage. The PTFE initially deflects a slight amount then the ball or poppet to come to rest against the metal seat so the PTFE does not have to absorb the full load of the high pressure.

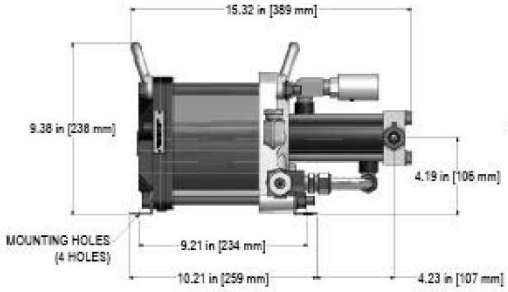
Directional Control and Release Valves

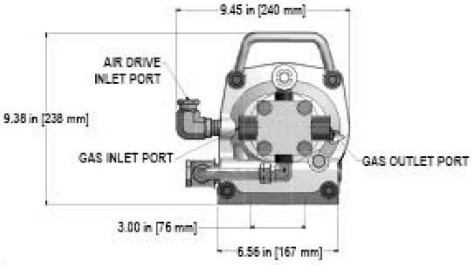
Directional Control valves are basically a family with common characteristics and benefits. They are seated poppet or ball design for virtually zero leakage at high pressures with low viscosity fluids.

Intensifiers

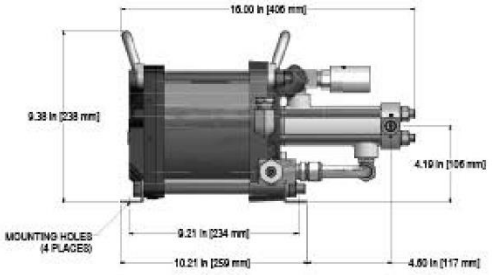
Intensifers with integral checks for cycling. All stainless steel in high pressure wetted section.

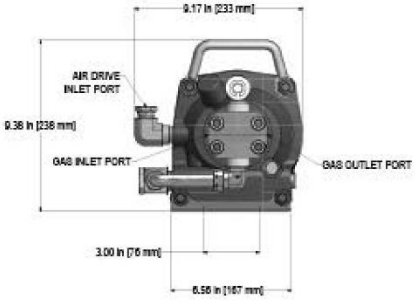
Gas Booster Model: AG-7



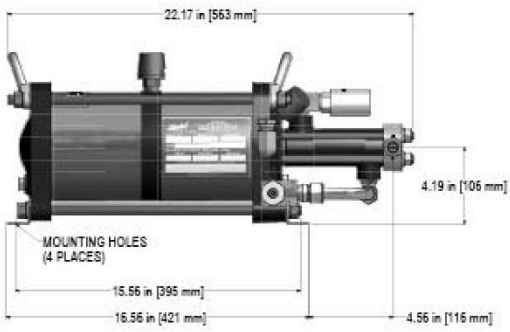


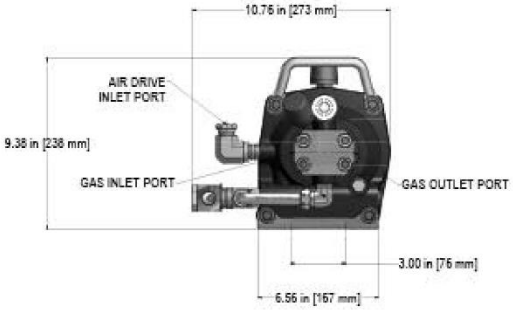
Gas Booster Models: AG-15, AG-30, AG-50, AG-75





Gas Booster Models: AG-62, AG-102, AG-152





Notes

For more information on our high-pressure products, visit Haskel.com or contact your local Haskel representative.

Haskel is a brand of Accudyne Industries, a leading global provider of precision-engineered, process-critical and technologically advanced flow control systems and industrial compressors that deliver consistently high performance and give confidence to the mission of our customers in the most important industries and harshest environments around the world. The company is powered by more than 3,000 employees at 18 manufacturing facilities, supporting a broad range of industries in more than 150 countries.

Accudyne INDUSTRIES

Haskel®

an Accudyne Industries brand

haskel.com
sales@haskel.com

GB 07 / 15
Printed in USA

APPENDIX II

Tescom
Safety, Installation, Operations & Service

Operations & Service Manual
DOPMS2080X012
Rev. 06/15

Safety, Installation, Operations & Service

TESCOM Product Manual

Do not attempt to select, install, use or maintain this product until you have read and fully understood this manual.

This manual is available in multiple languages online at www.tescom.com.

TESCOM

EMERSON
Process Management

Contents

Section 1: Symbols

1.1 Symbols 3

Section 2: Safety and Installation Precautions

2.1 Regulators and Valves 3

Section 3: Operations and Service

3.1 Types of Regulators 6
3.2 Pressure Reducing Regulators - Diaphragm-Sensed 7
3.3 Pressure Reducing Regulators - Piston-Sensed 10
3.4 Back Pressure Regulators - Diaphragm-Sensed 13
3.5 Back Pressure Regulators - Piston-Sensed 15
3.6 Valves - TESCOM 30 Series 18
3.7 Valves - TESCOM VA, VG and VT Series 19

Section 4: Limited Warranty

4.1 Limited Warranty 21

This manual is available in multiple languages online at www.tescom.com.

Section 1: Symbols

1.1 Symbols

⚠ CAUTION

Paragraphs highlighted by the **CAUTION** icon contain information that must be followed to maintain a safe and successful operating environment.

