



Safety & Training Program



Our Mission Statement:

Exceeding Customer Expectations
Through Performance Excellence.

- Turbo Torch Overview
- Safety - Discussion on Gas – Safe operating practices
- Definitions – Terminology - AWS recognized vocabulary
- Processes – Soldering & Brazing
 - Hand Torches
 - Gasses used
 - Safety
 - Demo
 - Features/Features
 - Air Acetylene
 - Gasses used
 - Safety
 - Demo/Features (tie in proper procedures)
 - Equipment Maintenance (Cleaning Tips)
 - Oxy Acetylene
 - Gasses Used
 - Safety
 - Demo/Features (tie in proper procedures)
 - Equipment Maintenance
 - Safety – Shut Down procedures

A FAMILY OF WELDING MARKET LEADERS

- Headquarters in St Louis, MO
- Manufacturing locations in North America, Latin America, Europe, Australia and Asia
- Distribution and Sales offices in 25 countries

- **A commitment to growth through product innovation and service quality.**
- **Unsurpassed commitment to safety, and an improved work environment**
- **Holder of more than 340 US and foreign patents**

We manufacture...

- Gas apparatus for weld brazing and soldering
 - Oxygen/acetylene
 - Acetylene/air
 - MAPP and Propane
- Arc welding products and power supplies
- Plasma cutting systems
- CNC cutting systems
- Hardfacing and filler metals
- Oxygen therapy equipment

Brand Recognition -

Most requested brand name in HVAC and Professional Plumbing Torch Market.

Innovative -

Originators of Air Swirl Technology.

Product Coverage –

Air Swirl Torches for Propane, MAPP and Acetylene usage.
Complete line of leading edge Oxy Acetylene equipment.
Multiple combinations to satisfy all market requirements.

- Soldering
 - Joining process that takes place below 840° F
- Brazing
 - Joining process that occurs above 840°, but below the melting point of the base metals
- Welding
 - Joining process that fuses like materials together
- Cutting
 - Oxy Acetylene
 - Plasma Cutting

Preparing Copper Before Soldering

Measure twice, cut once.

Always clean your copper before Soldering - no exceptions.

Always deburr the copper to get rid of burrs caused from cutting copper tubing. If burrs are not removed, flow is restricted and the copper will not last.

Always use a flux. Apply the flux correctly. Do not over flux.

Assembly and Support. Make sure the tube seats against fitting socket and the tube and fitting are properly supported.

Heating. Be careful not to overheat or direct the flame into the fitting cup as this could cause the flux burn and destroy its effectiveness.

Preparing Copper Before Soldering

Applying Filler Metal. Molten solder is drawn into the fitting by capillary action.

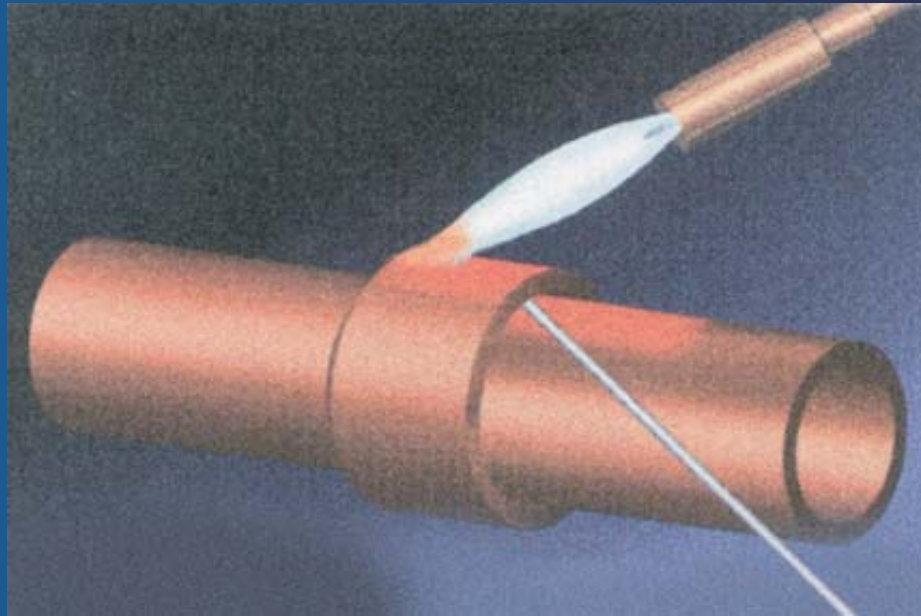
Cooling and Cleaning. After the joint is completed, natural cooling is the best. Shock cooling with water may cause stress on the joint.

The major difference between Soldering and Brazing are:

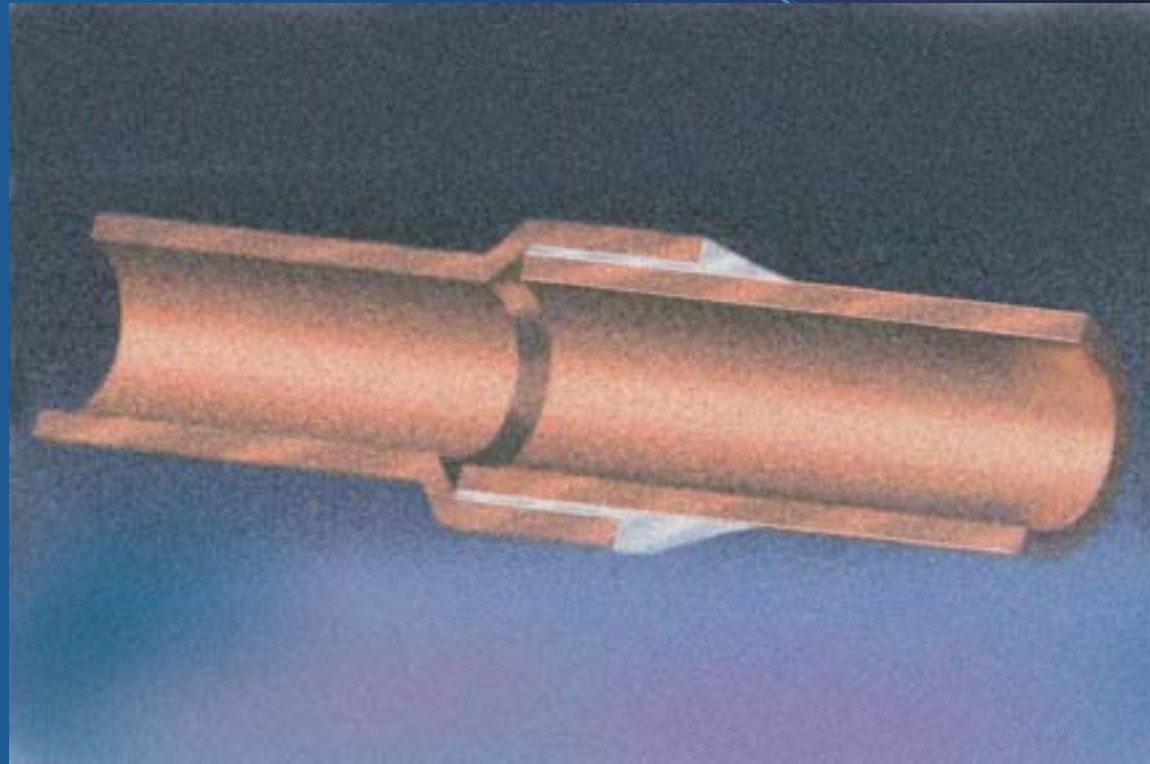
- Type of flux used
- Composition on filler metal
- Amount of heat required to melt the filler metal

