



Instruction Manual  
397 NCC/HTC 45 Degree  
Revised 10/2013

# **D/F MACHINE SPECIALTIES, INC.**

*MIG & TIG Welding Products, Consumables & Accessories*

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## **WATER-COOLED CURVED 45° DOCKING SPOOL® MACHINE BARREL COMBINATIONS**

**Model NCC (Slip-In Tip), Model HTC (Threaded Tip)**

**Standard and EURO Assemblies**



**INSTRUCTION, PARTS & SPECIFICATIONS MANUAL**

**D/F MACHINE SPECIALTIES** is a world leader in the design, development, and manufacture of “MIG” (GMAW) & “TIG” (GTAW) welding products, consumables and accessories. D/F offers several types of manual Air or Water-Cooled “MIG” welding tools, and with the increased use of automated and robotic welding systems, a demand has been created for welding tools of the highest quality, durability and interchangeability. For over forty years, D/F welding products have been used extensively on “MIG” and “TIG” welding applications. This experience, coupled with patented design features, unavailable on any other competitive equipment, has made D/F welding tools the most advanced “MIG” and “TIG” welding guns and barrels for semi-automatic, automatic or robotic welding applications.

This Catalog is a guide to helping you select the proper tool for a given semi-automatic, automatic or robotic welding application. The following is only a partial listing of available semi-automatic, automatic and robotic guns. For further information on special “MIG” and “TIG” requirements, please consult the factory.

#### **Customer satisfaction and customer benefits are the center points of all strategic contents**

The spirit of the D/F Machine Specialties personnel is to listen to and to integrate the customer throughout the process, to develop and design marketable products, to present prototypes, to carry out pilot tests and to prepare for and be open to new technology and tasks. We attract and carefully select talented individuals who share our values. Together we will nurture and sustain a work environment with two-way communication, training, mentoring, and rewarding career opportunities.

#### **Innovation and quality**

Innovation and quality come from being receptive and willing to learn from others. We encourage our people to be creative and take risks in the pursuit of excellence. Innovative practices are deeply rooted in every one of our employees, a philosophy that leads to continuous product development and industry firsts.

#### **Progress**

By remaining confident, focused, and persistent in challenging times, we will discover opportunity. Commitment to quality and the pursuit on innovation ensure that D/F Machine Specialties will remain an industry leader for years to come.

#### **Commitment to excellence**

At D/F Machine Specialties we commit to design, build and deliver premium products and superior customer support to quality driven welding professionals. Customers still to this day choose D/F over competitors because of our responsiveness and flexibility. Customers will continue to choose D/F tomorrow for our superior hand-made products and service. To ensure this, we need creative and competent personnel in all business divisions, an intensive exchange of thoughts and ideas with all users, participation in working and study groups within the field of welding technology and intensive cooperation with institutes and universities.

#### **Teamwork**

Striving for excellence is a commitment that is an integral component of the D/F Culture. Our team of skilled and dedicated employees takes pride in the excellence products they produce. Each of us willingly accepts personal responsibility for meeting our commitments and we hold each other to a high standard of accountability.

#### **Responsibility**

We will continually strive to be environmentally responsible and to support the health and safety of our employees, customers, and neighbors. We continue to support the communities in which we operate and the industries in which we participate.

*Thank You for Choosing D/F Machine Specialties*



**TABLE OF CONTENTS**

Introduction, (Table 1) Recommended Spare Parts, (Table 2) Gas Nozzles .....5

Disassembly, Assembly .....6

(Table 3) Current Tips .....7

Required Tools List for Disassembly & Assembly.....8-9

How Do I Cut, Fit, and Install a New Liner?..... 10

What is the Proper Use of the Nozzle Thread Chaser Tap?..... 11

Models NCC/HTC W/C Curved 45° Gun Standard - Parts..... 12

Models NCC/HTC W/C Curved 45° Gun Series A High Capacity - Parts..... 13

Ordering Information & Utilities - Conventional Utilities..... 14-15

Ordering Information & Utilities - EURO Utilities ..... 16-17

Robot Safety Mount & Mounting Arms ..... 18

Robotic Gun Layout - 3” Standard & Series A High Capacity..... 19

Robotic Gun Layout - 4” Standard & Series A High Capacity.....20

Robotic Gun Layout - 5” Standard.....21

Gun Dimensions, Smoke Extractor Kit .....22

Utility Station.....23

Wire Feeder Adapters.....24

Troubleshooting .....25-28

## **SAFETY MEASURES - \*\*PLEASE READ!\*\***

Welding is not particularly hazardous when certain safety practices are followed. Anyone using this equipment should be thoroughly trained in safe welding practices. Failure to observe safe practices may cause serious injury. Handling welding torches presents no danger if the appropriate safety regulations are strictly adhered to. For example:

- Starting-up procedures must be reserved for those fully conversant with processes relating to arc welding equipment.
- Arc welding can prove damaging to eyes, skin, and hearing! It is therefore imperative that the Accident Prevention Regulations UVV 26.0 and VGB 15 are fully observed and that all protective clothing, eye and ear protectors specified are worn.
- The load data given are maximum limit figures. Overloading will inevitably damage the torch!
- Before changing wear parts, disconnect for the power supply.
- The operating instructions for the individual welding components - e.g. power source, wire feed and cooling unit must be followed.
- Never pull the cable assembly across sharp edges or set down close to weld spatter or on a hot workpiece.
- Those not involved in the welding process should be protected by curtains or partitions from radiation and the danger of being dazzled.
- When handling gas cylinders, consult the instructions issued by the manufacturers and the suppliers of the pressurized gas.
- Workpieces which have been degreased using chlorinated solvents must be sprayed down with clean water before welding starts to avoid the risk of phosgene forming. For the same reason, no degreasing baths containing chlorine must be placed close to the welding point.
- All vapors given off by metals can cause harm and a special warning is attached to lead, cadmium, copper, zinc, and beryllium. If necessary, take appropriate precautions (by providing adequate ventilation or an extraction system) to ensure that the legal maximum levels of toxic concentrations are not exceeded.

**For more information**, refer to the following standards in their latest revisions and comply as applicable.

- ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.
- ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY - TOE FOOTWEAR obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
- ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
- OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.
- AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.
- NFPA Standard 70-1978, NATIONAL ELECTRICAL CODE obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
- ANSI Standard Z88.2, "Practice for Respiratory Protection" obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
- ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION obtainable from the American National Standards Institute, 1430 Broadway, New York, NY, 10018.
- NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING obtainable from the Superintendent of Documents, U.S. Printing Office, Washington, D.C. 20402.
- American Welding Society Standard AWSF4.1 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.

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### **IMPORTANT**

Make certain the cooling water supply is at least the minimum flow rate of 3 quarts per minute, at 40 psi (80 psi maximum). Gun ratings are affected by shielding gas used, arc time, cooling time and inlet water temperature. Water outlet temperature should not exceed 120 degrees F.

For normal GMAW a water circulator of the radiator cooler type with a 3 gallon capacity will provide ample cooling.

When High-Deposition GMAW or extended periods of arc time are used, it is recommended that a liquid chiller be considered. Precise temperature control maintains the cooling at constant temperature, thus prolonging the life of the welding equipment and more specifically extending the service life of the gas nozzle and current tip.

A refrigerated liquid chiller for GMAW may be obtained from:

Remcor Products Company - A Division of IMI Cornelius, Inc.  
500 Regency Drive Glendale Heights, IL 60139-6850  
Call Toll Free 800-551-4423 - Fax Toll Free 866.394.5140  
International Telephone 630-539-6911 - International Fax 630-539-6960

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## INTRODUCTION

This manual covers Remote Mounted Water-Cooled Curved Guns which offer a concept with interchangeability of models for mechanized or robotic MIG welding. The curved guns accommodate a wire diameter range of .030" - 1/8" Hard and Cored wires, and 3/64" - 3/32" AL wire.

The equipment consists of four (4) basic components: a Utility Station, an intermediate Utilities Combination assembly, a Docking Spool® body and a Water-Cooled Curved Gun. The Docking Spool® body is the principal component in this welding equipment arrangement. It accepts the utilities at the top end of the spool and provides a means of accepting the curved gun assembly at the lower end. In addition, several other features important to a welding system are provided. Incorporated within the water chamber of the Docking Spool® body are check valves which provide a means of retaining the residual water in the lines when the curved gun is removed from the Docking Spool® body. Also, a Posit ring is provided to allow positive location at the mounting bracket to achieve dimensional stability.

The curved gun assemblies are designated by two (2) models illustrated in the parts breakdown list. The Model NCC Water-Cooled Curved Gun has a current capacity of 400 amps in argon shielding. It accommodates a slip-in current tip fastened by a collet action nut. This arrangement increases the versatility of the equipment by allowing tip extension beyond the gas nozzle where critical access problems to the weld area are encountered. The wire diameter range is .030" - 1/8" with Hard/Cored wires and 3/64" - 3/32" with AL wire.

The Model HTC Water-Cooled Curved Gun has a current capacity of up to 500 amps. Rating would be contingent on the combination of the current tip and shielding gas to be used. The Model HTC employs threaded current tips and accommodates .030" - 1/8" Hard/Cored wires and 3/64" - 3/32" AL wire.

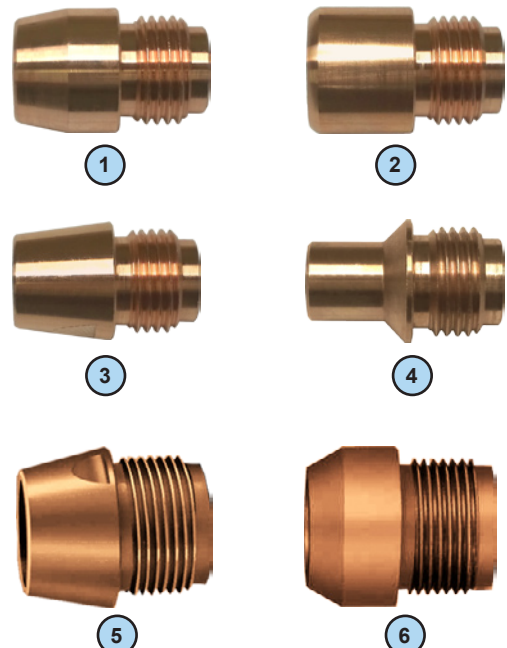
For further information or help with D/F Machine Specialties products, please visit our web site at [www.dfmachinespecialties.com](http://www.dfmachinespecialties.com), or consult the factory at 1-507-625-6200.