⚠ WARNING

Paragraphs highlighted by the **WARNING** icon contain information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Section 2: Safety and Installation Precautions

2.1 Regulators and Valves

⚠ WARNING

Do not attempt to select, install, use, or maintain this regulator, valve, or accessory until you have read and fully and fully understood these instructions.

Be sure this information reaches the operator and stays with the product after installation.

Do not permit untrained persons to install, use, or maintain this regulator, valve or accessory.

Improper selection, improper installation, improper maintenance, misuse, or abuse of regulators, valves, or related accessories can cause death, serious injury, and property damage.

Oxygen service requires special expertise and knowledge of system design and material compatibility in order to minimize the potential for death, serious injury, and/or property damage.

Possible consequences include but are not limited to:

- **High velocity fluid (gas or liquid) discharge**
- **Parts ejected at high speed**
- **Contact with fluids that may be hot, cold, toxic, or otherwise injurious**
- **Explosion or burning of the fluid**
- **Lines/hoses whipping dangerously**
- **Damage or destruction to other components or equipment in the system**

⚠ CAUTION

Safety Precautions

1. Inspect the regulator, valve, and accessories before each use.
2. Never connect regulators, valves, or accessories to a supply source having a pressure greater than the maximum rated pressure of the regulator, valve, or accessory.

3. Refer to product label (model specific) for maximum inlet pressures. If this rated pressure cannot be found, contact your local TESCOM representative for the rated pressure prior to installation and use. Verify the designed pressure rating of all equipment (e.g., supply lines, fittings, connections, filters, valves, gauges, etc.) in your system. All must be capable of handling the supply and operating pressure.
4. Clearly establish flow direction of the fluid before installation of regulators, valves, and accessories. It is the responsibility of the user to install the equipment in the correct direction.
5. Remove pressure from the system before tightening fittings, gauges or components.
6. Never turn regulator or valve body. Instead hold regulator or valve body and turn fitting nut.
7. If a regulator or valve leaks or malfunctions, take it out of service immediately.
8. Do not modify equipment or add attachments not approved by the manufacturer.
9. For pressure reducing regulators, it is highly recommended that the control knob or adjusting screw be turned fully counterclockwise before applying inlet pressure.
10. Apply pressure to the system gradually, avoiding a sudden surge of fluid or pressure shock to the equipment in the system.
11. Regulators are not shut-off devices. Install a pressure relief device downstream of the regulator to protect the process equipment from overpressure conditions. Shut off the supply pressure when the regulator is not in use.
12. Periodic inspection and scheduled maintenance of your equipment is required for continued safe operation.
13. The frequency of servicing is the responsibility of the user based on the application.
14. Positive seal/tied diaphragm regulators require the downstream pressure vented before turning the hand knob counterclockwise to reduce the outlet pressure. Damage may occur to the regulator if this procedure is not followed.
15. Never allow problems or lack of maintenance to go unreported.
16. Read and follow precautions on compressed gas cylinder labels.
17. It is important that you analyze all aspects of your application and review all available information concerning the product or system. Obtain, read, and understand the Material Safety Data Sheet (MSDS) for each fluid used in your system.
18. Never use materials for regulators, valves, or accessories that are not compatible with the fluids being used.
19. Users must test components for material compatibility with the system operating conditions prior to use in the system.
20. Vent fluids to a safe environment, and in an area away from personnel. Be sure that venting and disposal methods are in accordance with Federal, State, and Local requirements. Locate and construct vent lines to prevent condensation or gas accumulation. Make sure the vent outlet is not obstructed by rain, snow, ice, vegetation, insects, birds, etc. Do not interconnect vent lines; use separate lines if more than one vent is needed.
21. Do not locate regulators, valves, or accessories controlling flammable fluids near open flames or any other source of ignition.

22. Some fluids when burning do not exhibit a visible flame. Use extreme caution when inspecting and/or servicing systems using flammable fluids to avoid death or serious injury to personnel. Provide a device to warn personnel of these dangerous conditions.
23. Many gases can cause suffocation. Make certain the area is well ventilated. Provide a device to warn personnel of lack of Oxygen.
24. Never use oil or grease on these regulators, valves, or accessories unless recommended as specified in Operations and Service procedures. Oil and grease are easily ignited and may combine violently with some fluids under pressure.
25. Have emergency equipment in the area if toxic or flammable fluids are used.
26. Upstream filters are recommended for use with all fluids.
27. Do not bleed system by loosening fittings.
28. Prevent icing of the equipment by removing excess moisture from the gas.
29. Always use proper thread lubricants and sealants on tapered pipe threads.

2.1.1 Installation

⚠ CAUTION

Do not open packaging until ready for installation or in a clean environment. Product is cleaned in accordance with CGA 4.1 and ASTM G93, Verification Type 1, Test 1 and Test 2. With periodic verification of cleaning process to MIL-STD-1330D.

⚠ WARNING

Make sure that the components and materials used in the fluid handling system are compatible with the fluid and have the proper pressure rating. Failure to do so can result in death, serious injury, and/or property damage.

Inspect the regulator, valve, and accessories for physical damage and contamination. Do not connect the regulator, valve, or accessory if you detect oil, grease, or damaged parts. If the regulator, valve, or accessory is damaged, contact your local TESCOM representative to have the regulator cleaned or repaired.