Capillary Action

- It is important to understand the principles of capillary action in order to braze and soft solder properly.
- The filler will **always** flow to the heat source.



Proper Soldering Connection



You will see above an example of a properly filled coupling, with solder penetrating the full depth of the cup.

Soldering & Brazing

Joining Process - Connecting two pieces of base metal (e.g. copper tubing) with a capillary fitting, sealing those pieces with a filler that is melted by heating the base metal with a torch.

There are two processes - applications:

1) Soft Soldering (below 840° F) - Plumbing

Filler flows at 450 ° F

Must use a flux separately

Usually done at temps between 350° and 550°

2) Brazing (above 840° F) - HVAC/R

Typically occurs at temperatures between 1100° and 1500°

Example: Silver Flow (SF-1) flows at 1350 ° F

No separate flux required, rod contains flux (Phosphorus)

Brazing Alloys

Copper to Copper

When utilizing brazing alloys to join copper to copper the following silver proportions and operating temperatures are applicable:

Silver Content	Liquidus	Solidus
0%	1500°	1350°
2%	1450°	1190°
5%	1500°	1190°
6%	1425°	1190°
15%	1465°	1190°

Characteristics:

No flux is required when joining Copper to Copper

Brazing Alloys

Dissimilar Metals

When utilizing brazing alloys to join dissimilar metals the common denominators are higher amount of Silver, narrower flow range, lower melting point, and flux is required.

Silver Content

25%

45%

56%

Melting Point: 1145°

Plastic Range: 60°

Three gases most commonly used in the industry, Propane, MAPP and Acetylene. The operating temperature is affected by the torch and flame characteristics.

Propane Gas

- Liquid Petroleum (LP)
- Stable Gas
- Target Temperature 1750° (Using primary combustion torch)
- Affected by low temperatures (0° F)

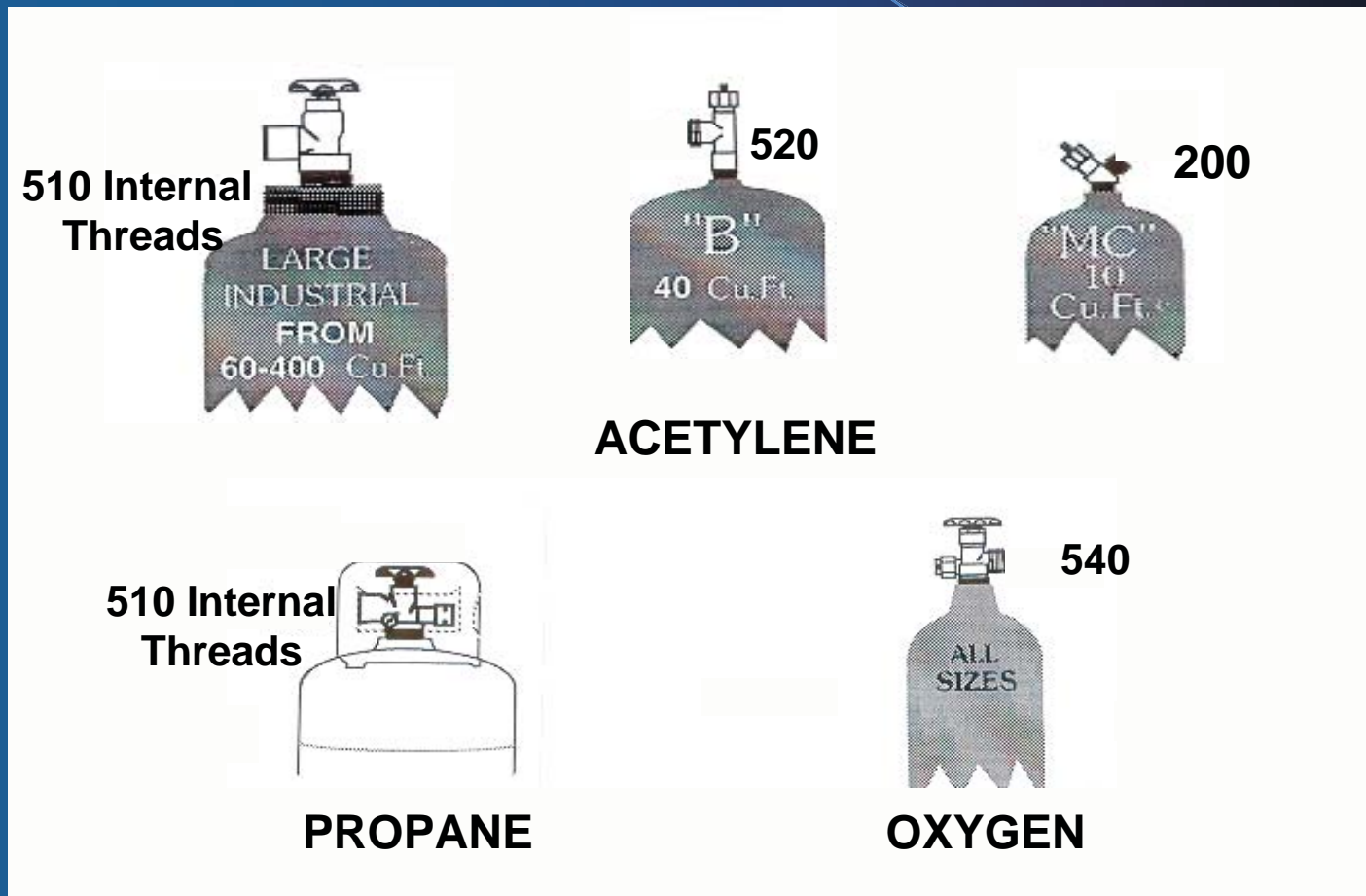
MAPP Gas

- Stabilized Methylacetylene and Propadiene
- Target Temperature 2400° (Using primary combustion torch)
- Affected by low temperatures (30° F)

Acetylene Gas

- Compound of Carbon and Hydrogen
- Two Carbon Two Parts Hydrogen
- Unstable Fuel Gas
- Target Temperature 2700° (Using primary combustion torch)
- Not affected by low temperatures

Cylinder valve identification for regulator selection
CGA (Compressed Gas Association) connection number



Porous Filler 8% to 10%

The filler, which completely occupies the steel shell, is 90% to 92% composed of millions of interconnected pores.