## TABLE 1 - RECOMMENDED SPARE PARTS

ITEM	CODE NO.	MIN QTY.
Gas Nozzle	To Be Selected	2
Current Tip	To Be Selected	25
Collet Nut	To Be Selected	1
Spatter Disc	To Be Selected	2
Body Liner	To Be Selected	2
Insulation Tube	To Be Selected	1

## TABLE 2 - GAS NOZZLES

Gun Model	Ref.	Nozzle Type	O.D.	I.D.	Code No.
NC/HT (Std. Capacity)	1	Copper Tapered	15/16"	5/8"	10362
	2	Copper Straight	1"	3/4"	10340
	3	Copper Straight	5/8"	7/16"	10374
	4	Copper Tapered	15/16"	5/8"	10359
NC/HT (Hi Capacity Series A)	5	Copper Short Taper	1-3/8"	11/16"	16749
		Copper Short Taper	1-3/8"	13/16"	16750
		Copper Short Taper	1-3/8"	15/16"	16751
	6	Copper Full Taper	1-3/8"	11/16"	18030
		Copper Full Taper	1-3/8"	13/16"	18031
		Copper Full Taper	1-3/8"	15/16"	18032





## DISASSEMBLY

1. Prior to removing the curved gun from the Docking Spool® body make sure that the power source and wire feeder are turned off.
2. Remove the (4) machine screws which fasten the transfer spool to the inner body. The nut and transfer spool may now be removed. By removing flat head screw and releasing the elbow fastening socket screws the body tube may be pulled from elbow casting.
3. To remove the water cooled nozzle or making a replacement of the inner body, first remove the gas nozzle (when used), next with wrench remove the current tip, tip adapter nut, or collet nut, whichever may be in use. This will allow the insulation tube, spatter disc 10405 or spatter disc 18253 and support tube to be removed. Also, remove the elbow nut - that retains the water cooled nozzle.
4. Remove the round head screw which secures the inner body to the elbow casting. Reference inner body pages 12 & 13; note that interconnection hose is a fixed length hose. To expose the interconnection hose nuts by which these are fastened to the water cooled nozzle it is necessary that interconnection hose 19 be released at the rear spool of the inner body thus allowing it to move forward. The inner body may now be moved forward. Should the insulation tubes and elbow insulator extend forward beyond elbow push these back far enough to expose the water hose fittings. By removing the water hose fittings the water cooled nozzle may be removed from the elbow.
5. If replacement of the inner body is required, the tip adapter must be removed to allow the inner body to be pulled out of the elbow by using a slight twisting motion.

## ASSEMBLY

1. Make certain that the interconnection hose (Code No. 42242) is securely fastened at the rear of the casting. Before connecting hose, note the position of the stainless steel spring liner within hose assembly. It is most desirable to connect the end of the hose to the casting water fitting using the end that indicates stainless spring liner closest to it. In other words, the nose end that indicates the open space within the hose should be the end that is fastened to the water cooled nozzle. The interconnection hose assembly may be bent into a U shape normally before applying it to the rear of the casting. When in proper position the interconnection hose will be over the top of the center tube extending from the casting and will be in location in the upper right hand concave viewing the inner body from the rear.
2. Hold both interconnection hoses in their relative position and slide inner body into body elbow. Slide the black insulator into position in the body elbow.
3. Insert the two (2) nylon insulating tubes over the hoses extending from the front of the elbow assembly.
4. The nylon collar should be in place on the rear of the water cooled nozzle assembly. It is important that the small hole in the nylon collar be on the lower right hand side viewing the nozzle from the rear when the interconnection hoses are fastened. After connecting the interconnection hoses push the water cooled nozzle up against the face of the body elbow. At the same time, make certain that the interconnection hose nut at rear aligns with the fitting at the rear spool so that it may be applied and fastened. The black elbow insulator should be in position to allow applying the round head body screw with insulating washer to fasten the inner body to the elbow. Upon completion the nut may be applied to the elbow to retain the water cooled nozzle.
5. Apply the insulation tube to the water cooled nozzle.
6. The above should be followed by applying the spatter disc. When spatter disc is replaced make certain that the counter-bored end is facing the weld body. Replacement of spatter disc support tube arrangement is accomplished by sliding the spatter disc into the water cooled nozzle, followed by pushing the support tube up into the water cooled nozzle, apply the current tip and replace the gas nozzle.
7. The body tube may now be applied by placing it over the rear spool of the inner body and pushing it forward until the hole aligns in the rear spool to allow applying the flat head screw. Following this the socket screws may be tightened in the elbow.
8. Place nut on the body tube. The transfer spool may be applied. Make certain at this point that the o-rings are in position in the counter-bores provided in the rear spool of the inner body. Slide the transfer spool down over the center tube and apply the four (4) machine screws. Distribute the fastening pressure evenly.
9. To complete the gun assembly at this point examine the transfer o-rings. Make replacement if necessary. Lubricate o-rings with silicone spray.

## TABLE 3 - CURRENT TIPS

### CURRENT TIPS - 5/16" DIAMETER SLIP-IN

Gun/Barrel Model	Wire Size	Wire Type	Code No.
All NC, NCC, NCM (Tip provides 1/8" set back)	.030"	Hard	10883
	.035"	Hard	10884
	.045"	Hard	10885
	.052"	Hard	10886
	1/16"	Hard	10887
	5/64"	Hard	10888
	3/32"	Hard	10889
	7/64"	Hard	10904
All NC, NCC, NCM (Tip provides 3/8" set back)	1/8"	Hard	10933
	.035"	Cored	10893
	.045"	Cored	10894
	.052"	Cored	10895
	1/16"	Cored	10896
	5/64"	Cored	10897
	3/32"	Cored	10898
	7/64"	Cored	10899
All NC, NCC, NCM (Tip provides 1/8" set back)	1/8"	Cored	10900
	3/64"	Soft	10902
	1/16"	Soft	10935
	5/64"	Soft	10888
	3/32"	Soft	10936



### CURRENT TIPS - 1/4" DIAMETER SLIP-IN

Gun/Barrel Model	Wire Size	Wire Type	Code No.
All NC, NCC, NCM (Tip provides 1/8" set back)	.030"	Hard	10787
	.035"	Hard	10788
	.045"	Hard	10789
	.052"	Hard	10830
	1/16"	Hard	10790
	5/64"	Hard	10792
All NC, NCC, NCM (Tip provides 1/8" set back)	3/64"	Aluminum	10781
	1/16"	Aluminum	10782
	5/64"	Aluminum	10823
All NC, NCC, NCM (Bent Tip) (Tip provides 1/8" set back)	3/32"	Aluminum	10783
	.045"	Hard	10562
	.035"	Hard	10565
	3/64"	Aluminum	10572
	1/16"	Aluminum	10573



### CURRENT TIPS - 7/16" DIAMETER THREADED

Gun/Barrel Model	Wire Size	Wire Type	Code No.
All HT, HTC, HTM, CTW, CW-T, MTW (Tip provides 1/8" set back)	.035"	Hard	15116
	.045"	Hard	15117
	.052"	Hard	15121
	1/16"	Hard	15118
	5/64"	Hard	15119
	3/32"	Hard	15120
	7/64"	Hard	15122
	1/8"	Hard	15105
All HT, HTC, HTM, CTW, CW-T, MTW (Tip provides 3/8" set back)	.035"	Cored	15101
	.045"	Cored	15106
	.052"	Cored	15112
	1/16"	Cored	15107
	5/64"	Cored	15108
	3/32"	Cored	15109
	7/64"	Cored	15110
	1/8"	Cored	15111
All HT, HTC, HTM, CTW, CW-T, MTW (Tip provides 1/8" set back)	3/64"	Aluminum	15126
	1/16"	Aluminum	15125
	5/64"	Aluminum	15087
	3/32"	Aluminum	15148
	1/8"	Aluminum	15123

