Bethlehem Apparatus Company, Inc.
Bethlehem Burners
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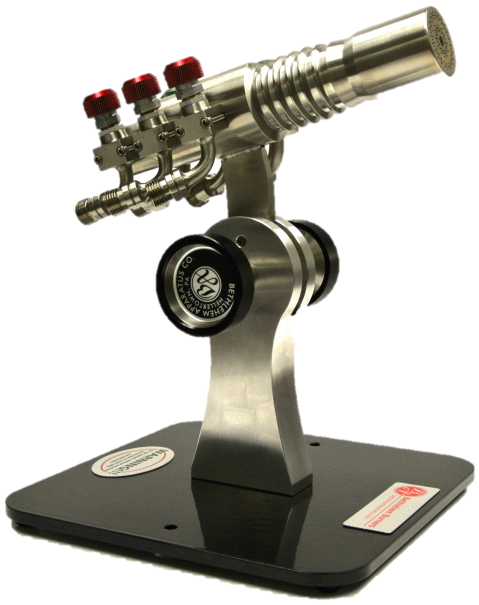
The Grand Operating Instructions:



The Bethlehem Grand Bench Burner was designed for use with gas and oxygen. Propane is the preferable gas, and is readily available from gas distributors. Be sure that your gas distributor can supply you with a pressure regulator. The regulator should be equipped with a gauge so you can see how much fuel remains in your fuel tank, and indicate the pressure you are sending to the torch.

BEFORE OPERATING ANY GAS BURNER YOU SHOULD BE FAMILIAR WITH THE ODOR OF THE FUEL YOU ARE USING. ALL GAS FUELS HAVE A DISTINCT ODOR. THE MANUFACTURER PURPOSELY ADDS THE ODOR SO YOU CAN EASILY DETECT A GAS LEAK. THE ODOR IS DIFFERENT FROM THE SMELL OF BURNED FUEL (CALLED PRODUCTS OF COMBUSTION). READ ALL INSTRUCTION MANUALS SUPPLIED BY YOUR GAS DISTRIBUTOR BEFORE OPERATING YOUR NEW BURNER.

Valve Configuration:

The Grand has six modular valves attached to the side of the burner. The valves located closest to the face of the torch work the outer fire, the valves located closest to the back of the torch work the center fire and the valves located between the outer and center fire valves work the middle fire. A red knob indicates gas connections and a green knob indicates oxygen connections. GAS is also stamped on the gas valve cap and OXY is stamped on the valve cap for oxygen. The six separate hose connections come equipped with B-fitting threads, ¼ inch inside diameter. These six separate hose connection sights allow for working the Grand with a foot-pedal oxygen saver. If foot-pedal mechanisms are not desired then the gas and oxygen connections may be combined with two (2) T or Y-connectors or with a 3 pronged showerhead connector (please contact Bethlehem for more information on T, Y and Showerhead connectors). Be sure to only connect gas lines to each other. We have supplied your burner with B-fitting hose connectors for safety reasons. The B-fittings will prevent you from connecting the gas and oxygen improperly. B-fittings have different threads to prevent mistakes in connecting gas and oxygen lines.

O-Rings:

The Grand uses silicone O-rings at eleven (11) locations. Five of the O-rings are internal connections and six of the O-rings connect to the six modular valves. While the O-rings are rated for high temperatures (approximately 400 degrees F), they may dry out over time. Replacement of the internal O-rings must be done at the factory. Replacement of the O-rings on the valve may be done in the field. If you start to experience FLASHBACK (covered below) return the burner for O-ring replacement.

Optimum Fuel Pressure:

Gas: 5 psi to 10 psi.

Oxygen: 10 psi to 25 psi.

DO NOT EXCEED 25 lbs. pressure on any feed. Excess pressure may cause gas or oxygen to leak through the valves and increase the chance of leakage through the hose connections.

Theory of Operation:

The Grand is designed to produce a wide variety of flame configurations so you can have the greatest versatility in your glass working. The flame is surface-mixed and low velocity. The torch operates without loud noise or flashback. Surface-mixed, low-velocity flames have the distinct advantage in that they are soft quiet flames while producing a soaking heat. Turning the precision needle valves easily changes flame settings. For best results, keep the fuel flow to a minimum. On Bethlehem burners, **loud noise does not indicate more heat**. The soft, intense blue flame will bathe your work in heat which will quickly penetrate the glass.