Acetone 42%

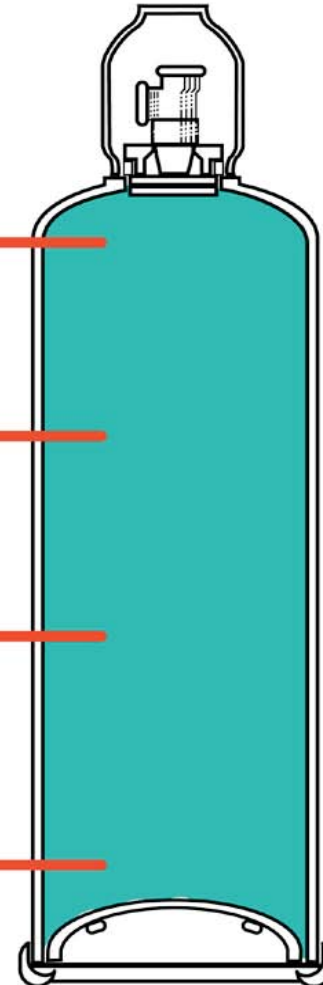
Acetone equal to 42% of the internal volume is dispersed throughout the filler.

Acetylene Gas 36%

The acetylene gas is uniformly absorbed by the acetone. The resulting mixture occupies 78% of the internal volume.

Reserve Volume at 70° F 10% to 12%

Since acetone and acetylene gas will expand as temperature rises, a safety reserve must be present even at 150° F.



■ Check newly filled cylinders:

- Open the valve just enough to let the gas flow.
- Place your hand in front of the outlet.
- If you feel moisture, return the cylinder to your distributor because you are drawing **acetone** instead of **acetylene**.

■ If pressure drops while using the torch:

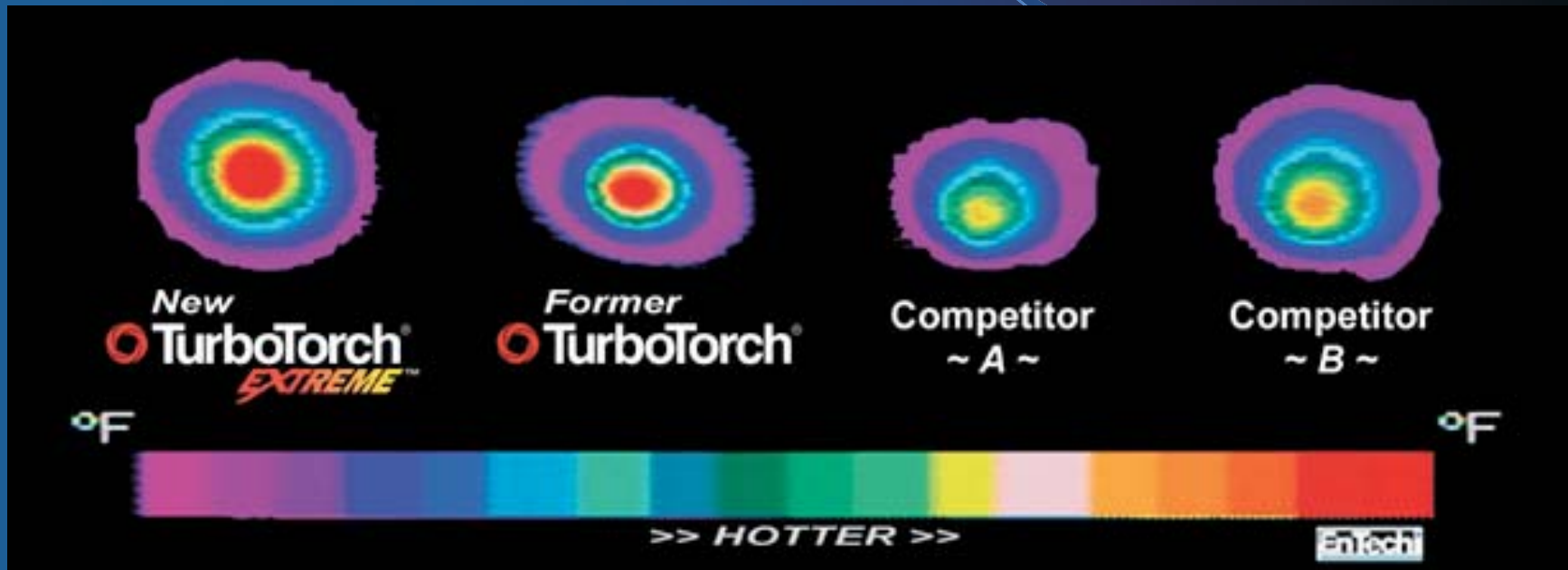
- Turn the torch off.
- Check the acetylene tank and determine if it is empty.
- If the tank is not empty, discontinue using the torch because you could draw acetone into the equipment.