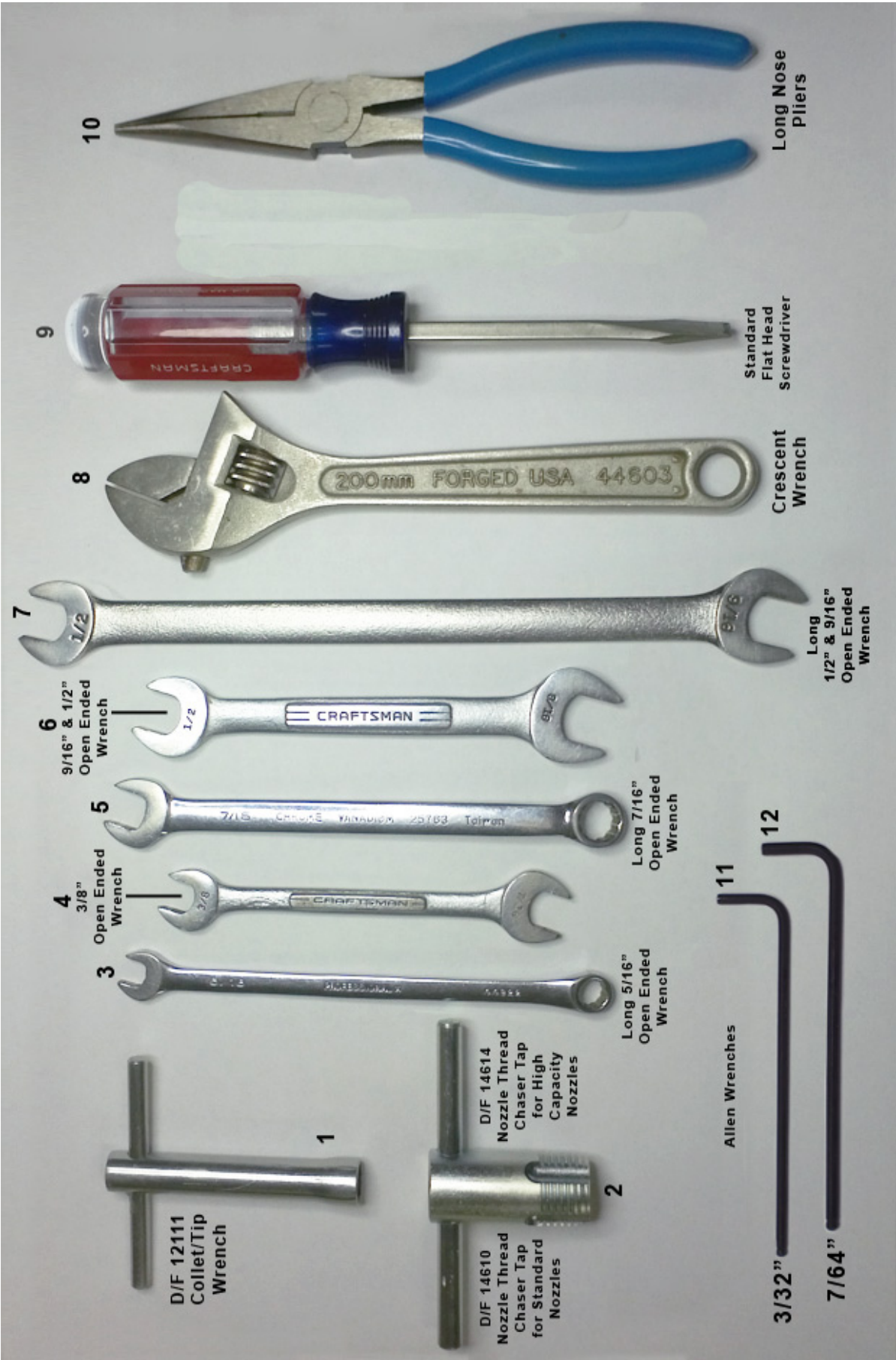


## REQUIRED TOOLS LIST FOR DISASSEMBLY & ASSEMBLY

1. **D/F 12111 Collet/Tip Wrench** - This is the only tool that should ever be used to tighten the collet nut or the tip. Pressure should be 30 lbs., or as snug as hand tightened. Never use another wrench to apply more torque to this wrench.
2. **D/F Nozzle Thread Chaser Tap** - This is used to re-tap damaged threads that have been improperly cleaned or cross threaded. Always blow out the nozzle and gas nozzle after changing gas cup or re-tapping. For more information on how to use the nozzle thread chaser tap, use the following link: [www.dfmachine.com/taps](http://www.dfmachine.com/taps)
3. **Long 5/16" Open Ended Wrench**
  - A. A short wrench will work, however we prefer the feel and comfort of the long 5/16" open ended wrench. This is used to loosen or tighten interconnection hoses (42196, 42242) to the fittings on the inner body.
  - B. Also use this wrench to connect the torch's water-cooled nozzle assembly to the interconnection hoses.
4. **3/8" Open Ended Wrench** - This is used on the docking spool's water in hose fitting to secure the water in hose to the docking spool. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches. You never want to use excessive force by using too large of a wrench. You will use the Long 7/16" Open Ended Wrench for the fitting on the water in hose itself while using the 3/8" wrench to steady the docking spool at the fitting. (see #5)
5. **Long 7/16" Open Ended Wrench** - This is used to secure the water in hose to the docking spool. (see #4)
6. **9/16" & 1/2" Open Ended Wrench**
  - A. This is used on the inner body's water out & power cable fitting to secure the water out and power cable to the docking spool. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches. We prefer the use of the larger wrenches on the power cable fitting to ensure that there are no water leaks, and that it has been seated correctly. You will use the #7 (Long 9/16" Open Ended Wrench) for the fitting on the water out & power cable hose. (see #7 A)
  - B. This is used on the docking spool's gas fitting to secure the gas hose to the docking spool. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches. (see #7 B)
  - C. This wrench is also used to secure the adapter and jam nut that hold the current tip to the inner body. In your left hand hold the inner body, and with your right hand thread up the adapter using the 1/2" Open Ended Wrench until it is tight. Now place the same wrench on the jam nut and snug it up against the inner body. Keeping that wrench on the jam nut and placing it on the table for force, take #7 (Long 1/2" Open Ended Wrench), place it on the adapter and push it down (counter-clockwise) securing the adapter to the inner body. (see #7 C)
7. **Long 1/2" & 9/16" Open Ended Wrench**
  - A. This is used to secure the water out & power cable to the docking spool. A medium size adjustable crescent wrench could be used as well. We prefer the use of the larger wrenches on the power cable fitting to ensure that there are no water leaks, and that it has been seated correctly. (see #6 A)
  - B. This is used to secure the gas hose to the docking spool. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches. (see #6 B)
  - C. This wrench is also used to secure the adapter and jam nut to the inner body. (see #6 C)
8. **Adjustable Crescent Wrench** - A medium size adjustable crescent wrench could be used as well. We prefer the use of the larger wrenches on the power cable fitting to ensure that there are no water leaks, and that it has been seated correctly. **CAUTION:** Never use excessive force with large wrenches, for you could twist or break parts.
9. **Standard Flat Head Screwdriver** - This is used to tighten or secure the torch's body screws. Also, the screwdriver can be used to straighten the contact tip if it is not aligned in the center of the gas cup or water-cooled nozzle **CAUTION:** This cannot be done unless the spatter disc has been removed from the torch.
10. **Long Nose Pliers** - These are used to grab the small white insulation tubes (10723) and get them into the correct position when working on the interconnection hose fittings inside the torch. Also they are very handy when changing a slip-in contact tip.
11. **3/32" Allen Wrench** - This is used to secure the socket set screw that holds the casing/conduit in the inner body.
12. **7/64" Allen Wrench** - This is used to secure the 2 socket screws that hold the elbow on the body housing.



REQUIRED TOOLS LIST FOR DISASSEMBLY & ASSEMBLY



## HOW DO I CUT, FIT, AND INSTALL A NEW LINER?

1. Be sure the MIG Gun cable is arranged in a straight line, free from twists, when installing or removing a wire liner.
2. Remove the old liner by first removing the MIG gun's contact tip.
3. Pull the old wire liner out of the conduit/casing assembly from the feeder connector or feeder adapter plug end. If you are using a feeder adapter that has an inlet, the inlet must be removed first. If you have any problems removing the liner you may un-thread the feeder adapter first this will also back the liner out of the conduit/casing.
4. If you know that the old liner is the correct length or is still the original liner that was cut at the factory you may hold the new liner up against the old liner and cut off the new liner to the same size as the old liner.
5. Make sure you have a good sharp cut off with no material sticking out!
6. To get the correct length of the new liner, insert the liner into the feeder adapter and feed it through the conduit/casing.
7. Once again be sure the MIG Gun cable is arranged in a straight line, free from twists, when installing a new wire liner.
8. Sometimes on longer conduits/casings and liners it may take 2 people together; one on each end to rotate and twist the conduit/casing to get the liner through the torch.
9. If you have any troubles getting a liner through a torch make sure you have a good sharp cut off, and if you have to you can gently sand the end of the liner on a belt sander. You can remove the cast in the aluminum liner by pre-bending and straightening the liner before loading.
10. After the new liner comes out the end of the torch you want to cut the new liner off flush with the end of the copper gas nozzle or Cu gas cup.
11. Now you have the overall length of the liner, you still have to take out the length of the contact tip.
12. Carefully remove the liner one more time.
13. After removing the liner hold the gun end of the liner up against the tip.
14. Cut off the length off the tip plus the set back of the tip (1/8" or 3/8" tip setbacks)
15. Now that you have cut off the length of the tip plus the setback you may install the new liner and it will back up into the back of the tip chamfer.
16. We always recommend checking the condition of the insulation tube in the front of the torch and collet nut that holds the slip-in tip.
17. We always recommend replacing the spatter disc/gas diffuser, contact tip, and nozzle, after installing a new liner.
18. Tighten the flat head set screw in the inner body, or the Allen set screw in the docking spool onto the conduit/casing to prevent backward movement or an unwanted pumping action.

## WHAT IS THE PROPER USE OF THE NOZZLE THREAD CHASER TAP?

All D/F Nozzles are hand checked for fit before and after plating, and checked again before shipping. If a nozzle has been installed on a new complete torch, they have also been hand checked while being assembled.

The only reason to ever take a gas cup out a nozzle is to clean it. The nozzle and the gas cup must be blown out, and all of the threads have to be wire brushed and blown out again before hand-tightening the gas cup back into the nozzle. If you can't thread it in by hand then something is wrong. Never force a gas cup into a nozzle.

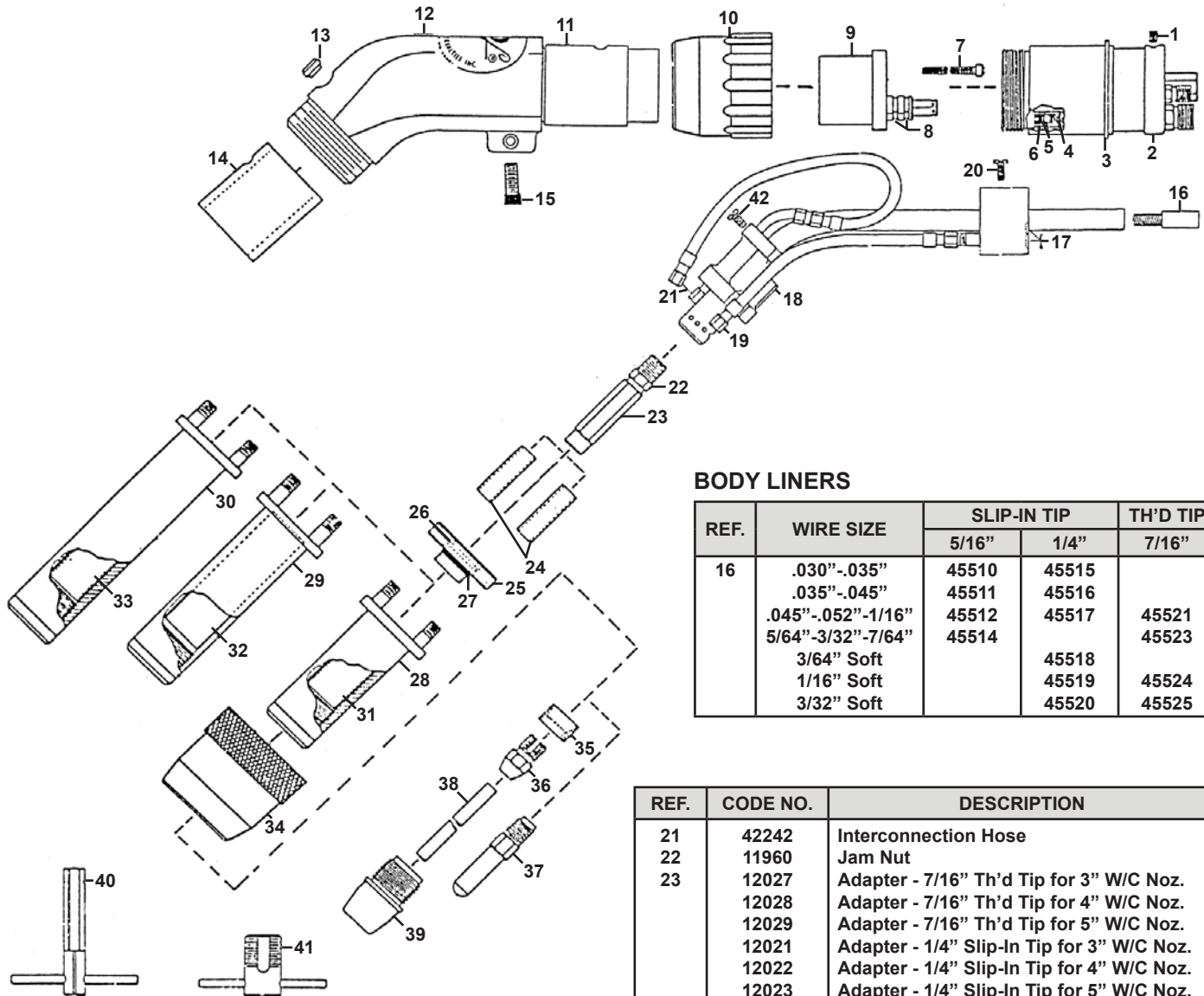
When using the D/F Machine Specialties nozzle thread chaser taps, be sure to always follow the steps below:

1. Make sure that the nozzle is properly supported when tapping so it does not twist in the front of the torch body and cause damage.
  - Improper support can cause the spigots to twist off the top of the rear nozzle collar, or damage the torch internal body parts.
  - Note where the water ports go down the sides of the water-cooled nozzle (following down in line with the spigots). Too much direct pressure on these water ports could cause them to cave in and block off the flow of water.
  - Best practice is to hold the water-cooled nozzle in a vice with soft jaws, perpendicular to the spigots.
  - Over-tightening of the vice can cause damage in general.
2. Remove the tip from the front of the torch before tapping.
3. Lightly lubricate the nozzle and nozzle thread chaser tap before tapping.
4. Be sure to start the tap very carefully. Do not cross thread the nozzle.
5. Be very careful to start threads correctly. Only tap 1/2 turn at a time, always backing up and removing chips 1/2 cycle at a time before moving forward. Do not try to tap further into the water-cooled nozzle than needed or past the factory thread depth.
6. Blow out the nozzle after tapping. Wire brush and blow off the gas cup before threading it back into the nozzle.
7. If nozzle is badly deformed or damaged please return to the factory for a repair estimate before disposing of product (damaged parts can often be repaired).

### ORDERING INFORMATION - NOZZLE THREAD CHASER TAPS

CODE NO.	DESCRIPTION	USED WITH NOZZLE ASSEMBLY	USED FOR GAS NOZZLE
14610	Nozzle Thread Chaser Tap for Standard A/C & W/C Nozzle Assembly Front	13197 16184 11117, 45101 11118, 45102 11119, 45103 45114 45107 NCC-N/HTC-N NCC-LRN, HTC-LRN	10340 10359 10362 10374
14611	Nozzle Thread Chaser Tap for BIG MIG & BIG TIG Nozzle Assembly Front	11123	10382 10387 10389 10390 10392
14612	Nozzle Thread Chaser Tap for Nozzle Body Assembly Rear	13196 13197 13198 16184	
14614	Nozzle Thread Chaser Tap for Series A High-Capacity Nozzle Assembly Front	11142, 45120 11138, 45121 45127 11132, 45129 45125	16748 16749 16750 16751 18030 18031 18032
14615	Nozzle Thread Chaser Tap for Nozzle Body Assembly Front	13198	10379
14617	Nozzle Thread Chaser Tap for Tandem Nozzle Assembly Front	41641	41667 41668

# **WATER-COOLED CURVED 45° GUN STANDARD - PARTS** **MODEL NCC (Slip-In Tip), MODEL HTC (Threaded Tip)**



## **BODY LINERS**

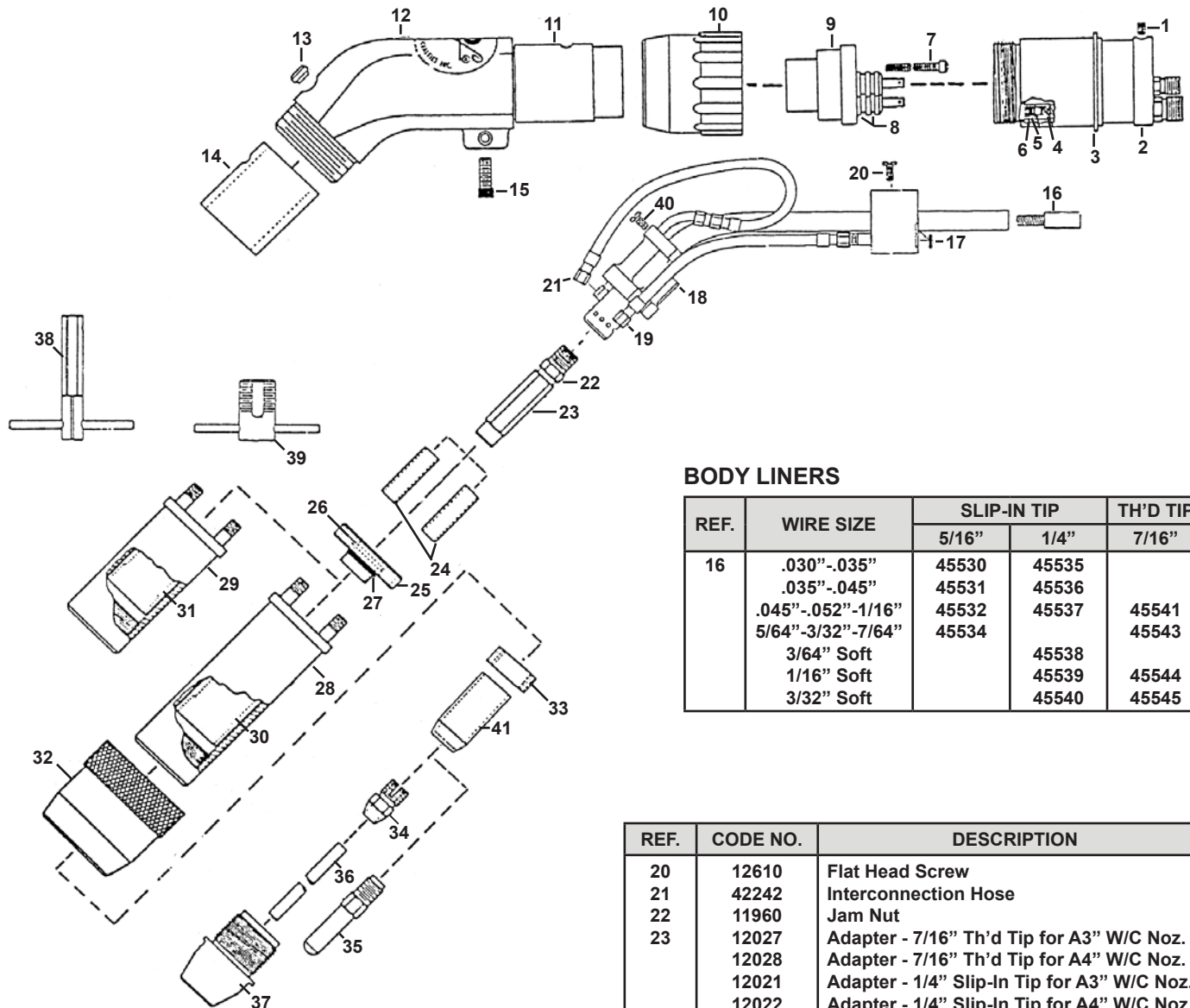
REF.	WIRE SIZE	SLIP-IN TIP		TH'D TIP
		5/16"	1/4"	7/16"
16	.030"-.035"	45510	45515	
	.035"-.045"	45511	45516	
	.045"-.052"-1/16"	45512	45517	45521
	5/64"-3/32"-7/64"	45514		45523
	3/64" Soft		45518	
	1/16" Soft		45519	45524
	3/32" Soft		45520	45525

REF.	CODE NO.	DESCRIPTION
21	42242	Interconnection Hose
22	11960	Jam Nut
23	12027	Adapter - 7/16" Th'd Tip for 3" W/C Noz.
	12028	Adapter - 7/16" Th'd Tip for 4" W/C Noz.
	12029	Adapter - 7/16" Th'd Tip for 5" W/C Noz.
	12021	Adapter - 1/4" Slip-In Tip for 3" W/C Noz.
	12022	Adapter - 1/4" Slip-In Tip for 4" W/C Noz.
	12023	Adapter - 1/4" Slip-In Tip for 5" W/C Noz.
	18312	Adapter - 5/16" Slip-In Tip for 3" W/C Noz.
	18263	Adapter - 5/16" Slip-In Tip for 4" W/C Noz.
	18313	Adapter - 5/16" Slip-In Tip for 5" W/C Noz.
24	10723	Insulation Tube (2 req'd)
25	18070	Insulating Collar
26	13912	O-ring - Internal
27	12516	O-ring - External
28	11117	Water-Cooled Nozzle 3"
29	11118	Water-Cooled Nozzle 4"
30	11119	Water-Cooled Nozzle 5"
31	12301	Insulation Tube for 3" Nozzle
32	12302	Insulation Tube for 4" Nozzle
33	12303	Insulation Tube for 5" Nozzle
34	18071	Nut
35	10405	Spatter Disc
36	11950	Collet Nut - 1/4" Slip-In Tip
	18262	Collet Nut - 5/16" Slip-In Tip
37		Threaded Current Tip (see p. 7, Table 3)
38		Slip-In Current Tip (see p. 7, Table 3)
39		Gas Nozzle (see p. 5, Table 2)
40	12111	Wrench
41	14610	Nozzle Thread Chaser Tap
42	12613	Round Head Screw