2.1.2 Repair Service

If a regulator or valve leaks or malfunctions, take it out of service immediately. You must have instructions before doing any maintenance. Do not make any repairs you do not understand. Have qualified personnel make repairs. Return any equipment in need of service to your equipment supplier for evaluation and prompt service. Equipment is restored to the original factory performance specifications, if repairable. There are flat fee repair charges for each standard model. The original equipment warranty applies after a complete overhaul.

⚠ CAUTION

Proper component selection

1. Consider the total system design when selecting a component for use in a system.
2. The user is responsible for assuring all safety and warning requirements of the application are met through his/her own analysis and testing.

3. TESCOM may suggest material for use with specific media upon request. Suggestions are based on technical compatibility resources through associations and manufacturers. TESCOM does NOT guarantee materials to be compatible with specific media – THIS IS THE RESPONSIBILITY OF THE USER!
4. Component function, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system user.

⚠ WARNING

Do not modify equipment or add attachments not approved by the manufacturer. Failure to do so can result in death, serious injury, and/or property damage.

Section 3: Operations and Service

ASSEMBLY/INSTALLATION DRAWINGS & BILLS OF MATERIAL drawings and parts lists for your product may be obtained by contacting TESCOM. Tescom will provide these by email, fax or mail. Your local Tescom representative can provide additional assistance. Be sure to have your complete model number ready. See page 39 for contact information for the TESCOM location closest to you.

3.1 Types of Regulators

Diaphragm-Sensed - Pressure Reducing Regulators

By Series

- 04
- 12
- 15
- 26-1100
- 26-1200
- 26-1500
- 26-1600
- 22-2200
- 22-5400
- 23
- 44-2200
- 44-2600
- 44-2800
- 44-3200
- 44-3400
- 44-4600
- 44-5000
- 44-5800
- 449-254
- 64-2600
- 64-2800
- 64-3200
- 64-3400
- 64-3600
- 64-5000
- 64-5400
- 74-2400
- 74-3000
- 74-3800
- DA
- DG
- DH
- DH-16
- DK
- FR-2000
- PH-1800
- PH-2200
- PH-2600
- PH-3200
- PS3400
- SG1, SG2, SG3

Diaphragm-Sensed - Back Pressure Regulators

By Series

- 26-2300
- 26-2500
- 26-2700
- 26-2900
- 44-2300
- 44-2500
- 44-4700
- DV

stop random contamination resulting from the installation of the regulator. An auxiliary upstream filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the regulator at high flow rates.

⚠ WARNING

A regulator is not intended to be used as a shutoff device. When the regulator is not in use, the inlet supply should be turned off. As a safety precaution, a pressure relief device should be installed downstream of the regulator.

3.2.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the regulator removed from the line. However, in some cases repair may be accomplished without removal of the regulator body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the regulator will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCOM (see pg. 39 for TESCOM contact information).

The following steps outline the disassembly of pressure reducing regulators for maintenance and repair:

1. Clamp the regulator in a vise by the flats on the bottom and/or side of the regulator body.
2. Turn control knob and/or spring adjustment mechanism counterclockwise to insure removal of all spring force on the diaphragm.

NOTE: (Dome loaded regulators) All pressurized gas or liquid must be vented from dome before disassembly.

3. Remove upper portion of regulator (bonnet and/or dome). Some models require the mounting bracket to be removed first.

NOTE: Upper portion of regulator may also include spring button, load spring back-up plate, and diaphragm, etc. Review correct drawing to ensure that all parts have been disassembled.

NOTE: (Two-Stage Regulator) TESCOM Model Series 44-3400, 64-3400 and PS3400 are two-stage regulators that have portions on both ends of the regulator body that must be removed. It is TESCOM's recommendation that two-stage regulators be returned to the factory for repair.

4. The valve parts can now be removed from the regulator body by turning the seat retainer and/or back cap counterclockwise until it is free of the regulator body.

⚠ CAUTION

When removing valve parts from a regulator that has a back cap, care must be taken to insure the main valve stem remains vertical. If the main valve stem is not removed correctly, parts may remain in the regulator.

5. To disassemble main valve assembly and/or valve, clamp valve in smoothed jaw vise or hold with pliers. Clamping should be done on flats.

Piston-Sensed - Pressure Reducing Regulators

By Series

- 20-1000
- 20-1100
- 20-1200
- 26-1000
- 26-2000
- 44-1100
- 44-1500
- 44-1800
- 44-1300
- 44-4000
- 44-4200
- 44-5200
- 44-7400
- 50-2000
- 50-2200
- 50-4000
- 50-4100
- 54-2000
- 54-2200
- 54-2800
- 56-2000
- BB-1
- CP3200

Piston-Sensed - Back Pressure Regulators

By Series

- 26-1700
- 44-1700
- 44-5500
- 44-2900
- 54-2100
- 54-2300
- 54-2700
- 54-3500
- BB-3

3.2 Pressure Reducing Regulators - Diaphragm-Sensed

3.2.1 General

TESCOM's diaphragm sensed pressure reducing regulators are specifically engineered for applications requiring dependable pressure regulation. These regulators are especially appropriate for installations where high system pressures (up to 6000 psi) must be reduced to levels suitable for actuating low pressure (28 vac to 500 psi) instruments and related equipment.

3.2.2 Pressure Activation Methods

TESCOM uses three basic types of activation methods. The activation method provides the means by which the operator can set the force that determines the outlet pressure of a regulator.

Control Knob: Delivery pressure is increased by turning the control knob. The control knob applies a load through a spring to the diaphragm.