For best results, you should light the gas flame on the center fire first. Once you have the yellow flame close to the burner head, you can slowly add oxygen. As soon as oxygen is added, the color will change from yellow to blue. This indicates complete combustion. As you change the flame height you should always keep the flame color as blue as possible. If the individual jets (small cones of sharp color near the burner face) are giving off long yellow "candles", this is an indication of unburned fuel. This is usually caused by the addition of too much gas, either by volume or pressure.

Unburned fuel will cause carbon deposits on the face of the burner. Keep carbon deposits to a minimum. If a deposit builds up on the burner face, you could overheat the front face, causing the burner to deteriorate over time. Carbon deposits will also change the flame characteristics of your burner and the carbon could become dislodged from the face and deposit onto the glass being heated. Use the stainless steel cleaning wires, brush and wooden dowel provided to remove all carbon deposits.

To extinguish the flame you should always turn off the oxygen before the gas. Do not over tighten the valves.

For more information about Bethlehem Burners bench burners and torch operation, please visit our web site at http://bethlehemburners.com.

Bethlehem Grand Burner Technical Characteristics:

Surface-Mixed Burner
All Bethlehem Burners are gas and oxygen surface-mixed. The gas and oxygen are kept separate until they leave the face of the burner. This style of burner allows for the greatest flexibility in operation without flashback.

Bethlehem's Grand burner allows the operator the freedom of regulating the flame size simply by turning the gas or oxygen valves. A standard pre-mix burner would require the operator to change burner tips to achieve similar results in performance.

Flashback
A flashback is when pre-mixed fuels burn inside the burner body, resulting in a flame blow out, or even an internal flame that will destroy a burner.

The surface-mixed burner is safer because it will not allow the fuel mixture to burn inside the burner body. Therefore, as in pre-mix burners, fire checks and flame arrestors are not required with The Grand but encouraged. To test your burner for proper performance, just simply turn the oxygen flow off and back on rapidly. If there is a loud gun-shot-like bang, then pre-mixing is occurring and the burner should be returned to Bethlehem Apparatus for repairs.

CAUTION
DO NOT USE BURNERS THAT MAKE A LOUD ***BANG*** WHEN THE OXYGEN SUPPLY IS ABRUPTLY CUT OFF.

Gases
Bethlehem's Grand is designed to burn natural gas, hydrogen, propane or butane fuels. Do not use acetylene. Acetylene contains excess carbon that will clog the gas ports on the burner face.

Carbon Monoxide Warning

All Bethlehem Burners torchers are designed to be operated with gas and oxygen. The burners are intended to produce an open flame. EXTREME CARE must be taken to assure that combustible materials are kept away from the open flame. The burner flame is combustion, which results in the production of water vapor, carbon dioxide, and CARBON MONOXIDE, which is a highly poisonous, odorless, colorless, tasteless gas. It is very flammable. Be sure to use adequate ventilation when operating burners. Use a carbon monoxide detector in the room where burners are operated. Do not smoke around combustible gases.

Safety Regulations

All Bethlehem burners are surface-mixed and do not require a flashback arrestor, which is required for pre-mix torches. However, the need for a flashback arrestor may be subject to regulation. Therefore, we advise all of our burner customers to check with their local, state and federal regulations regarding burner/ torch requirements.

NFPA 58

In accordance with the National Fire Protection Association (NFPA) the use of liquid fuel i.e. propane, butane, and
natural gas requires that all containers are to be stored outside.

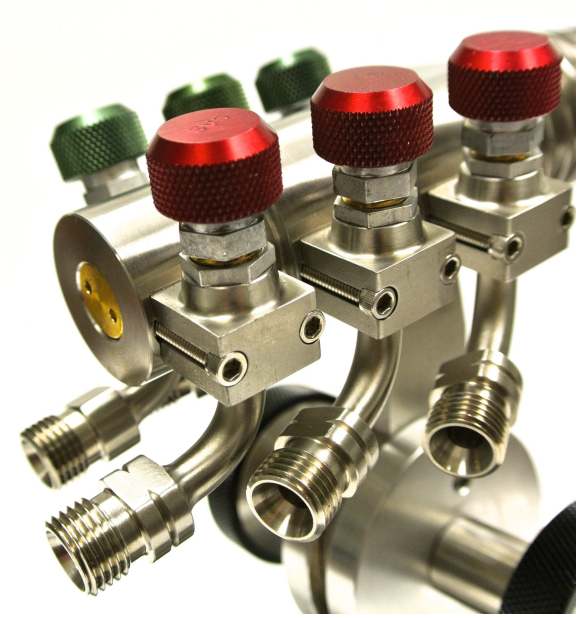
6.1.1*
(3) Installation of container appurtenances and regulators
(4). Installation of piping (including flexible connectors and hose), hydrostatic relief valves and piping service limitations.