REF.	CODE NO.	DESCRIPTION
1	14712	Socket Set Screw
2	45153	Docking Spool Body
3	40026	Posit Ring
4	40022	Spring
5	40023	ball
6	40024	Seat
7	40020	Screw (4 req'd)
8	13921	O-ring (6 req'd)
9	40027	Transfer Spool
10	40002	Nut
11	40013	Body Tube
12	40028	Elbow Casting
13	12880	Washer
14	18053	Insulator - Elbow
15	14262	Socket Set Screw - Casting
16		Body Liner (see chart above)
17	13920	O-ring (3 req'd)
18	40029	Inner Body
19	42196	Interconnection Hose
20	12610	Flat Head Screw

# WATER-COOLED CURVED 45° GUN SERIES A HIGH CAPACITY - PARTS

## MODEL NCC (Slip-In Tip), MODEL HTC (Threaded Tip)



### BODY LINERS

REF.	WIRE SIZE	SLIP-IN TIP		TH'D TIP
		5/16"	1/4"	7/16"
16	.030"-.035"	45530	45535	
	.035"-.045"	45531	45536	
	.045"-.052"-1/16"	45532	45537	45541
	5/64"-3/32"-7/64"	45534		45543
	3/64" Soft		45538	
	1/16" Soft		45539	45544
	3/32" Soft		45540	45545

REF.	CODE NO.	DESCRIPTION
1	14712	Socket Set Screw
2	45153	Docking Spool Body
3	40026	Posit Ring
4	40022	Spring
5	40023	ball
6	40024	Seat
7	40020	Screw (4 req'd)
8	13921	O-ring (6 req'd)
9	40027	Transfer Spool
10	40002	Nut
11	40013	Body Tube
12	40028	Elbow Casting
13	12880	Washer
14	18053	Insulator - Elbow
15	14262	Socket Set Screw - Casting
16		Body Liner (see chart above)
17	13920	O-ring (3 req'd)
18	40029	Inner Body
19	42196	Interconnection Hose

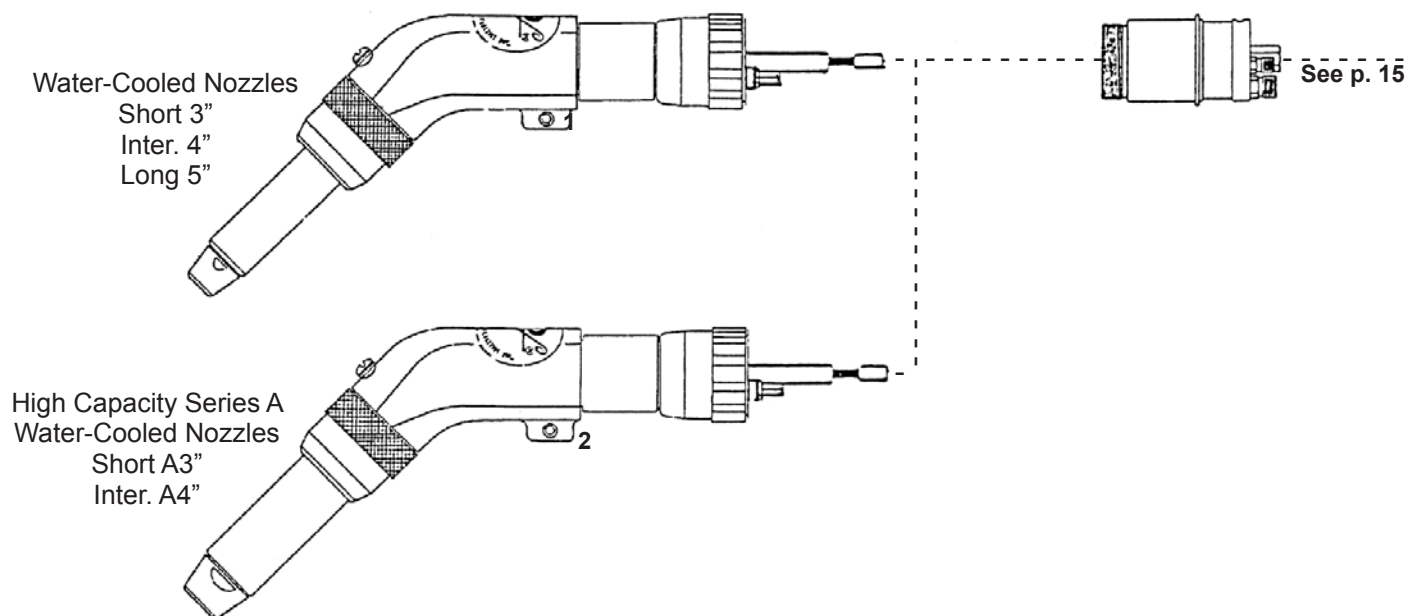
REF.	CODE NO.	DESCRIPTION
20	12610	Flat Head Screw
21	42242	Interconnection Hose
22	11960	Jam Nut
23	12027	Adapter - 7/16" Th'd Tip for A3" W/C Noz.
	12028	Adapter - 7/16" Th'd Tip for A4" W/C Noz.
	12021	Adapter - 1/4" Slip-In Tip for A3" W/C Noz.
	12022	Adapter - 1/4" Slip-In Tip for A4" W/C Noz.
	18312	Adapter - 5/16" Slip-In Tip for A3" W/C Noz.
	18263	Adapter - 5/16" Slip-In Tip for A4" W/C Noz.
24	10723	Insulation Tube (2 req'd)
25	18070	Insulating Collar
26	13912	O-ring - Internal
27	12516	O-ring - External
28	11142	Water-Cooled Nozzle 3"
29	11138	Water-Cooled Nozzle 4"
30	18451	Insulation Tube for 3" Nozzle
31	18452	Insulation Tube for 4" Nozzle
32	18050	Nut
33	18253	Spatter Disc
34	11950	Collet Nut - 1/4" Slip-In Tip
	18262	Collet Nut - 5/16" Slip-In Tip
35		Threaded Current Tip (see p. 7, Table 3)
36		Slip-In Current Tip (see p. 7, Table 3)
37		Gas Nozzle (see p. 5, Table 2)
38	12111	Wrench
39	14614	Nozzle Thread Chaser Tap
40	12613	Round Head Screw
41	18251	Support Tube for 3" Nozzle
	18252	Support Tube for 4" Nozzle



# CONVENTIONAL ASSEMBLY - DEDICATED OR ROBOTIC

## 45 DEGREE WATER-COOLED CURVED GUN

### MODELS NCC/HTC



## ORDERING INFORMATION

To obtain a complete Water-Cooled Nozzle Assembly, reference the table below and the parts list.

Note: Specify wire diameter, Gas Nozzle (page 5, Table 2) and Current Tip (page 7, Table 3).

REF.	CODE NO.	DESCRIPTION
1	47697	W/C Curved Gun Assembly - Short 3" Nozzle
	47698	W/C Curved Gun Assembly - Inter. 4" Nozzle
	47699	W/C Curved Gun Assembly - Long 5" Nozzle
2	47764	W/C Curved Gun Assembly - Short A3" High Capacity Nozzle
	47765	W/C Curved Gun Assembly - Inter. A4" High Capacity Nozzle

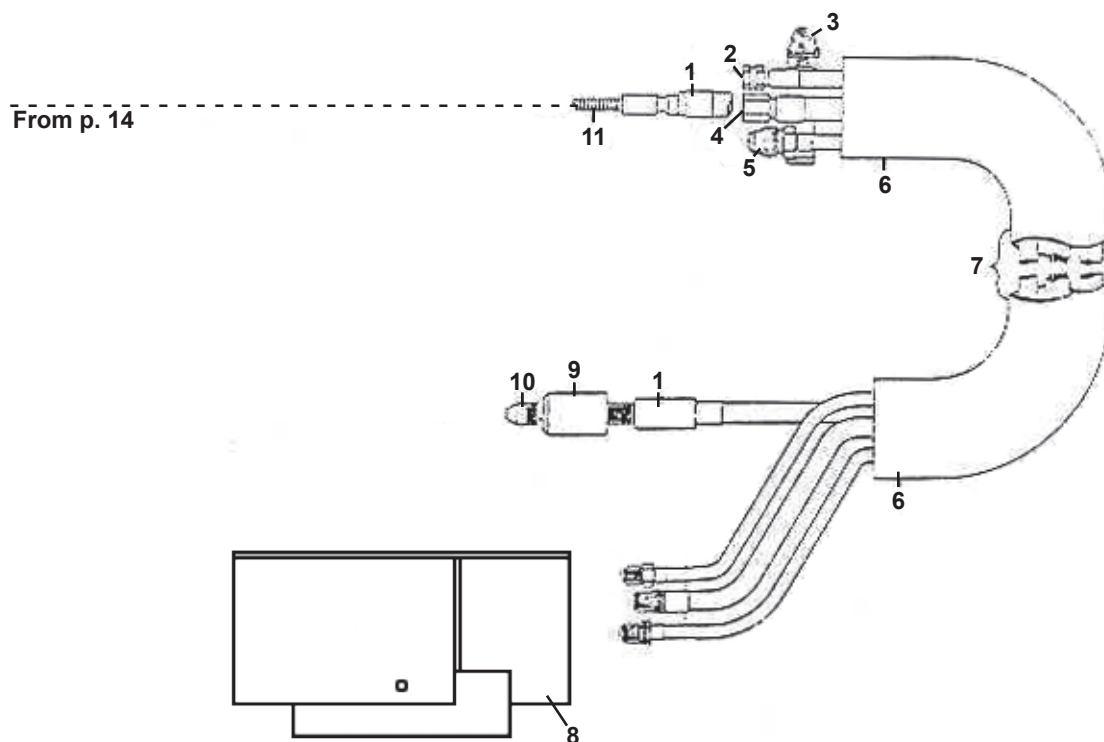
## COMPLETE ASSEMBLY

Add footage to code number for length desired.

