Manual

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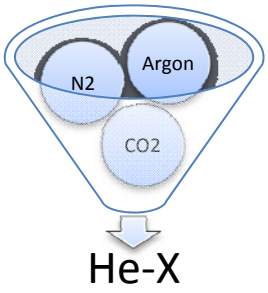


Principle of operation:

The plasma suppression nozzle from Advanced Nozzles LLC works by focusing a combination of two gasses on the plasma created by the laser welding process. The two gasses are selected and mixed to provide the correct ionization potential for your application (see table #1).

The aiming of this nozzle is important to its efficiency in extinguishing the plasma. For this reason an alignment tool has been provided to enable you to properly align the nozzle to your welding process. The use of the tools removes some of the subjectivity found in the alignment of some of the other nozzle assemblies currently in use. The assembly allows for alignment in two axes (X and Z) and to a minor degree in the Y axis.

Attaching your nozzle assembly:

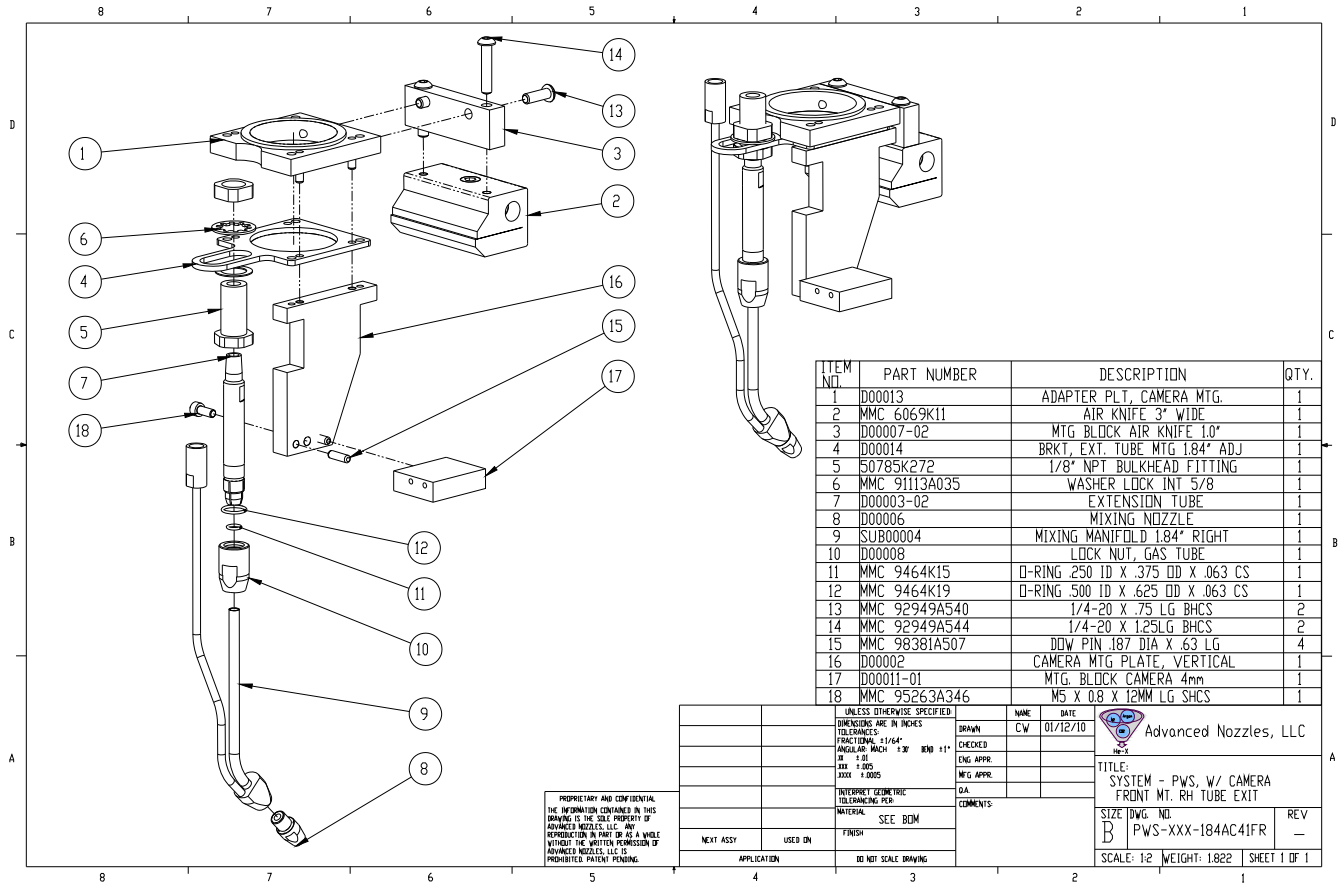
PWS System:

The old PWS nozzle must be removed prior to the installation of the new nozzle. To accomplish this you should first turn off the water cooling to the nozzle. It will be necessary to tie both of the water cooling lines together with a connecter. The lines should be moved as far away from the process as possible to keep them from becoming damaged. Next remove the two gas lines from the PWS nozzle. Make sure you mark them before removal so you know which flow meter they are connected to. Once the connections are taken care of you can undo the four M5 socked head cap screws that secure the nozzle. ***It is a good idea to put these parts in a box for safe keeping.***

Before mounting your new air-knife adapter bracket **(item #1)** check to see if it will be holding the camera mounting plate as well **(item #16)**. If so, your extension tube mounting bracket **(item #4)** gets sandwiched between the camera mounting plate and the air-knife adapter bracket. If you do not have the camera mounting plate attached to the air-knife adapter bracket the extension tube mounting bracket gets sandwiched between the air-knife adapter

bracket and the mirror focus unit. ***Drawing #1 depicts the assembly with the camera mount plate.***

There are four M 5 bottom head socket screws (not shown) that come with your new air-knife adapter bracket assembly. These are used to secure the adapter bracket to the bottom of the mirror focus unit. The adapter bracket holds the air-knife assembly and in some cases the camera mounting bracket. The bracket comes in two versions to allow it to be mounted in either a right hand or left hand configuration depending on your material flow direction. The left hand version is depicted in drawing #1. The nozzle should be placed on the upstream side of the process flow aiming toward the downstream side. The air-knife is pointed toward the upstream side of the process.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	D00013	ADAPTER PLT, CAMERA MTG.	1
2	MMC 6069K11	AIR KNIFE 3" WIDE	1
3	D00007-02	MTG BLOCK AIR KNIFE 1.0"	1
4	D00014	BRKT, EXT. TUBE MTG 1.84" ADJ	1
5	50785K272	1/8" NPT BULKHEAD FITTING	1
6	MMC 91113A035	WASHER LOCK INT 5/8	1
7	D00003-02	EXTENSION TUBE	1
8	D00006	MIXING NOZZLE	1
9	SUB00004	MIXING MANIFOLD 1.84" RIGHT	1
10	D00008	LOCK NUT, GAS TUBE	1
11	MMC 9464K15	O-RING .250 ID X .375 OD X .063 CS	1
12	MMC 9464K19	O-RING .500 ID X .625 OD X .063 CS	1
13	MMC 92949A540	1/4-20 X .75 LG BHCS	2
14	MMC 92949A544	1/4-20 X 1.25LG BHCS	2
15	MMC 98381A507	DOW PIN .187 DIA X .63 LG	4
16	D00002	CAMERA MTG PLATE, VERTICAL	1
17	D00011-01	MTG. BLOCK CAMERA 4mm	1
18	MMC 95263A346	M5 X 0.8 X 12MM LG SHCS	1

Drawing #1

Attach the air-knife using the supplied bracket, **(item #3)**, and the supplied ¼"-20 Button head socket screws, **(items #13 and 14)**. Please note that the air-knife has a ¼" NPT fitting on either side of the assembly. You need to decide which side you will supply the clean dry air to.

Once you have the extension tube mounting bracket mounted you should thread the extension tube **(item #7)** into the bulkhead fitting **(item #5)**. *Thread sealant for this assembly is not required. Please note that the extension tubes come in three different lengths depending on the focal length of the focusing mirror that is being used.*

Using the supplied nut and lock washer, assemble the bulkhead fitting with the extension tube into the extension tube mounting bracket. Hand tighten the assembly for now.

You should now decide on which style gas line fitting you will use. This will connect the existing gas lines from your flow meters to the 1/8" NPT female threads on the bulkhead fitting **(item #5)** and mixing manifold **(item #9)**. Connect the primary gas line to the bulkhead fitting. Connect the secondary line to the mixing manifold. ***Table #1 will explain which gasses will be used for each line.***

Gas Mixing Chart

	Stainless Steel	Carbon Steel Low Speed	Carbon Steel High Speed
Helium	**5 SCFH, Center**		
Argon	**20 SCFH, OD**	**20 SCFH, OD**	**10 SCFH, OD**
CO2		**30 SCFH, Center**	**20 SCFH, Center**
Nitrogen			

Note: Center means ID orifice which is the main manifold connection (Bulkhead fitting). OD means the outer orifice which is the secondary connection (Mixing manifold).

You should now thread the gas tube lock nut **(item #10)** onto the extension tube. Make sure that both O-rings **(items # 11 and 12)** are in the nut before assembly. Be careful not to nick the O-rings during this assembly. Do not tighten the nut at this point. With the focus head in its highest Z axis location, you now want to slide the mixing manifold **(item #9)** through the lock nut and into the extension tube. Make sure you push this as far up into the extension tube as it will go.

Now thread the nozzle **(item #8)** into the mixing manifold. The nozzle is made of copper and has 7/16" flats on it. Using a 7/16" open end wrench on the nozzle and a ½" open end wrench around the end of the mixing manifold tighten the two together***. Be careful not to over tighten this assembly as the copper can be deformed.***

Your assembly is now complete. Please refer to the alignment procedure to complete your installation.