6.2.1
LP-Gas containers shall be located outside of buildings unless they are specifically allowed to be located inside of buildings.

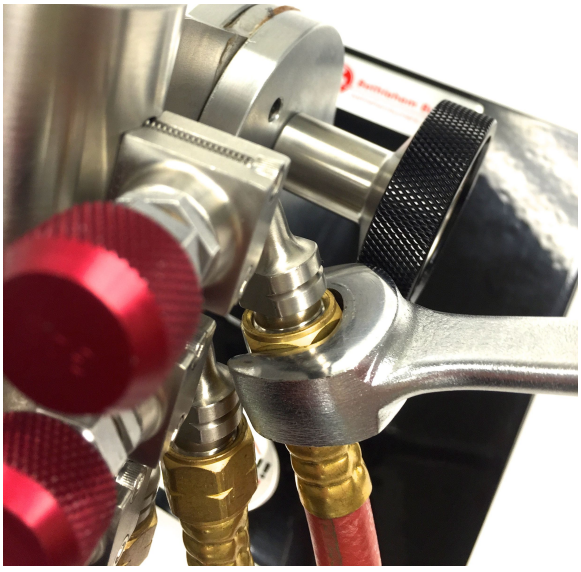
6.3.1*
Containers installed outside of buildings, whether of the portable type replaced on a cylinder exchange basis or permanently installed and refilled at the installation, shall be located with respect to the adjacent containers, important building, group of buildings, or line of adjoining property that can be built upon.

Hose Connections

To ensure a secure and safe hose connection, Bethlehem bench burner valves come equipped with male B-fitting threads at the hose connections sites.

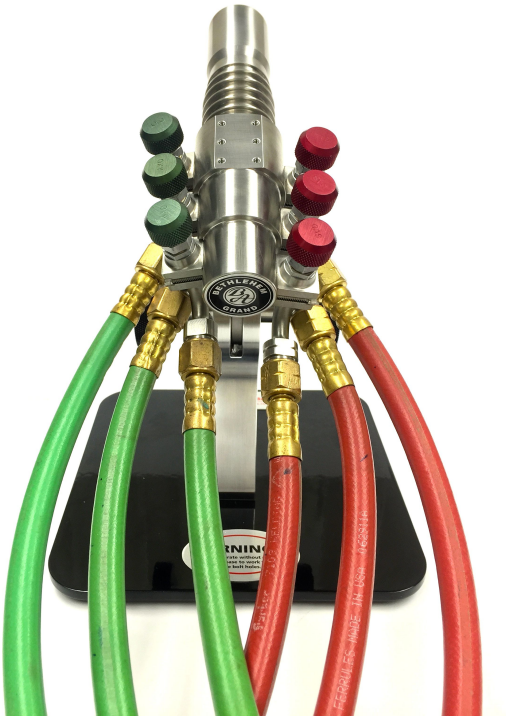


The Grand burner requires USA standard ¼" T-grade welding hose with crimped female B-fittings. Simply thread the female B-fitting attached to the hose onto the male B-fitting on the valve and tighten with a wrench.



Gas B-fittings tighten to the left and Oxygen B-fittings tighten to the right.

DO NOT USE TEFLON TAPE ON THE B-FITTING THREADS. The stainless steel threads on the torch will grind into the brass threads on the hose creating an airtight seal. Adding tape will disrupt the seal and create leaks or fragments of tape will become dislodged and travel into the torch, causing internal damage to the torch.



Helpful Tip:

Use soapy water on the hose connection sites to check for gas or O2 leaks. Simply spray soapy water onto the hose connection sites and flow gas and O2 to the torch while keeping the torch valves closed. If bubbles form in the soapy water, then tighten the hose B-fitting onto the valve B-fitting using a wrench.

For more information about proper hose connections, Bethlehem Burners torch line, foot-peddles, Y-T-Showerhead connectors and Bethlehem torch services, please visit our website at www.bethlehemburners.com or call us at (610) 838-7034.