Example: Require Model NCC with 5" Nozzle & 8 Ft. Utilities: Code No. 42162-8

W/C NOZZLE	COMPLETE STANDARD ASSEMBLIES CONSISTS OF GUN ASSEMBLY AND UTILITY COMBINATION	
	MODEL NCC	MODEL HTC
Short 3"	42160	42170
Inter 4"	42161	42171
Long 5"	42162	42172
Short A3" High Cap.	42163	42173
Inter. A4" High Cap.	42164	42174

# STANDARD ASSEMBLY UTILITIES



Ref.	Code No.	Description
1	46350	Casing .030"-.035" (Requires Liner)
	46370	Casing .035"-1/16" (Requires Liner)
	46420	Casing .035"-.045" (Single Piece)
	46440	Casing .045"-1/16" (Single Piece)
	46460	Casing 5/64"-3/32" (Single Piece)
	46480	Casing 7/64"-1/8" (Single Piece)
	46500	Casing 1/8" (AL, Single Piece)
	46300	Water In Hose Assembly
2	14803	Clamp
4	46320	Water Out Hose & Power Cable Assembly
5	46260	Gas Hose Assembly - Standard
6	46630	Cable/Hose Sheath
7		Utility Combination - Consists of: Items 1, 2, 3, 4, 5, 6 & 11
	46620	.030"-.035"
	46621	.035"-1/16"
	46622	.035"-.045"
	46623	.045"-1/16"

Ref.	Code No.	Description
7	46624	5/64"-3/32"
	46625	7/64"-1/8"
8	45196	Optional Utility Station (see p. 23)
9		Feeder Adapter - (see p.24)
10		Inlet (see p. 24)
11	47020	Liner .030"-.035" Hard/Cored
	47021	Liner .035"-.045" Hard/Cored
	47022	Liner .045"-1/16" Hard/Cored
	47023	Liner 3/64" Soft
	47024	Liner 1/16" Soft
	47025	Liner 3/32" Soft

NOTE (for Casings, Water In, Water Out & Power Cable, Gas Hose, Sheath, Utility Combination, and Liner only):

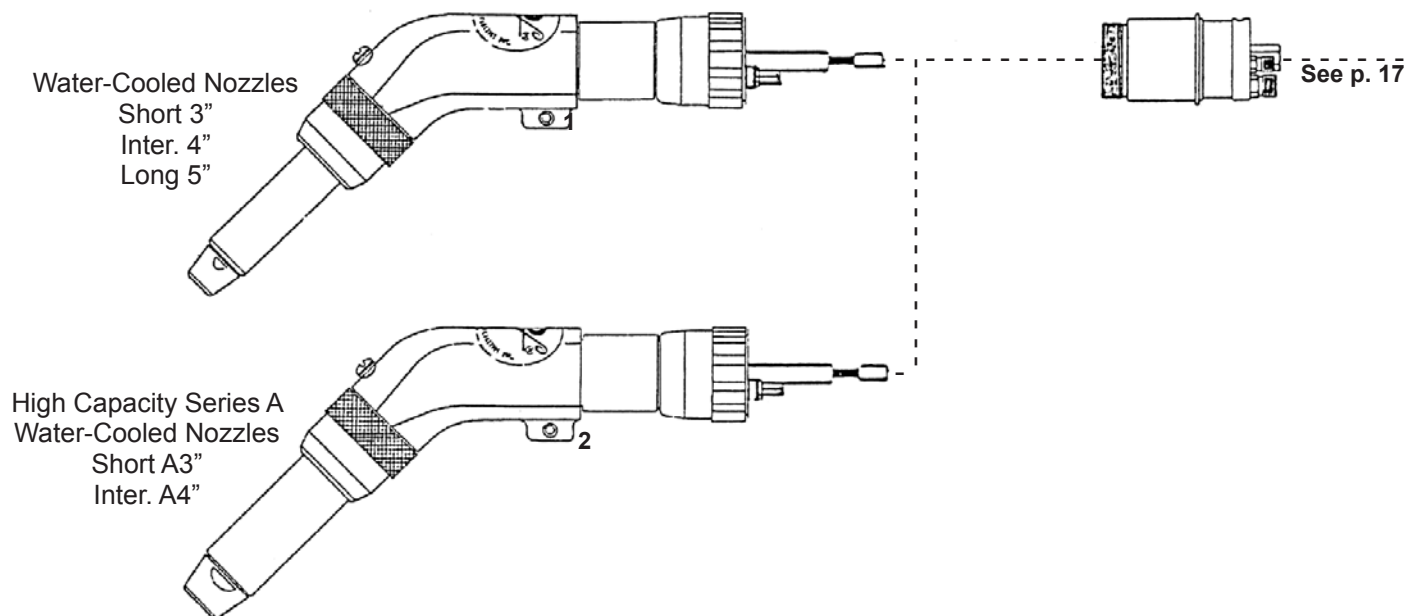
Add footage to code number for length desired.

Example: Require 6 Ft. Water In Hose Assembly - Code No. 46300-6.

# CONVENTIONAL ASSEMBLY - DEDICATED OR ROBOTIC

## 45 DEGREE WATER-COOLED CURVED GUN

### MODELS NCC/HTC



## ORDERING INFORMATION

To obtain a complete Water-Cooled Nozzle Assembly, reference the table below and the parts list.  
 Note: Specify wire diameter, Gas Nozzle (page 5, Table 2) and Current Tip (page 7, Table 3).

REF.	CODE NO.	DESCRIPTION
1	47697	W/C Curved Gun Assembly - Short 3" Nozzle
	47698	W/C Curved Gun Assembly - Inter. 4" Nozzle
	47699	W/C Curved Gun Assembly - Long 5" Nozzle
2	47764	W/C Curved Gun Assembly - Short A3" High Capacity Nozzle
	47765	W/C Curved Gun Assembly - Inter. A4" High Capacity Nozzle

## COMPLETE ASSEMBLY

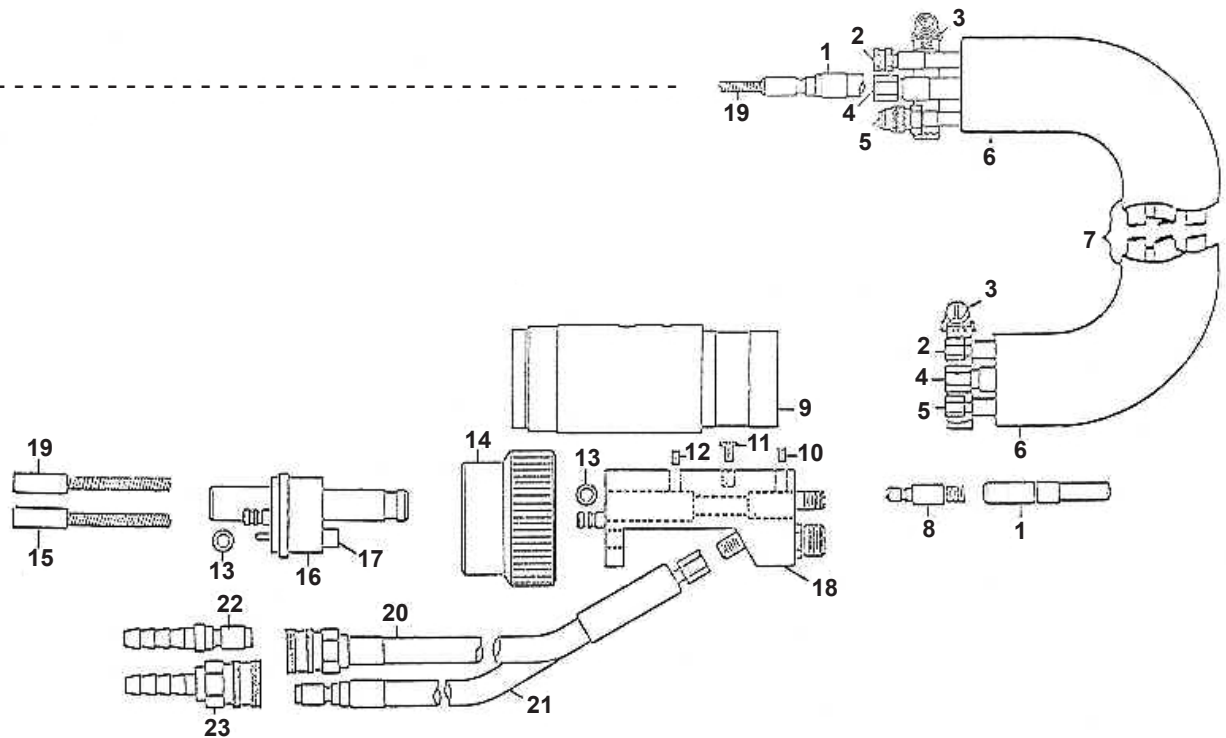
Add footage to code number for length desired.

Example: Require Model NCC with 5" Nozzle & 8 Ft. Utilities: Code No. 42181-8

W/C NOZZLE	COMPLETE STANDARD ASSEMBLIES CONSISTS OF GUN ASSEMBLY AND UTILITY COMBINATION	
	MODEL NCC	MODEL HTC
Short 3"	42179	42187
Inter 4"	42180	42188
Long 5"	42181	42189
Short A3" High Cap.	42182	42190
Inter. A4" High Cap.	42183	42191

# EURO ASSEMBLY UTILITIES

From p. 16



REF.	CODE NO.	DESCRIPTION
1	46350	Casing .030"-.035" (Requires Liner)
	46370	Casing .035"-3/32" (Requires Liner)
	46420	Casing .035"-.045" Single Piece
	46440	Casing .045"-1/16" Single Piece
	46460	Casing 5/64"-3/32" Single Piece
	46480	Casing 7/64"-1/8" Single Piece
2	46160	Water In Hose Assembly
3	14803	Clamp
4	46180	Water Out & Power Cable
5	46130	Gas Hose Assembly
6	46631	Cable/Hose Sheath
7		Utilities Combination
		Consists of 1, 2, 4, 5, 6 & 8
	46640	.030"-.035" (46460, Req. Liner)
	46641	.035"-1/16" (D/F Casing, Req. Liner)
	46642	.035"-.045" Single Piece Casing
	46643	.045"-1/16" Single Piece Casing
	46644	5/64"-3/32" Single Piece Casing
	46645	7/64"-1/8" Single Piece Casing
8	18466	Casing Adapter .030"-1/16"
	18467	Casing Adapter 5/64"-1/8"
9	18471	Body Housing
10	14712	Socket Set Screw
11	12611	Machine Screw - Nylon
12	14263	Socket Set Screw