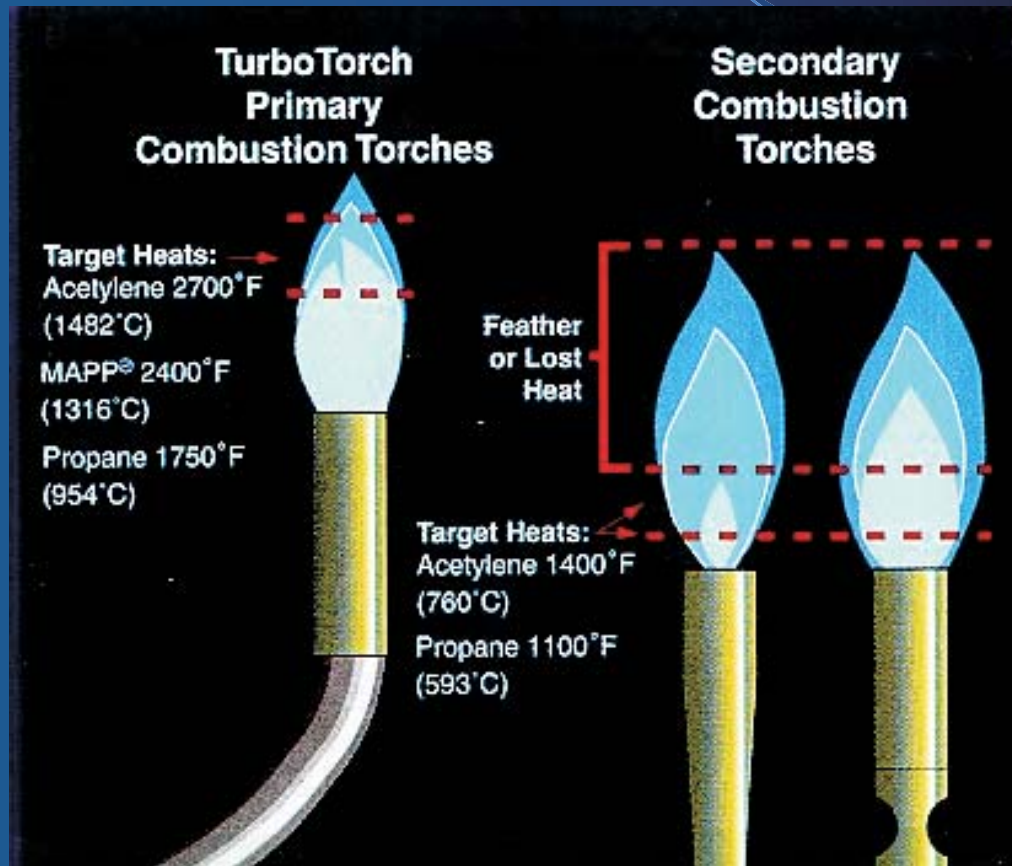
Air Fuel (swirl)

- TurboTorch invented and patented effective air fuel/swirl
- We continue to lead in this market (Extreme Torches)
- More productivity
 - No oxygen tank so less money and less weight
 - “On target” heat

Air Fuel (swirl)



Target Heat Temperatures



TurboTorch Swirl Combustion

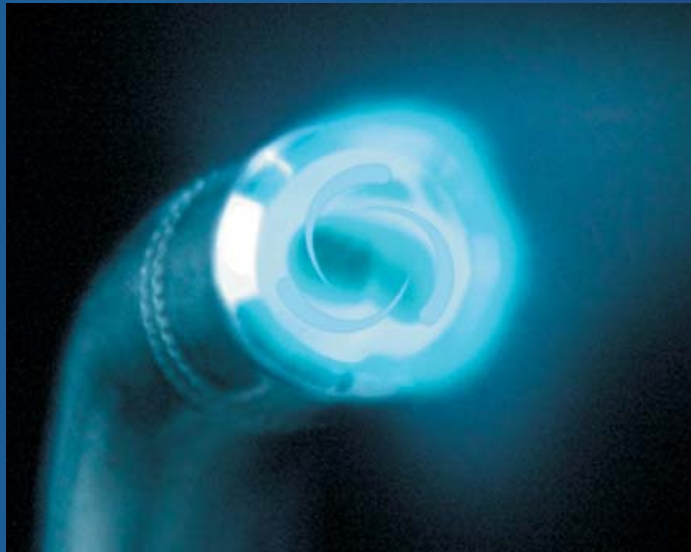
- Temperatures obtained with TurboTorch swirl combustion wrap around direction of flame.
- - Propane 1750 °F
- - MAPP 2400 °F
- - Acetylene 2700 °F

- This allows a connection to be brazed without heating nearby pieces of copper.

- Copper up to 1 1/8" can be brazed with an MC tank. Do not use a tip larger than A-8 on an MC tank. Use a B tank for more capacity or to braze larger sizes.

TurboTorch Swirl Combustion

This is what a TurboTorch swirl combustion flame looks like when looking into the Tip.



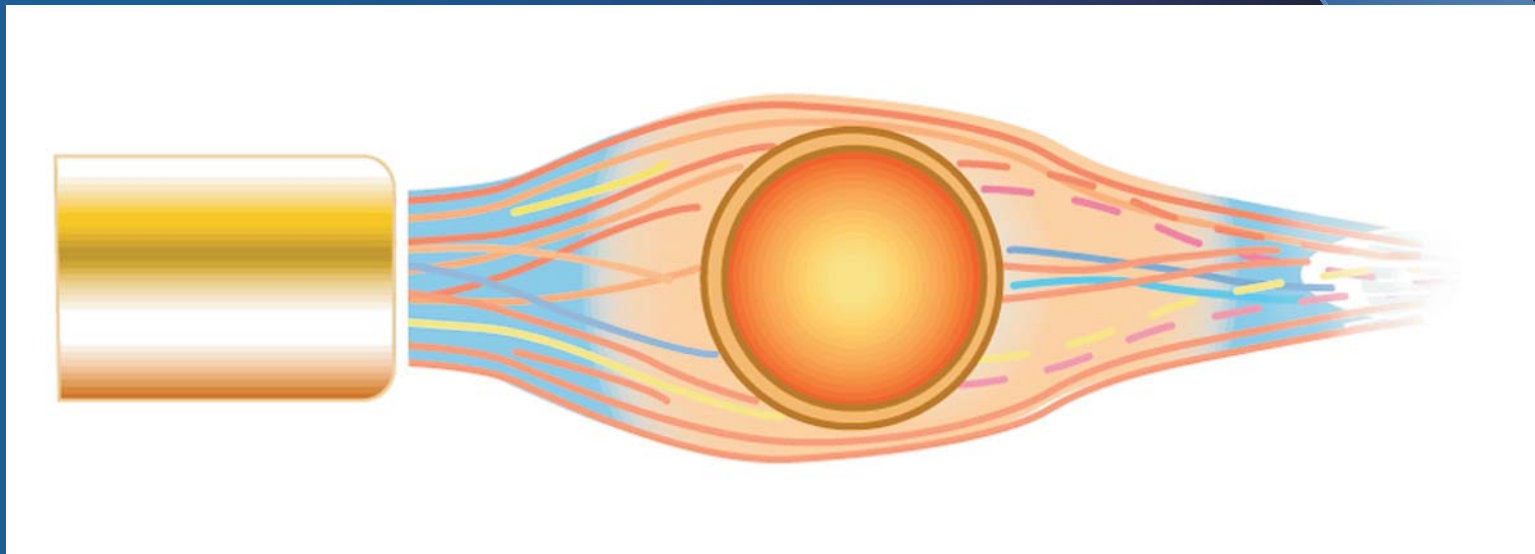
This 2700 Deg flame is capable of brazing and soldering copper faster than any other torch manufactured in the world.