Dome Load: Delivery pressure is increased by applying pressurized gas or liquid to the dome of a regulator at a pressure equal to the outlet pressure desired. This dome pressure is normally provided by a second regulator called the pilot regulator.

Combination Spring and Dome: Delivery pressure is increased by applying a spring force as well as the introduction of pressurized gas or liquid.

3.2.3 Operation (Control Knob Adjustment)

Controlled outlet pressure settings are obtained using TESCOM pressure reducing regulators by adjusting the control knob. Rotating the knob clockwise raises the outlet pressure while a counterclockwise rotation coupled with venting of the downstream side of the regulator plumbing lowers the outlet pressure. Final adjustments should be made in the direction of increasing pressure to obtain the most accurate set point.

TESCOM regulators will operate with any liquid or gaseous media compatible with the wetted materials. Some series/modifications come with an internal filter designed to

⚠ CAUTION

Care must be used to not damage valve.

⚠ WARNING

Several TESCOM regulators are supplied with internal filters. They will be located either in the inlet port or in the main valve area of the regulator. In each case, they should be removed and replaced before reassembly.

3.2.5 Reassembly

The regulator is reassembled in the reverse order of disassembly, observing the following precautions. Please reference the Bill of Material and Assembly Drawing for the correct location of replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCOM replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system they will be used in. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.
3. Apply a thin uniform coating of fluorocarbon grease to any or all of the following parts: Indentation of spring button, threaded portion of adjusting screw, entire threaded area of the bonnet, all O-rings, all threaded parts internal to regulator.

⚠ WARNING

Do not apply any type of grease to threaded internal parts of regulators that come standard with metal to metal diaphragm seals. These models include the following regulator series: 23, 449-254, 44-2200, 44-2300, 44-2500, 44-2600, 44-2800, 44-2900, 44-3200, 44-4600, 44-4700, 44-5800, 64-2600, 64-2800, 64-3600, 64-5400, 74-2400, 74-3000 AND 74-3800.

NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Valve seat must be installed with the chamfered side towards the main valve.
5. Standard Regulator with Control Knob - The body and bonnet are best joined by holding the bonnet assembly open end up and dropping all required items into place one at a time. The last item to be placed in the bonnet will be the diaphragm. It can be centered on the seating surface of the bonnet before the body assembly is inverted and screwed into the bonnet firmly – hand tight. Regulator should then be placed in vise and bonnet re-torqued to correct specifications. See Assembly Drawing.
6. Dome/Combination Spring and Dome Loaded Regulators are more easily reassembled by holding regulator firmly in vise and reinstalling dome.
7. Self-Venting Regulator - If your regulator has an adjustable relief valve mechanism, it is set on final assembly at the factory and usually will not require further adjustment. If adjustment becomes necessary, use the following procedure after regulator has been installed:

   Step 1. Remove hole plug in control knob.

   Step 2. Using control knob, apply 10 to 15 psi on downstream side.

   Step 3. Turn CW vent adjusting screw (located under hole plug) until media can be heard escaping through vent valve.

Step 4. Turn screw CCW until media flow stops, plus 1/2 turn. Replace hole plug.

8. Reinstalling wire mesh inlet filter: Insert filter into primary inlet port. It then must be expanded to fit correctly. This can be accomplished by inserting a metal tool the same size as the port and then lightly tapping it with a hammer.

⚠ WARNING

After regulator has been reassembled, it MUST be connected to a pressure source with media compatible with the use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

3.3 Pressure Reducing Regulators - Piston-Sensed

3.3.1 General

TESCOM™ piston sensed pressure reducing regulators are specifically engineered for applications requiring dependable pressure regulation. These regulators are especially appropriate for installations where high system pressures (up to 20,000 psi) must be reduced to levels suitable for actuating low pressure (0 to 20,000 psi) instruments and related equipment.

3.3.2 Pressure Activation Methods

TESCOM uses four basic types of activation methods. The activation method provides the means by which the operator can set the force that determines the outlet pressure of a regulator.

Control Knob: Delivery pressure is increased by turning the control knob. The control knob applies a load through a spring to the piston.

Dome Load: Delivery pressure is increased by applying pressurized gas or liquid to the dome of a regulator at a pressure equal to the outlet pressure desired. This dome pressure is normally provided by a second regulator called the pilot regulator.

Combination Spring and Dome: Delivery pressure is increased by applying a spring force as well as the introduction of pressurized gas or liquid.

Air Actuated (Multiplier): Delivery pressure is controlled by applying 0-100 psig pilot pressure to the air actuator, resulting in full outlet pressure range control.

3.3.3 Operation (Control Knob Adjustment)

Controlled outlet pressure settings are obtained using TESCOM pressure reducing regulators by adjusting the control knob. Rotating the knob clockwise raises the outlet pressure while a counterclockwise rotation, coupled with venting of the downstream side of the regulator plumbing, lowers the outlet pressure. Final adjustments should be made in the direction of increasing pressure to obtain the most accurate set point.

TESCOM regulators will operate with any liquid or gaseous media compatible with the wetted materials. Some series/modifications come with an internal filter that only are designed to stop random contamination resulting from the installation of the regulator. An auxiliary upstream filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the regulator at high flow rates.

⚠ WARNING

A regulator is not intended to be used as a shutoff device. When the regulator is not in use, the inlet supply should be turned off. As a safety precaution, a pressure relief device should be installed downstream of the regulator.