REF.	CODE NO.	DESCRIPTION
13	13922	O-ring (4 required)
14	18473	Nut - Connector
15		Stub Liner at Connector
		Required with Single Piece Casings
	18508	Stub Liner .030"-.035"
	18509	Stub Liner .035"-.045"
	18510	Stub Liner .045"-1/16"
	18511	Stub Liner 5/64"-3/32"
	18512	Stub Liner 7/64"-1/8"
16	18492	Spool - Rear
17	18474	Sleeve - Contact Pin
18	18472	Connector Body
19	47020	Liner .030"-.035" Hard/Cored
	47021	Liner .035"-.045" Hard/Cored
	47022	Liner .045"-1/16" Hard/Cored
	47023	Liner 3/64" Soft
	47024	Liner 1/16" Soft
	47025	Liner 3/32" Soft
20	18468	Q.D. Water In Hose Assembly
21	18469	Q.D. Water Out Hose Assembly
22	13295	Plug - Water in from Cooler
23	13301	Socket - Water Out
24	18493	EURO Connector Complete
		Consists of: 9-14, 16, 18, & 20-23

## ORDERING INFORMATION:

WIRE CASINGS, WATER IN HOSE, WATER OUT & POWER CABLE, GAS HOSE, UTILITIES COMBINATION & LINERS ONLY

Add Footage Digit to Item Code Number for Length Required

Example: Require 10 Ft. Casing .035"-3/32" - 46370-10

Example: Require 6 Ft. Liner .045" - 47022-6

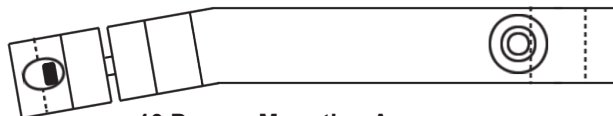
# ROBOT SAFETY MOUNT & MOUNTING ARMS

Ref.	Code No.	Description
1		Insulating Disc - Ref. Table A
2	40519-S	Rumble Safety Mount - Medium Duty Standard
	41246-QD	Rumble Safety Mount - Medium Duty Quick Disconnect
	40520-S	Rumble Safety Mount - Heavy Duty Standard
	41247-QD	Rumble Safety Mount - Heavy Duty Quick Disconnect
3	40865	Rear Shaft Bracket Only
4	40869	Arm Assembly - Complete 6"
	40870	Arm Assembly - Complete 8"
	40871	Arm Assembly - Complete 10"
5	40539	Bushing
6	40565	Arm - Only 6"
	40566	Arm - Only 8"
	40567	Arm - Only 10"



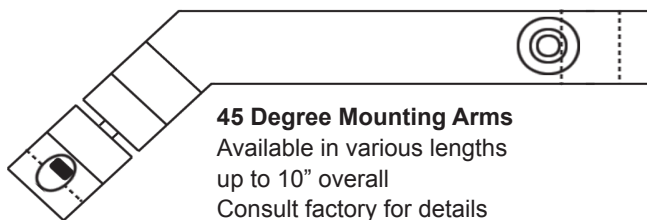
## Straight Mounting Arms

Available in various lengths  
up to 10" overall  
Consult factory for details



## 10 Degree Mounting Arms

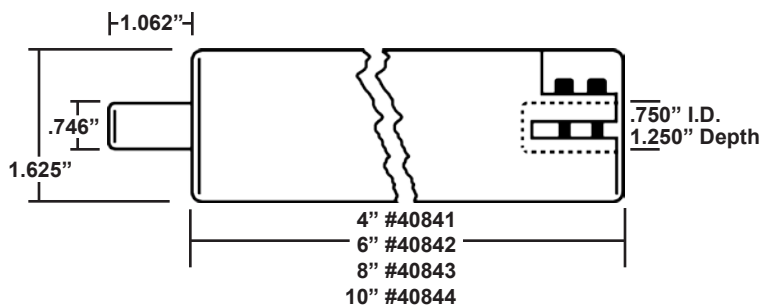
Available in various lengths  
up to 10" overall  
Consult factory for details



## 45 Degree Mounting Arms

Available in various lengths  
up to 10" overall  
Consult factory for details

## Extension Arms



## Universal Mounting Arms

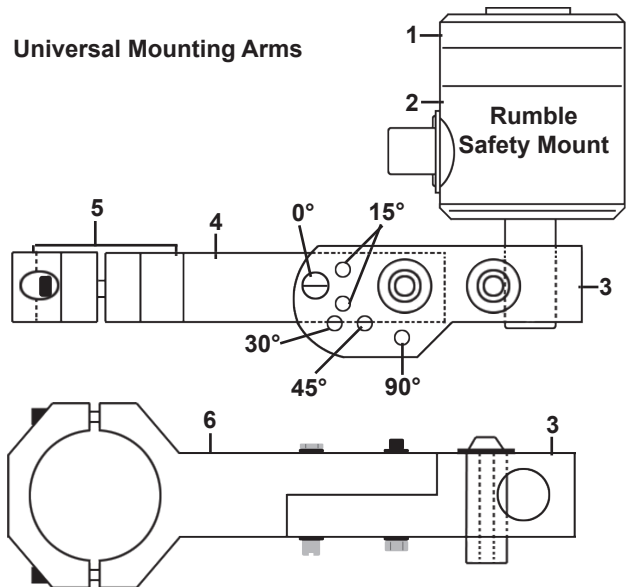
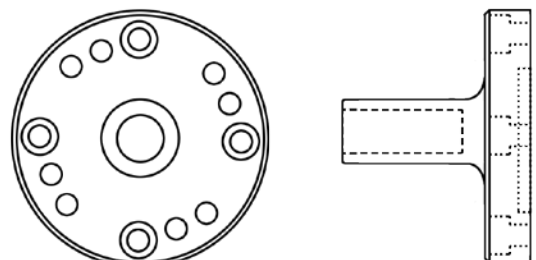


Table A - Insulating Discs

Robot Model		Code No.
CTBiotech	H-80 Series	40507
	H-280 Series	40507
	WV-15	40507
	TH-8	40507
	GA-100 (Gantry)	40507
GMF	S100	40547
	S200	40547
	Arc Mate	40547
Hitachi Milacron	PW-10	40507
	T3-726	40521
	T3 746	40522
	T3-776	40523
	T3-786	40524
	T3-556	40525
	T3-586	40526
	T3-735	40527
Motoman Westinghouse	T3-646	40546
	Komatsu RWL-0005	40506
	Unimation 760	40548
		40549

## Flanged Post Mount

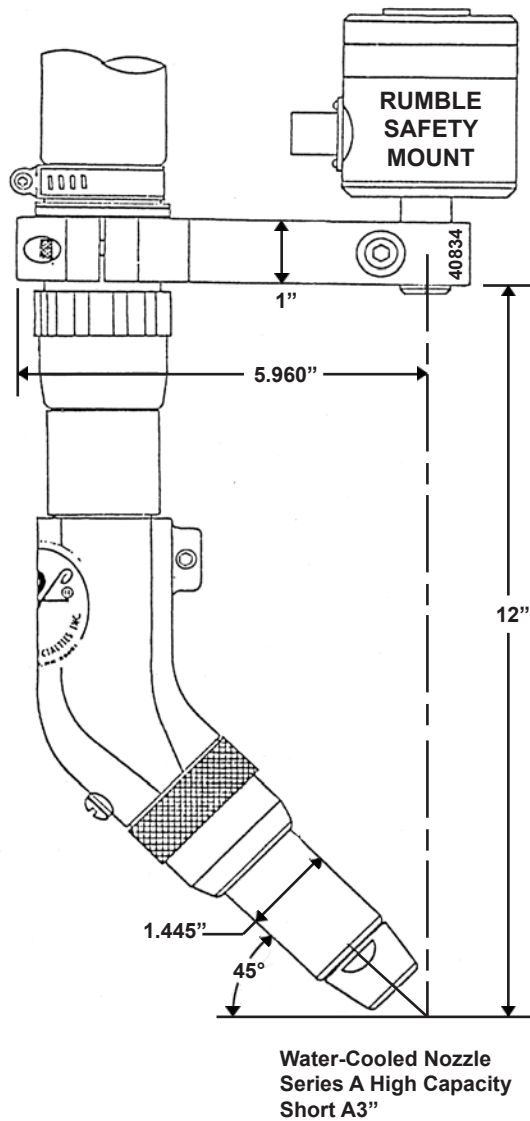
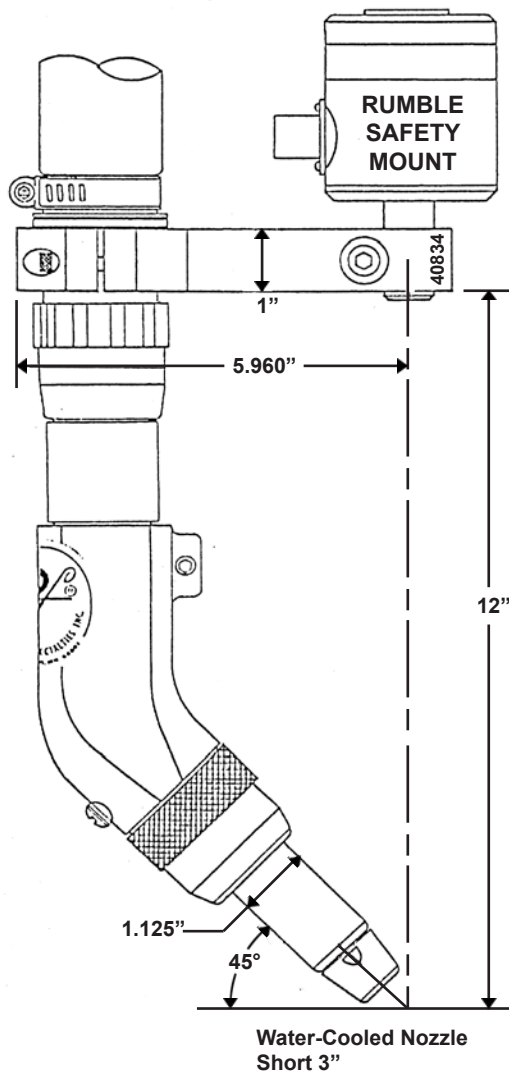
Code No. 40509