Alignment Procedure

Note:
This procedure assumes that you have already determined the correct focus position. If not, set your focus and note the position on your Z axis. A focus standard should be created to allow for the setting of this position.

With the focus head in the up position in the Z axis, push the mixing manifold **(item #9, Drawing #1)** all the way up in the extension tube **(item #7, Drawing #1)**. Insert the alignment tool **(see figure 1)** into the center orifice on the mixing nozzle **(item #8, Drawing #1)**. You can now move the focus head down to the welding position (focus position).

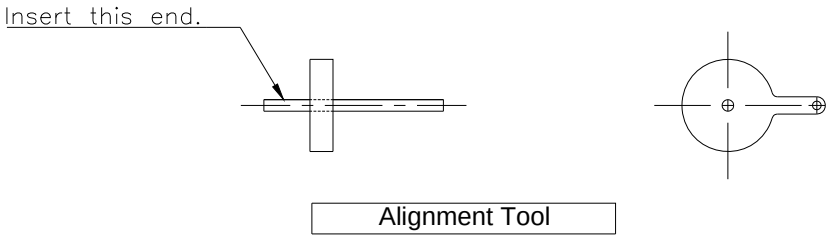
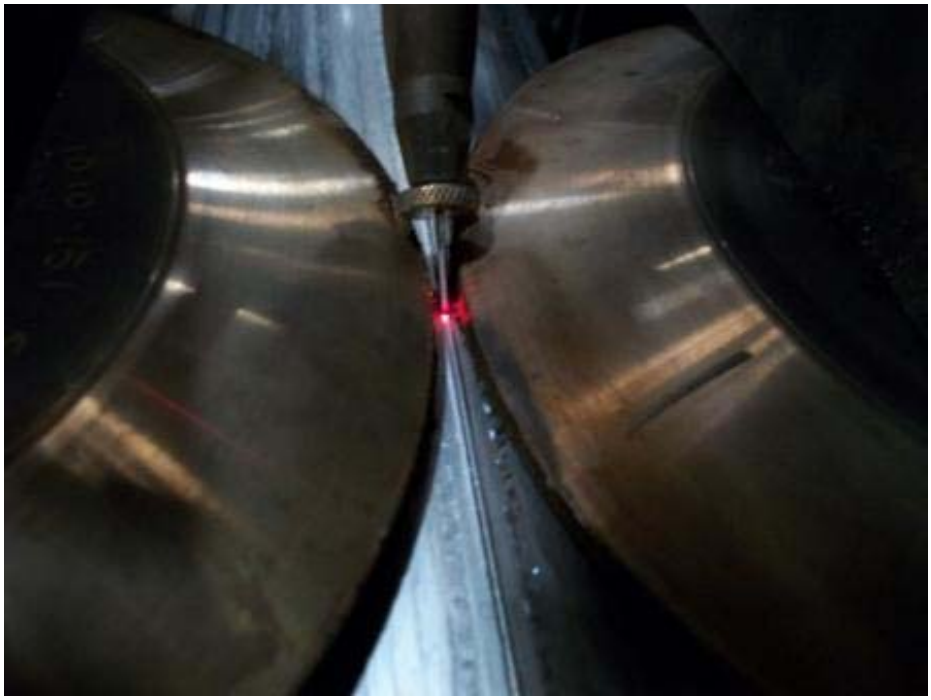


Figure 1

With the focus head in the welding position and the pointing diode/He Ne turned on, you can now move the mixing manifold down until the end of the alignment tool touches the top of your material. You can now adjust the location of the bulkhead fitting until the end of the alignment tool is located on the pointing diode/He Ne. Once the bulkhead position has been set, lock it down with the lock nut. You will need a 13/16" open end wrench for the lock nut, and a 7/8" open end wrench for the bulkhead fitting.

Using a 5/8” open end wrench on gas tube lock nut, and a 7/16” open end wrench on the extension tube, tighten the gas tube lock nut **(item #10, Drawing #1)** while making sure the alignment tool remains set on the pointing diode/He Ne. Tighten this lock nut only enough to hold the gas manifold in place. You may need to use a ½” open end wrench on the end of the mixing manifold to make the final alignment adjustment with the alignment tool in place.

Once the alignment is set, move the focus head back up so that the alignment tool can be removed without disturbing the alignment position. **Refer to picture #1.**



Picture #1

Processing Notes:

The gas flow rates in table #1 are meant to be used as a guideline only. The goal should be to minimize the flow rate of the gasses used. This will vary with the type of material being welded and the linear speed of the material. If your material is either dirty or coated, it will tend to produce more plasma and therefore require more gas flow. If you find that your process is not as stable as you need it to be you may need to increase the Helium flow rate. If you are not using Helium and you find that the process is not stable, you may need to introduce a small volume of Helium.

It is important to remember that this nozzle is designed to focus the gas very effectively; therefore lower flow rates are better for this nozzle!