3.3.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the regulator removed from the line. However, in some cases repair may be accomplished without removal of the regulator body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the regulator will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCOM (see pg. 39 for TESCOM contact information).

The following steps outline the disassembly of pressure reducing regulators for maintenance and repair:

1. Clamp the regulator in a vise by the flats on the bottom and/or side of the regulator body.
2. Turn control knob and/or spring adjustment mechanism counterclockwise to insure removal of all spring force on the piston.

NOTE: (Dome loaded regulators): All pressurized gas or liquid must be vented from dome before disassembly.

3. Remove upper portion of regulator (bonnet and/or dome). Some models require the hand knob and/or mounting bracket to be removed first.

NOTE: Upper portion of regulator may also include spring button, load spring back-up plate, and piston sensor, etc. Review correct drawing to ensure that all parts have been disassembled.

NOTE: (Two-Stage Regulator) TESCOM Model Series BB-5 is a two-stage regulator that has portions on both ends of the regulator body that must be removed. It is TESCOM's recommendation that two-stage regulators be returned to the factory for repair.

4. The valve parts can now be removed from the regulator body by turning the seat retainer and/or back cap counterclockwise until it is free of the regulator body.

⚠ CAUTION

TESCOM Models 26-1000 and 44-1100 valve parts are held in place by the use of left-handed threads.

When removing valve parts from a regulator that has a back cap, care must be taken to insure the main valve stem remains vertical. If the main valve stem is not removed correctly, parts may remain in the regulator.

5. To disassemble main valve assembly and/or valve, clamp valve in smoothed jaw vise. Clamping should be done on flats.

⚠ CAUTION

Care must be used to not damage valve. A Special service tool (Part number 6557-3) may be ordered from the factory to aid in the disassembly of the main valve assembly found in TESCOM Regulator Models 26-1000, 26-2000, 44-1100, 50-2000 and 54-2000.

NOTE: Several TESCOM regulators are supplied with internal filters. They will be located either in the inlet port or in the main valve area of the regulator. In each case, they should be removed and replaced before reassembly.

3.3.5 Reassembly

The regulator is reassembled in the reverse order of disassembly, observing the following precautions. Please reference the Bill of Material and Assembly Drawing for the correct location of replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCOM replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system they will be used in. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.
3. Apply a thin uniform coating of fluorocarbon grease to any or all of the following parts: indentation of spring button, threaded portion of adjusting screw, entire threaded area of the bonnet, all O-rings, all threaded parts internal to regulator.

NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Valve seats must be installed with the chamfered side towards the main valve.
5. Standard Regulator with Control Knobs - The body and bonnet are best joined by holding the bonnet assembly open end up and dropping all required items into place one at a time. The last item to be placed in the body of most all of TESCOM regulators is the piston sensor. Place all O-rings and back-up rings that are external to the piston sensor in the body before placing the sensor in place. O-rings should always be installed before back-up rings. The bonnet and body may now be attached. This is best done by holding the body in one hand and the bonnet in the other. Tilt the body at a 45° angle and then attach the bonnet by screwing it into the body firmly, hand tight. Regulator should then be placed in vise and bonnet re-torqued to correct specifications. See Assembly Drawing.
6. Dome/Spring Combination and Dome Loaded Regulators are more easily reassembled by holding regulator firmly in vise and reinstalling dome.
7. Self-Venting Regulator - If your regulator has an adjustable vent valve mechanism, it is set on final assembly at the factory and usually will not require further adjustment. If adjustment becomes necessary, use the following procedure after regulator has been installed:

   Step 1. Remove hole plug located in control knob.

   Step 2. Using control knob, apply 100 to 150 psi on downstream side.

   Step 3. Turn vent adjusting screw clockwise (located under hole plug) until media can be heard escaping through vent valve.

   Step 4. Turn screw counter-clockwise until media flow stops, plus 1/2 turn. Replace hole plug.

8. Reinstalling wire mesh inlet filter - Insert filter into primary inlet port. It must then be expanded to fit correctly. This can be accomplished by inserting a metal tool the same size as the port and then lightly tapping it with a hammer.

⚠ WARNING

After regulator has been reassembled, it should be connected to a pressure source with media compatible with the use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

3.4 Back Pressure Regulators - Diaphragm-Sensed

3.4.1 General

TESCOM's diaphragm sensed back pressure regulators are specifically engineered for applications requiring dependable pressure regulation. These regulators are especially appropriate for installations where the system or process requires the pressure to be limited to a maximum pressure. The control pressure range can be up to a maximum of 500 psig.

3.4.2 Pressure Activation Methods

TESCOM uses three basic types of activation methods. The activation method provides the means by which the operator can set the force that determines the back pressure of a regulator.

Control Knob: Back pressure is increased by turning the control knob. The control knob applies a load through a spring to the diaphragm.

Dome Load: Back pressure is increased by applying pressurized gas or liquid to the dome of a regulator at a pressure equal to the outlet pressure desired. This dome pressure is normally provided by a second regulator called the pilot regulator.

Combination Spring and Dome: Back pressure is increased by applying a spring force as well as the introduction of pressurized gas or liquid.

3.4.3 Operation (Control Knob Adjustment)

Controlled back pressure settings are obtained using TESCOM back pressure regulators by adjusting the control knob. Rotating the knob clockwise raises the back pressure while a counterclockwise rotation will lower the back pressure. Final adjustments should be made in the direction of increasing pressure to obtain the most accurate back pressure set pressure.