TurboTorch Swirl Combustion

Swirl combustion is unique because it completely burns the fuel inside the flame tube. The gases coming out of the tip end, are pure, clean heat. Which gives a non oxidizing, non-carbonizing flame.

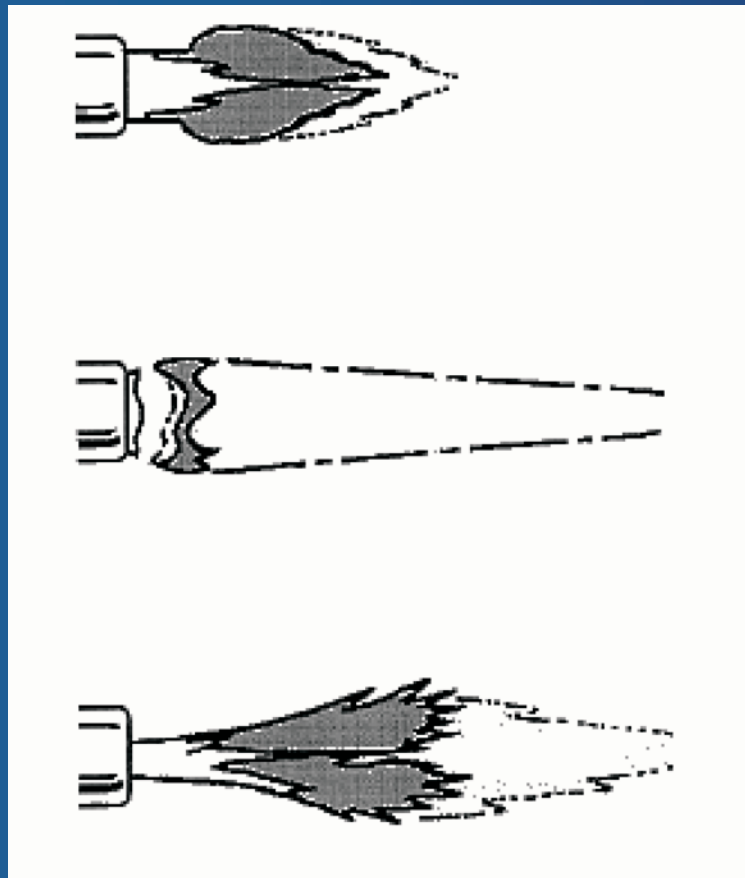
TurboTorch Swirl Combustion

This is what a TurboTorch swirl combustion wrap around direction flame looks like when applying the flame to copper.



Correct and incorrect TurboTorch Flames

NOTE: Extremely low or high flame settings are hard to ignite. An extremely low flame setting will cause the flame tube to overheat.



Correct Adjustment

Compact Flame - dark blue points extending from tip about 1 1/2 tip diameters beyond end of tip. Tip remains cool.

Too Little Gas

Soft Flame - pressure too low to achieve proper mix. Tip will overheat. Darker blue portion of flame barely visible from end of tip. Flame pink in color.

Too Much Gas

Darker blue portion of flame comes out from tip. Combustion taking place beyond flame tube.

Correct Heating Technique

Heating Technique

The maximum heat zone is very concentrated. It is located between 1 and 2 tip diameters from the end of the tip (Figure 4). Holding the torch too close or too far away from the target produces less heat (Figure 5). The angle at which the heat is applied can also increase the target heat.

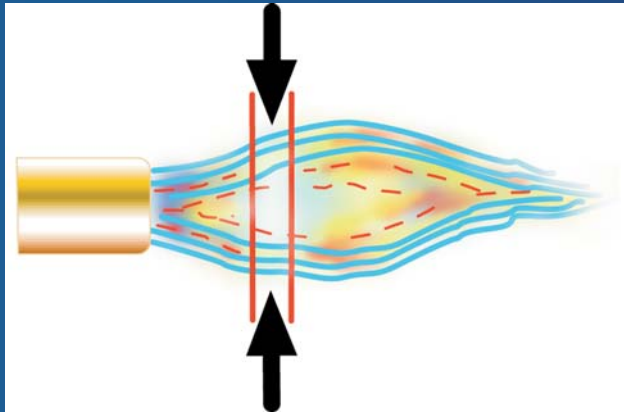


Figure 4 -
Maximum Heat Zone

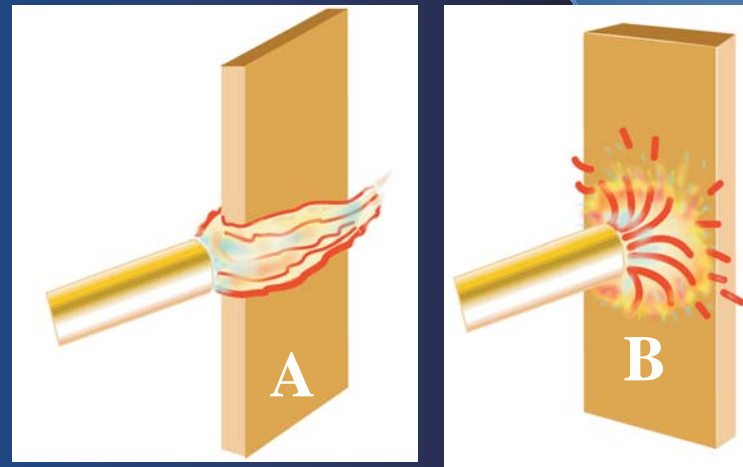


Figure 5 - Heating Angles
A. To obtain maximum target heat

Fuel setting

Use with fuel settings wide open

- If you have too much heat, move to smaller tip
- Blackened tips indicate incorrect fuel settings
- Incorrect use voids warranty

TurboTorch Swirl Combustion Air Acetylene Kits



Acetylene Tip Chart for A-2 through A-8



A-2
(0386-0100)



A-3
(0386-0101)



A-5
(0386-0102)



A-8
(0386-0103)

