



Bethlehem Apparatus Company, Inc.

# Bethlehem Burners

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## The Bethlehem Star Operating Instructions:



The **Bethlehem Burners Star** torch was designed for the modern flame worker. The stainless-steel construction keeps the torch barrel cool to the touch, and the low velocity flame reduces fuel waste while increasing the torches fuel mixture range! The *Star* torch is the perfect torch for flame workers of all skill levels and for use with oxygen concentrators!

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.

### Optimum Fuel Pressure:

Gas: 2 psi to 10 psi.

Oxygen: 8 psi to 35 psi.

DO NOT EXCEED 50 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 *Star* is designed to produce a wide variety of fuel mixture combinations, which provide the lampworker with a wide variety of flames settings. The torch produces **surface-mixed** flames and operates without loud noise or flashback. The fuel and oxygen are kept separate when traveling through the torch and combine as they exit the torch face to produce a gentle yet penetrating flame atmosphere, perfect for melting borosilicate and soda-lime glass.

The **Precision Needle Valves** on either side of the torch barrel, control the volume of fuel flowing through the torch. To OPEN the valve and increase the fuel flow, turn the valve cap counterclockwise. To CLOSE the valve and decrease the fuel flow, turn the valve cap clockwise.



To light the torch, open the GAS (fuel) valve and using a sparker or lit match, ignite the fuel flow coming out of the eleven gas hypo tubes. Once ignited, slowly open the OXY valve to introduce pure oxygen to the gas flame. Decrease and increase the fuel and oxygen flow until the torch creates a blue flame with eleven blue/white gas candles. The gas candles should be distinct from one another and *at least* 10mm long. The five outer most gas candles will have a distinctly wider look to them than the six center gas candles. They almost look like flower petals! This is normal and to be expected when running *The Star* torch.



It is common for the gas flame to blow out when the oxygen is first introduced. You may even hear a small popping sound when the gas flame is extinguished by the introduction of oxygen. This is normal and nothing to worry about. If this happens, just try again, and try to open the oxygen valve a little more slowly, so the sudden rush of oxygen doesn't blow out the flame. If you cannot get the torch to light, please contact **Bethlehem Burners** for assistance. [www.bethlehemburners.com](http://www.bethlehemburners.com).

When shutting off the torch, close the OXY valve first, followed by the GAS valve.

Unburned fuel will cause carbon deposits in the face of *The Star* burner. Keep carbon deposits to a minimum. If a deposit builds up on the burner face, you will overheat the front face, causing the burner to deteriorate. Carbon deposits will also change the flame characteristics of your burner. Your torch comes with cleaning wires, a brush, wooden dowel and cleaning instructions. Please follow the cleaning instructions to learn how to remove carbon build up from your torch face and gas jets.

### **Hose Connection:**

The *Star* torch is equipped with **two** modular precision needle valves, with each needle valve having its own hose connection. The **RED** knob on the valve 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 valve bodies come equipped with Male **B-fitting** hose threads and have a **¼ inch** inside diameter.

## Modular Valves



Use **T-Grade Welding Hose** with **Female B-fitting** connections to connect your **Bethlehem Burners *Star* torch** to the fuel sources.



\*Bethlehem Burners does not carry long lengths of T-Grade Welding Hose. To purchase this type of hose, contact a Glass Tool or Welding Tool Supplier. You can find a list of Glass Tool Supplier on our "Locate a Distributor Page" on the Bethlehem Burners Website.

<https://www.bethlehemburners.com/locate-distributor>

If your T-Grade Welding Hose does not come with Female B-Fitting Hose connections, you can attach the hose to your torch using Hose Barb Adapters and a Hose Clamp.



\*Hose Barb Adapters can be found on Bethlehem Burners "Accessories" page.

<https://www.bethlehemburners.com/product/accessories>

\*Bethlehem Burners does not carry Hose Clamps.

### **O-Rings:**

The *Star Burner* uses silicone O-rings at five locations. Three of the O-rings are internal

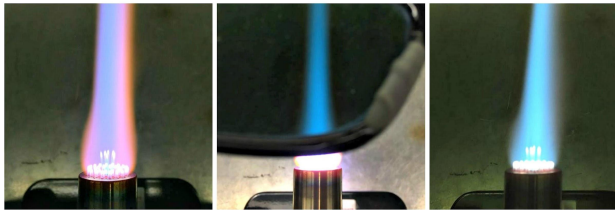
connections and two of the O-rings connect to the two modular valves. While the O-rings are rated for high temperatures (approximately 400 degrees F), they may dry out over time. Replacement of the internal O-rings must be done at the factory. If you start to experience FLASHBACK (covered below) return the burner for O-ring replacement.

## WARNING

### Do Not Overheat the Torch Face

Running soft, gas rich flames that sit low on the face of the torch can lead to the torch face overheating. Be sure to always flow enough oxygen to keep the heat away from the torch face. If the torch face is glowing red, the torch face is too hot! Immediately turn off the torch and let the face cool down before you proceed. Overheating the torch face can lead to metal deterioration, which will damage the structural integrity of the torch, and it will disrupt the torches' ability to produce well-balanced and efficient flames.

Below is an example of a dangerous (dangerous for the torch) flame setting for a **Bethlehem Burners** torch, as seen through protective glasses. The picture on the right is what the flame looks like without glasses; the picture on the left is the same flame, only seen through the protective glasses. The torch used in these pictures is the **Bethlehem Champion** torch, but the same basic principles apply to all lampworking torches.



For more information about **Bethlehem Burners** and how best to care for your Bethlehem Burners flame working torch, please visit our web site at <http://bethlehemburners.com>.

## Star Flame

### Technical Characteristics:

#### Surface-Mixed Burner

All *Bethlehem Burners* torches 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.

The *Star* torch allows the operator the freedom of regulating the flame size simply by turning the gas or oxygen valves, whereas 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.

To test your burner for proper performance, just simply turn off the oxygen flow. If there is a loud bang, then pre-mixing is occurring, and the burner should be returned to **Bethlehem Burners** for repairs.

#### CAUTION

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

#### Gases

The *Star* torch is designed to burn natural gas, hydrogen, propane, and butane fuels.

#### Do not use acetylene.

Acetylene contains excess carbon which will clog the gas ports on the burner face.

#### Carbon Monoxide Warning

All **Bethlehem Burners** torches 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** torches are surface-mixed and do not require a flashback arrestor, which are required for pre-mix torches. However, the need for a

flashback arrestor may be subject to regulation. Therefore, we advise all our torch customers to err on the side of caution and use Flashback Arrestors on their tanks.

### **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.