TESCOM regulators will operate with any liquid or gaseous media compatible with the wetted materials. Some series/modifications come with an internal filter designed to stop random contamination resulting from the installation of the regulator. An auxiliary upstream filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the regulator at high flow rates.

⚠ WARNING

A back pressure regulator is not intended to be used as a system safety relief device. When the regulator is not in use, the inlet pressure should be turned off.

3.4.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the regulator removed from the line. However, in some cases repair may be accomplished without removal of the regulator body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the regulator will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCOM (see pg. 39 for TESCOM contact information).

The following steps outline the disassembly of back pressure regulators for maintenance and repair:

1. Clamp the regulator in a vise by the flats on the bottom and/or side of the regulator body.
2. Turn control knob and/or spring adjustment mechanism counterclockwise to insure removal of all spring force on the diaphragm.

NOTE: (Dome loaded regulators) All pressurized gas or liquid must be vented from dome before disassembly.

3. Remove upper portion of regulator (bonnet and/or dome). Some models require the mounting bracket to be removed first.

NOTE: Upper portion of regulator may also include spring button, load spring back-up plate, and diaphragm, etc. Review correct drawing to ensure that all parts have been disassembled.

4. The valve parts can now be removed from the regulator body by turning the seat retainer and/or back cap counterclockwise until it is free of the regulator body.
5. To disassemble diaphragm valve assembly and/or valve, clamp valve in smoothed jaw vise. Clamping should be done on flats.

⚠ CAUTION

Care must be used to not damage valve.

3.4.5 Reassembly

The regulator is reassembled in the reverse order of disassembly, observing the following precautions. Please reference the Bill of Material and Assembly Drawing for the correct location of replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCOM replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system they will be used in. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.
3. Apply a thin uniform coating of fluorocarbon grease to any or all of the following parts: Indentation of spring button, threaded portion of adjusting screw, entire threaded area of the bonnet, all O-rings, all threaded parts internal to regulator.

⚠ WARNING

Do not apply any type of grease to threaded internal parts of regulators that come standard with metal to metal diaphragm seals. These models include the following regulator series: 44-2300, 44-2500, 44-2900 and 44-4700.

NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Valve seat must be installed with the chamfered side towards the valve.
5. Standard Regulator with Control Knob - The body and bonnet are best joined by holding the bonnet assembly open end up and lowering all required items into place one at a time. The last item to be placed in the bonnet will be the diaphragm. It can be centered on the seating surface of the bonnet before the body assembly is inverted and screwed into the bonnet firmly – hand tight. The 44-2300 is an exception. In this case stack the diaphragm, diaphragm back up plate, load spring and spring button on top of the body. Lower the bonnet and screw the bonnet onto the body firmly-hand tight. Regulator should then be placed in vise and bonnet re-torqued to correct specifications. See Assembly Drawing.
6. Dome/Combination Spring and Dome Loaded Regulators are more easily reassembled by holding regulator firmly in vise and reinstalling dome.

⚠ WARNING

After regulator has been reassembled, it MUST be connected to a pressure source with media compatible with the use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

3.5 Back Pressure Regulators - Piston-Sensed

3.5.1 General

TESCOM™ piston sensed back pressure regulators are specifically engineered for applications requiring dependable pressure regulation. These regulators are especially appropriate for installations where the system or process requires the pressure to be limited to a maximum pressure. The control pressure range can be up to a maximum of 20,000 psi.

3.5.2 Pressure Activation Methods

TESCOM uses four basic types of activation methods. The activation method provides the means by which the operator can set the force that determines the outlet pressure of a regulator.

Control Knob: Delivery pressure is increased by turning the control knob. The control knob applies a load through a spring to the piston.

Dome Load: Delivery pressure is increased by applying pressurized gas or liquid to the dome of a regulator at a pressure equal to the outlet pressure desired. This dome pressure is normally provided by a second regulator called the pilot regulator.

Combination Spring and Dome: Delivery pressure is increased by applying a spring force as well as the introduction of pressurized gas or liquid.

Air Actuated (Multiplier): Delivery pressure is controlled by applying 0-100 psig pilot pressure to the air actuator, resulting in full outlet pressure range control.

3.5.3 Operation (Control Knob Adjustment)

Controlled back pressure settings are obtained using TESCOM back pressure regulators by adjusting the control knob. Rotating the knob clockwise raises the inlet pressure while a counterclockwise rotation will lower the inlet pressure. Final adjustments should be made in the direction of increasing pressure to obtain the most accurate back pressure set pressure.

TESCOM regulators will operate with any liquid or gaseous media compatible with the wetted materials. Some series/modifications come with an internal filter that only are designed to stop random contamination resulting from the installation of the regulator. An auxiliary upstream filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the regulator at high flow rates.

⚠ WARNING

A back pressure regulator is not intended to be used as a system safety relief device. When the regulator is not in use, the inlet pressure should be turned off.

3.5.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the regulator removed from the line. However, in some cases repair may be accomplished without removal of the regulator body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the regulator will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCOM (see pg. 39 for TESCOM contact information).

The following steps outline the disassembly of back pressure regulators for maintenance and repair:

1. Clamp the regulator in a vise by the flats on the bottom and/or side of the regulator body.
2. Turn control knob and/or spring adjustment mechanism counterclockwise to insure removal of all spring force on the piston.

NOTE: (Dome loaded regulators): All pressurized gas or liquid must be vented from dome before disassembly.

3. Remove upper portion of regulator (bonnet and/or dome). Some models require the hand knob and/or mounting bracket to be removed first.