TIP NO.	TIP SIZE		GAS FLOW		COPPER TUBING SIZE CAPACITY				REPLACEMENT
	IN	MM	@14 PSI	(0.9 BAR)	SOFT SOLDER		SILVER SOLDER		ORIFICE MODEL
			FT ³ /HR	M ³ /HR	IN	MM	IN	MM	
A-2	1/8	4.8	2.0	0.17	1/8 - 1/2	3-15	1/8 - 1/4	3-10	OR-A2
A-3	3/16	6.4	3.6	0.31	1/4 - 1	10-25	1/8 - 1/2	3-12	OR-A3
A-5	1/4	7.9	5.7	0.48	3/4 - 1 1/2	20-40	1/4 - 3/4	10-20	OR-A5
A-8	5/16	9.5	8.3	0.71	1 - 2	25-50	1/2 - 1	15-25	OR-A8

Acetylene Pro Line (Self Lighting) Tip Chart



PL-3A
(0386-0874)



PL-5A
(0386-0818)



PL-8A
(0386-0819)



PL-12A
(0386-0820)

TIP NO.	TIP SIZE		GAS FLOW		COPPER TUBING SIZE CAPACITY				REPLACEMENT MODEL	REPLACEMENT TIP ENDS
	IN	MM	@14 PSI SCFH	(0.9 BAR) M3/HR	SOFT SOLDER		SILVER SOLDER			
					IN	MM	IN	MM		
PL-3A	1/4	5.0	3.6	0.31	1/4 - 1	10-25	1/8 - 1/2	3-12	OR-A3	3A-TE
PL-5A	3/16	6.4	5	0.42	3/4 - 1 1/2	20-40	1/4 - 3/4	10-20	OR-A8	5A-TE
PL-8A	5/16	7.9	7	0.59	1 - 2	25-50	1/2 - 1	15-30	ORPL-8A	8A-TE
PL-12A	3/8	9.5	9	0.76	2 - 4	50-90	1 - 2	25-50	OR-T6	12A-TE

Handtorches

- Plumbing and small maintenance
- MAPP or Propane
- High quality
 - Three year warranty
 - Able to soft solder and braze larger sizes

STK Features

Steel Flame Holder ensures consistent swirl combustion in high temperatures



Diaphragm regulator provides superior performance for maximum temperatures

Built in filters for maximum reliability

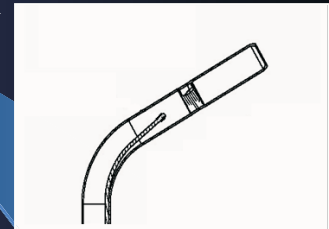
**3 Year
Warranty**

TX500 Series Features



Steel Flame Holder ensures consistent swirl combustion in high temperatures

Insulating ceramic wire holder withstands high heat (patent pending)



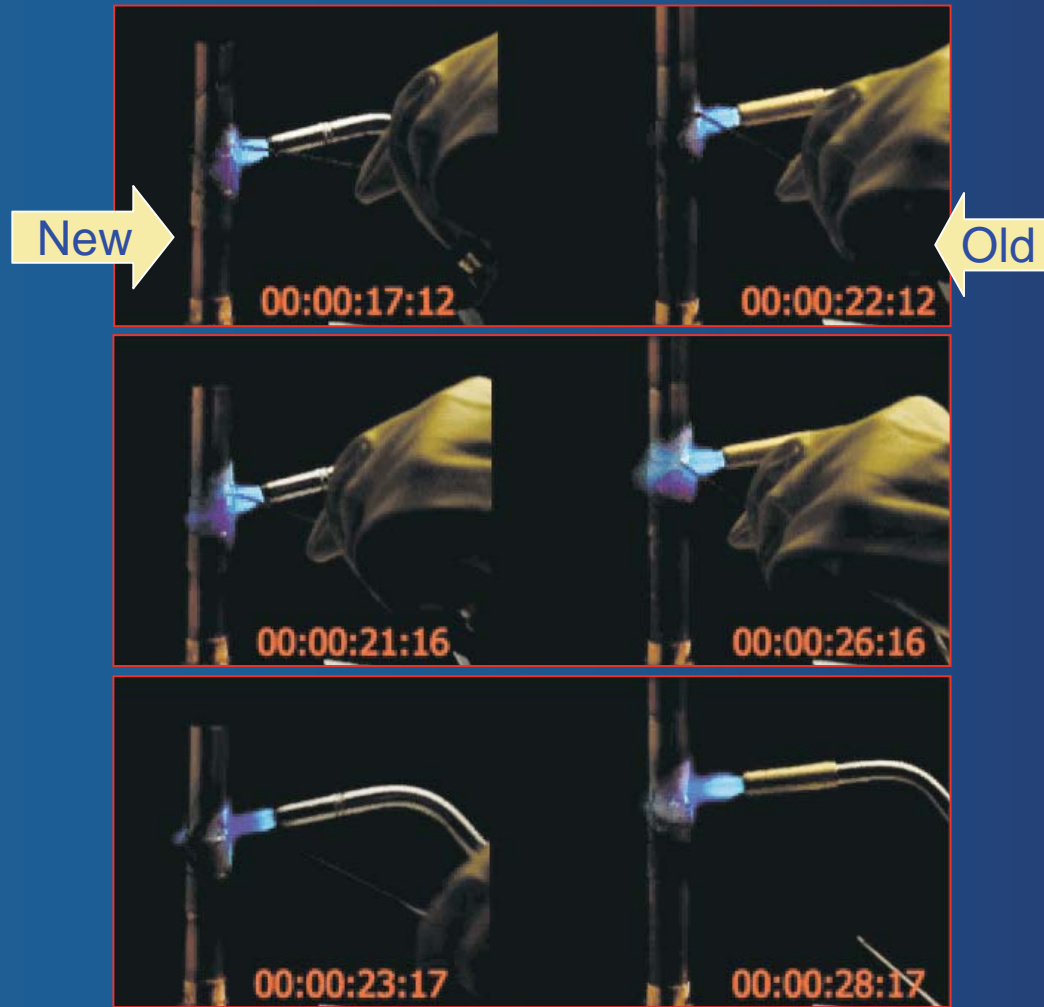
One Piece Stainless Steel Flame Tube for Durability

Built in filters for guaranteed reliability

Diaphragm regulator provides high gas flow for maximum temperatures



TL44 vs TX 504



Reduced Brazing Times

- Two copper pipes are both heated using the TX-504
- The pipe on the left (TurboTorch Extreme) reaches the optimal brazing temperature faster, with a tighter wrapping, more concentrated flame compared to the right (TurboTorch TL44).

TurboTorch Hand Torches



Snake Torches

MAPP & Propane

Self-lighting Snake Kit
PS-3T & PS-4T



TS-1B



Cleaning Orifices

All orifices can be inserted into the LP and acetylene handles or on the elbow of the STK-R.

Use a 1/8" hex head wrench to remove the orifices.

Always remember to put the orifice back into the torch tip.

Always remember to replace the o-rings you have removed to take the orifices out.

How to Clean Orifices



1. Unscrew the orifice from tip.
2. Reverse the orifice and screw it into the handle.
3. In a well ventilated area, turn on the gas and blow out the orifice.
4. Unscrew orifice from the handle and replace in the tip.

How to Clean Orifices



1. Unscrew the orifice using a small hex-head wrench.
2. In a well ventilated area, turn orifice around and screw into the swivel stem and blow out the orifice with gas.

Proper Torch Usage

The acetylene regulator should always be turned fully on.

Do not use A-11, A-14, PL12A, and A-32 Tips with an MC tank.

Always run torch with a full flame.

Reducing the flame could overheat the tip, ruin the tip end, or loosen the helical rotor.

Using partial flame with self lighting tips could cause the ignition wire to burn as well as loosen the rotor.

Do not rotate the TurboTorch flame like using oxygen and acetylene.

Always keep the flame on the copper with as little movement as possible.

Move the filler instead.

The regulators on the hand torches are adjustable for either MAPP or propane use.

Adjusting the flame to lower the heat could cause tip damage

Proper Torch Usage

For optimum torch performance, it is important to clean and maintain tips and regulators.

Things to know and remember:

- Clear the tip of solder.

- Clear the tip of flux and debris.

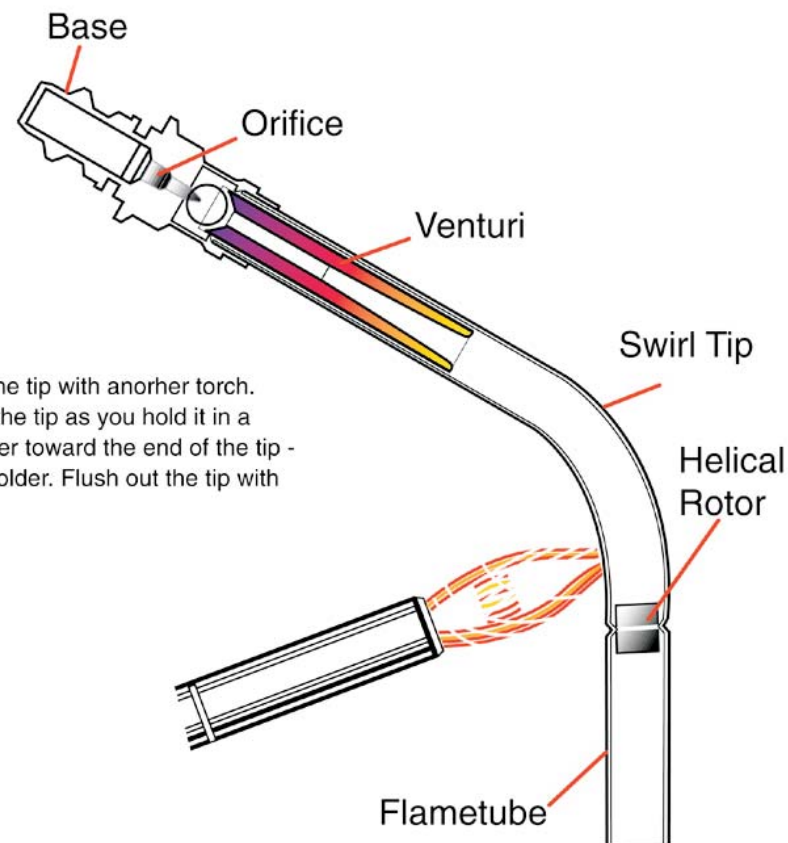
- Clean the orifices.

- Prevent hand torch flames from sputtering and flaring up.

Cleaning Torches

To remove solder or other debris from inside tip ...

First remove the orifice and heat the tip with another torch. You move the flame to the end of the tip as you hold it in a vertical position and draw the solder toward the end of the tip - shake the tip to help remove the solder. Flush out the tip with hot water and replace the orifice



Oxygen/Acetylene

When considering TurboTorch oxy-acetylene equipment, please remember that this is manufactured by the globally renowned “Victor Equipment Co.” Quality and safety are our heritage.

Longest used process

Hottest temperature available

Please always refer to the manufactures operating recommendations and safety instructions before use.

Oxygen and Acetylene Handles and Cutting Attachments



103-01FP Handle
“A” Hose Fittings, 3/8” - 24



152-01FP Cutting Attachment
Use with 103-01FP Handle



101-01FP Handle
“B” Hose Fittings, 9/16” - 24



151-01FP Cutting Attachment
Use with 101-01FP Handle

Tip Chart for Oxygen & Acetylene

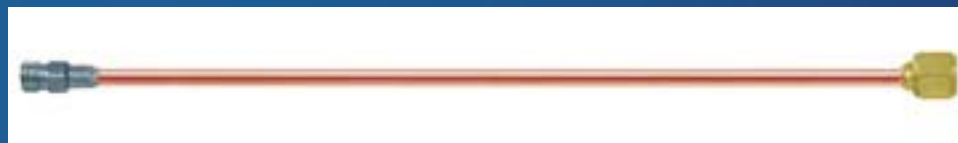
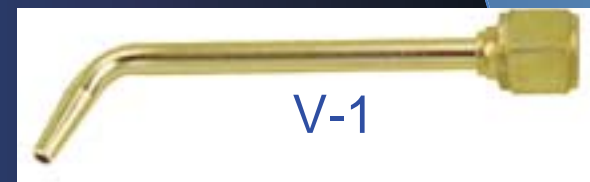
Replacement Nozzles & Mixers for CWK Series

MODEL NUMBER	PART NUMBER	TIP SIZE	BRAZING CAPACITY FOR COPPER TUBING	USED WITH THESE HANDLES	CONFIGURATION
000-W-J-CS	0387-0038	000	¼ - ½" (3-12mm)	103-01FP	Complete w/Nozzle Mixer
00-W-J-CS	0387-0039	00	¼ - ¾" (3-19mm)	103-01FP	Complete w/Nozzle Mixer
0-W-J-CS	0387-0040	0	¼ - 1" (6-25mm)	103-01FP	Complete w/Nozzle Mixer
1-W-J-CS	0387-0041	1	¼ - 1¼" (6-31mm)	103-01FP	Complete w/Nozzle Mixer
2-W-J-CS	0387-0042	2	¼ - 1½" (12-38mm)	103-01FP	Complete w/Nozzle Mixer