NOTE: Upper portion of regulator may also include spring button, load spring, back-up plate, and piston sensor, etc. Review correct drawing to ensure that all parts have been disassembled.

4. The seat parts can now be removed from the regulator body by turning the seat retainer counter clockwise until it is free of the regulator body.
5. To disassemble sensor and valve assembly and/or valve, clamp the spring plate in a smoothed jaw vise or hold with pliers. Clamping should be done on flats.

⚠ CAUTION

Care must be used to not damage valve surfaces.

3.5.5 Reassembly

The regulator is reassembled in the reverse order of disassembly, observing the following precautions. Please reference the Bill of Material and Assembly Drawing for the correct location of replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCOM replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system they will be used in. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.
3. Apply a thin uniform coating of fluorocarbon grease to any or all of the following parts: Indentation of spring button, threaded portion of adjusting screw, entire threaded area of the bonnet, all O-rings, all threaded parts internal to regulator.

NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Valve seats must be installed with the chamfered side towards the main valve.
5. Standard regulator with control knobs - The body and bonnet are best joined by holding the bonnet assembly open end up and lowering all required items into place one at a time. The last item to be placed in the body of the majority of TESCOM regulators, is the piston sensor. Place all O-rings and back-up rings that are external to the piston sensor in the body before placing the sensor in place. O-rings should always be installed before back-up rings. The bonnet and body may now be attached. This is best done by holding the body in one hand and the bonnet in the other. Tilt the body at a 45° angle and then attach the bonnet by screwing it into the body firmly, hand tight. Regulator should then be placed in vise and bonnet re-torqued to correct specifications. See Assembly Drawing.
6. Dome/Spring combination and Dome Loaded regulators are more easily reassembled by holding regulator firmly in vise and reinstalling dome.
7. Reinstalling wire mesh inlet filter - Insert filter into primary inlet port. It must then be expanded to fit correctly. This can be accomplished by inserting a metal tool the same size as the port and then lightly tapping it with a hammer.

⚠ WARNING

After regulator has been reassembled, it must be connected to a pressure source with media compatible with the use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

3.6 Valves - TESCOM 30 Series

3.6.1 General

TESCOM 30 Series shut-off manuals are specifically engineered for applications requiring dependable controls. These valves are especially appropriate for installations where high system pressures (up to 10,000 psi) are used.

3.6.2 Actuation Types

These are hand knob, manual control. The valve is closed by turning the hand knob clockwise.

3.6.3 Operation

The valve is closed by turning the hand knob clockwise and opened by turning the hand knob counterclockwise. The hand knob rotation changes the position of the valve stem in relation to the seat.

TESCOM valves will operate with any liquid or gaseous media compatible with the wetted materials. A filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the valve at high flow rates.

3.6.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the valve removed from the line. However, in some cases repair may be accomplished without removal of the valve body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the valve will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCOM (see pg. 39 for TESCOM contact information).

The following steps outline the disassembly of the 30 Series valve for maintenance and repair:

1. Clamp the valve body in a vise.
2. Turn the hand knob counterclockwise several turns to ensure the valve stem is not contacting the seat.
3. Remove the hand knob to expose the flats on the upper portion of the stem retainer.

Note: Upper portion of the valve may also include stem, seal, o-rings seat retainer. Review correct drawing to ensure that all parts have been disassembled.

4. The 30-1100 series seat is accessed from the bottom of the valve body.

⚠ CAUTION

Care must be used to not damage sealing components.

3.6.5 Reassembly

The valve is reassembled in the reverse order of disassembly, observing the following precautions. Please reference Bill of Materials and Assembly Drawing for the correct location of the replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damage with TESCOM replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system the valve will be used in. All parts in the flow stream must be free of particles which could prevent proper seating on the valve stem.
3. Apply a thin uniform coating of fluorocarbon grease to the following parts: threaded portion of the adjusting screw, the lower part of the threaded area of the stem retainer, all the o-rings.

NOTE: Do NOT apply any type of grease to the inlet and outlet connections.

4. Valve seat must be installed with the chamfered side towards the valve stem.
5. Thread the stem retainer into body hand-tight. Valve should be placed into a vise and the stem retainer re-torqued to specifications. See Assembly Drawing.

⚠ WARNING

After valve has been reassembled, it must be connected to a pressure source with a media compatible with the use the valve and pressurized to check for internal and external leakage and operation characteristics.

3.7 Valves - TESCOM VA, VG and VT Series

3.7.1 General

TESCOM VA, VG and VT Series valves are specifically engineered for application requiring dependable controls. These valves are especially appropriate for installations where high system pressures (up to 10,000 psig) are used.

3.7.2 Actuation types

The valve is closed or opened by applying low air pressure to the actuation port.

3.7.3 Operation

The normally closed (spring closed) VA and VG valves require a minimum pressure of 60 psi applied to the actuation port to open. The normally open (spring open) VA and VG valves require a minimum pressure of 60 psi applied to actuation port to close. The VT valve requires a minimum pressure of 80 psi for actuation pressure.

TESCOM valves will operate with any liquid or gaseous media compatible with the wetted materials. A filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the valve at high flow rates.

3.7.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the valve removed from the line. However, in some cases repair may be accomplished without removal of the valve body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

The following steps outline the disassembly of the VA, VG and VT series valves for maintenance and repair. For field repairs and maintenance, it is recommended to use the valve modules for repair. Module numbers are located on the datasheets or call TESCOM for the module number.

An Assembly Drawing and Bill of Material for the valve will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCOM (see pg. 39 for TESCOM contact information).

Special repair tools are available for field servicing valve modules (P/N 64084 for VA module and JT103871 for VG module):

1. Clamp the valve body in a vise.
2. Remove the upper portion of the valve bonnet. The actuation side.
3. For the VT valve, also remove the lower bonnet.

NOTE: Upper portion of the valve may also include stem, seals and o-rings. Review correct drawing to ensure that all parts have been disassembled.

⚠ CAUTION

Care must be used to not damage sealing components.

3.7.5 Reassembly

The valve is reassembled in the reverse order of disassembly, observing the following precautions. Please reference Bill of Materials and Assembly Drawings for the correct location of the replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCOM replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system the valve will be used in. All parts in the flow stream must be free of particles which could prevent proper seating on the valve stem.
3. Apply a thin uniform coating of fluorocarbon grease to the following parts: The bonnet threads and all o-rings.

NOTE: Do NOT apply any type of grease to the inlet and outlet connections.

4. Place the valve body into a vise ad re-torque the bonnet of specifications. See Assembly Drawing.

⚠ WARNING

After valve has been reassembled, it must be connected to a pressure source with a media compatible with the use the valve and pressurized to check for internal and external leakage and operation characteristics.

Section 4: Limited Warranty

4.1 Limited Warranty

Tescom Corporation ("Seller") warrants that the licensed firmware embodied in the goods will execute the programming instructions provided by Seller, and that the goods manufactured or services provided by Seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller, whichever period expires first. Consumables and services are warranted for a period of 90 days from the date of shipment or completion of the services. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products. If buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, correct any errors that are found by Seller in the firmware of services or repair or replace F.O.B. point of manufacture that portion of the goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the goods/services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources or environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by buyer or any other party except as may be agreed upon in writing in advance by Seller. All costs of dismantling, reinstallation and freight and the time and expenses of Seller's personnel and representatives for site travel and diagnosis under this warranty clause shall be borne by buyer unless accepted in writing by Seller. Goods repaired and parts replaced by Seller during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by Seller. THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE. THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOOD OR SERVICES.

Safety, Installation, Operations & Service Manual
Rev. A
Published 06/15

Emerson Process Management
Regulator Technologies, Inc.
TESCOM

AMERICAS
12616 Industrial Blvd.
Elk River, MN 55330 USA
T +1 800 447 1250
+1 763 241 3238
F +1 763 241 3224
na.tescom@emerson.com
www.tescom.com

EUROPE
An der Trave 23-25
23923 Selmsdorf, Germany
T +49 (0) 3 88 23/31-287
F +49 (0) 3 88 23/31-140
eu.tescom@emerson.com
www.tescom-europe.com

Brandon House
23-25 Brandon Street
Hamilton ML3 6DA
South Lanarkshire, UK
T +44 1698 424 254
F +44 1698 459 299
uk.tescom@emerson.com
www.tescom.com

ASIA PACIFIC
3/F. Building #2 No. 1277
Xin Jin Qiao Road Jinqiao E.P.Z.
Pudong Shanghai 201206 China
T +86 21 2892 9970
F +86 21 2892 9001
ap.tescom@emerson.com
www.tescom.com

MIDDLE EAST & AFRICA
PO Box 17033 Jebel Ali Free Zone-South
(Zone 2)
Dubai, UAE
T +971 4 811 8443
F +971 4 886 5465
mea.tescom@emerson.com
www.tescom.com

TESCOM

EMERSON.
Process Management

TRONAIR®

APPENDIX III

Instrument Certification Notice

Instrument Certification Notice

The gauge Certificates of Calibration supplied for the gauge(s) on this unit contain the calibration data for the actual instrument calibrated, along with the calibration date of the **STANDARD** used to perform the calibration check.

The due date for re-calibration of the instrument should be based upon the date the instrument was placed in service in your facility. Re-calibration should be done on a periodic basis as dictated by the end user's quality system or other overriding requirements.

Note that Tronair, Inc. does not supply certificates of calibration on flow meters or pyrometers unless requested at the time of placed order. These instruments are considered reference indicators only and are not critical to the test(s) being performed on the aircraft.

Tronair, Inc.
1 Air Cargo Pkwy East
Swanton, OH 43558

Phone: (419) 866-6301 | 800-426-6301
Web: www.tronair.com
Email: sales@tronair.com

TRONAIR®

APPENDIX IV

Declaration of Conformity

EU Declaration of Conformity

Model Number(s) 20-4532-9000
Product Type/Name: Three Cylinder High Pressure Oxygen Cart With Tiltable Cradles and Booster

Declaration: Tronair has assessed the equipment described above against the Essential Health and Safety Requirements of one or more Directives. Based on this assessment, the equipment described above is deemed to comply with the directive(s) listed below.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Directives: European Machinery Directive 2006/42/EC

Standards: EN ISO 12100-2010 - Safety of machinery – Basic concepts, general principles for design
Risk assessment and risk reduction

Markings: CE

The technical documentation for the machinery is available from:

RAUH Hydraulic GmbH
Hallstadtler Straße 63
Email: tronair@rauh-hydraulik.de

Location of Issue: Tronair, 1 Air Cargo Parkway East, Swanton, OH 43558

Identification of person empowered to sign on behalf of the Manufacturer:

Patrick Finch
Quality Assurance Representative