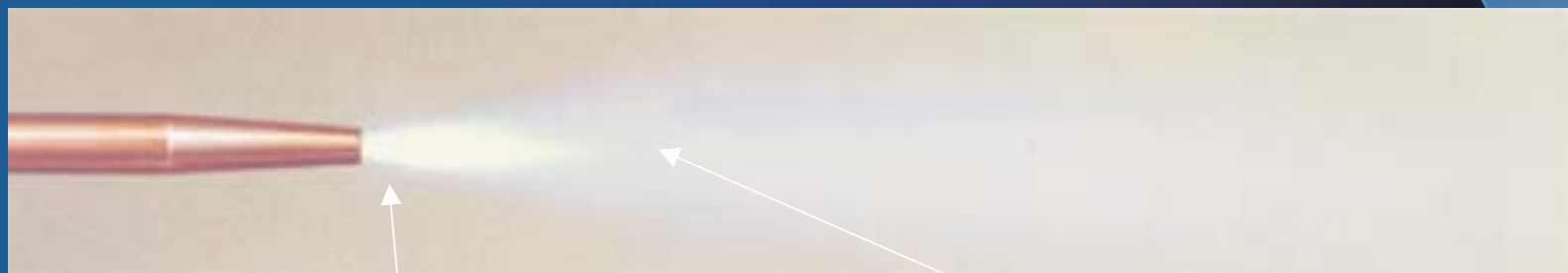
W-J Nozzle

Pro Vantage Tips



Oxygen and Acetylene Flames

- **Reducing Flame**
- A reducing (or carbonizing) flame is the opposite of an oxidizing flame. A reducing flame has a fuel gas-oxygen ratio such that excess fuel gas is present.
- The reducing flame is characterized by a small, blue inner cone with a soft, white, feathered inner cone also present.
- This flame is recommended for the brazing industry.



Inner Cone White

Nearly Colorless
Acetylene Feather
Light Orange

Oxygen and Acetylene Flames

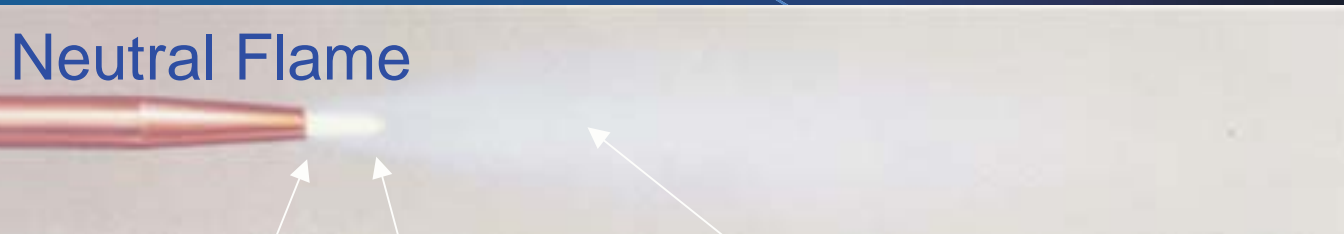
- **Reducing Flame (Continued)**
- The reducing flame offers several advantages:
- The reducing flame can actually remove oxide from the surface of the material. The excess fuel gas requires oxygen from the air to completely combust all of the fuel gas. Therefore, oxygen surrounding the assembly is used in the combustion, helping to keep oxidation of the assembly to a minimum.
- It also has the ability to heat evenly. The reducing flame is a softer flame, allowing it to wrap around a cylindrical point and heat evenly. To achieve this effect, the flame should be applied so that the end of the feather cone just touches the part to be brazed.
- This wrap around effect of the reducing flame provides less of a chance for localized overheating that can occur with a neutral or oxidizing flame.

Oxygen and Acetylene Flames

Compare the Three Oxygen & Acetylene Flames



Oxygen and Acetylene Flames



Neutral Flame

Stand Off

Inner Cone White

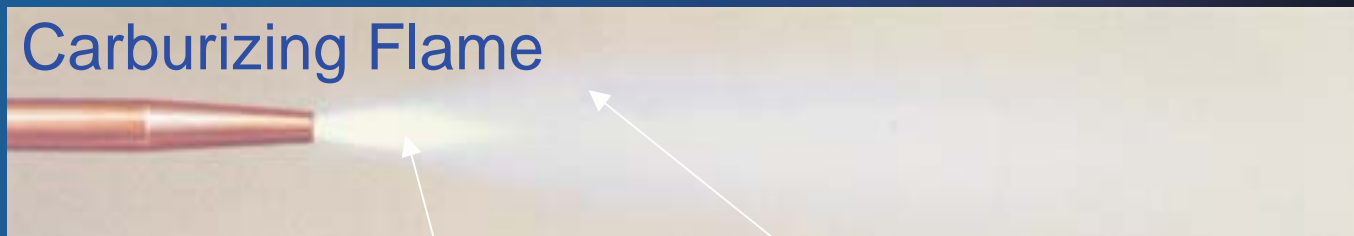
Nearly Colorless
No Acetylene Feather
Bluish to Orange



Oxidizing Flame

Inner Cone White

Nearly Colorless
Bluish to Orange



Carburizing Flame

Inner Cone White

Nearly Colorless
Acetylene Feather
Light Orange

Purging the system with Nitrogen

- The purpose of running nitrogen through the system is to prevent oxidation of copper on the inside of the tube when brazing.
- Pressure test the system with nitrogen to check for leaks.
- TurboTorch regulators both purge and pressure test
- Insert Picture of SKP 40T



Additional Tips that can be used with STK-9



STK-9



ST-33



ST-1



ST-11

TurboTorch Extreme



Extreme Durability

Extreme Performance

Extreme 3 Year Warranty

Extreme Swirl Combustion
Tip Concentrates
Heat – Reduces Brazing
Time by 40%

Products used by HVAC/R



Oxygen/Acetylene



Why use Turbo Torch?

- We invented and patented the effective use of air fuel swirl
- We continue to lead this market with innovation and quality
 - Extreme Line of Torches
 - 3 Year Warranty
 - Superior Design & Engineering for Improved Efficiency

REMEMBER !!!!

Follow the manufactures operating recommendations & safety instructions.
Before use, Before turning on gas,
Before igniting and single gas or combination of gases.