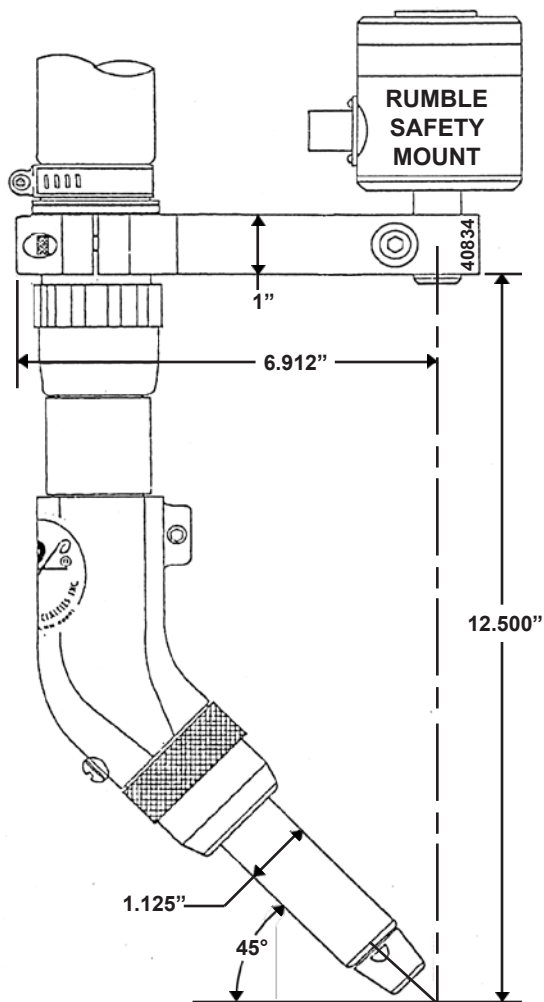
## ROBOTIC GUN LAYOUT

45 Degree W/C Docking Spool® Curved Gun Models NCC/HTC, NCC-A/HTC-A  
Standard Short 3" and Series A3" Nozzles

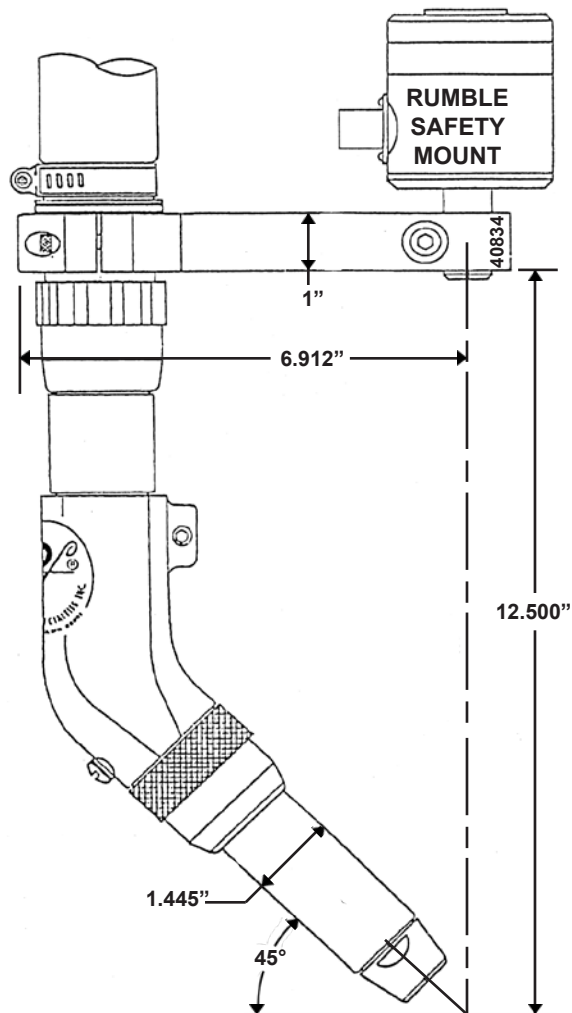


## ROBOTIC GUN LAYOUT

45 Degree W/C Docking Spool® Curved Gun Models NCC/HTC, NCC-A/HTC-A  
Standard Intermediate 4" and Series A4" Nozzles

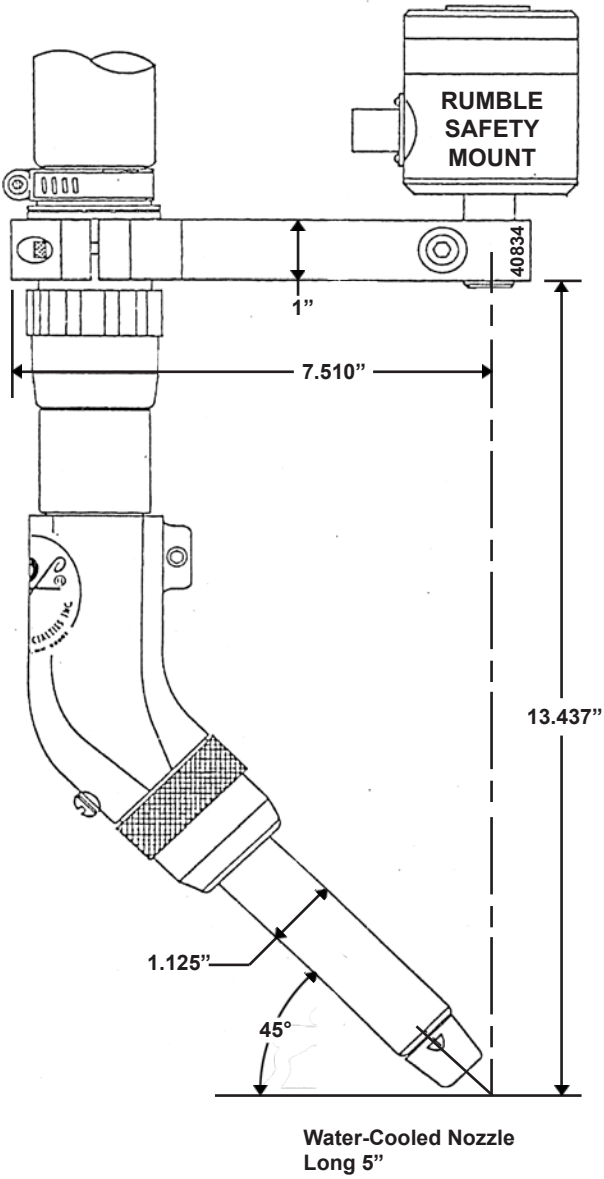


Water-Cooled Nozzle  
Intermediate 4"

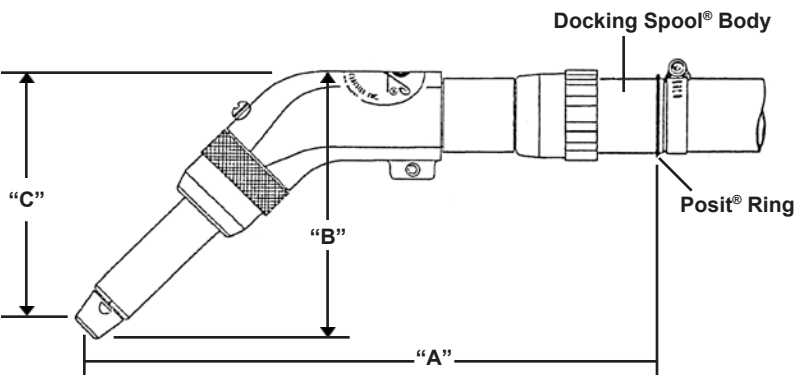


Water-Cooled Nozzle  
Series A High Capacity  
Intermediate A4"

**ROBOTIC GUN LAYOUT**  
**45 Degree W/C Docking Spool® Curved Gun Models NCC/HTC**  
**Standard Long 5" Nozzle**



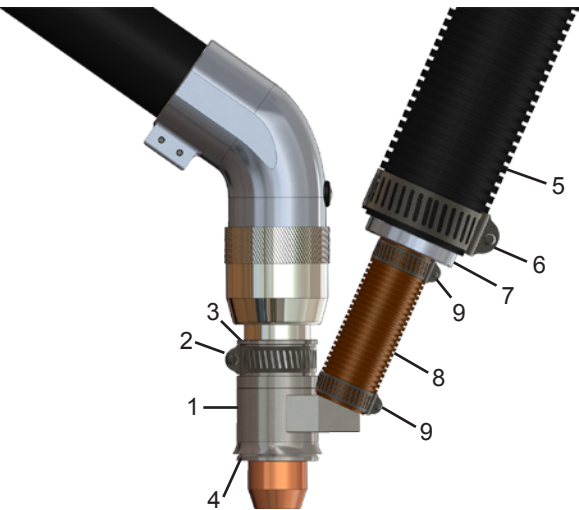
GUN DIMENSIONS



Docking Spool® Body  
Mounting Area:  
1.750" Diameter  
1.250" Width

W/C NOZZLE DESCRIPTION	DIMENSIONS		
	"A"	"B"	"C"
Short 3"	12.837"	5.733"	5.227"
Intermediate 4"	13.312"	6.450"	6.562"
Long 5"	13.787"	7.132"	6.611"
Series A3"	12.837"	5.733"	5.227"
Series A4"	13.312"	6.450"	6.562"

SMOKE EXTRACTOR



ORDERING INFORMATION  
Standard Water-Cooled Nozzle Configuration

Ref.	Code No.	Description
1	40055	Extractor Shell
2	14802	Clamp 1"
3	40052	Insulator
4	40056	Deflector Ring (Gas Noz. 10359, 10362, 10374)
	40057	Deflector Ring (Gas Noz. 10340)
5	40049	Vacuum Hose 2" Dia.
6	14822	Clamp 2"
7	40048	Transition Hose Adapter
8	40047	Transition Hose 3/4" - Silicon
9	14804	Clamp 3/4"

NOTE: For Vacuum Hose 40049, Add Footage Digit  
for Length Required.  
Example: Require 15 Ft. - Code No. 40049-15

ORDERING INFORMATION  
Hi-Capacity (Series A) Water-Cooled Nozzle Configuration

Ref.	Code No.	Description
1	40050	Extractor Shell
2	14803	Clamp 1-1/2"
3	40058	Insulator
4	40051	Deflector Ring
5	40049	Vacuum Hose 2" Dia.
6	14822	Clamp 2"
7	40048	Transition Hose Adapter
8	40047	Transition Hose 3/4" - Silicon
9	14804	Clamp 3/4"

NOTE: For Vacuum Hose 40049, Add Footage Digit  
for Length Required.  
Example: Require 15 Ft. - Code No. 40049-15

# UTILITY STATION

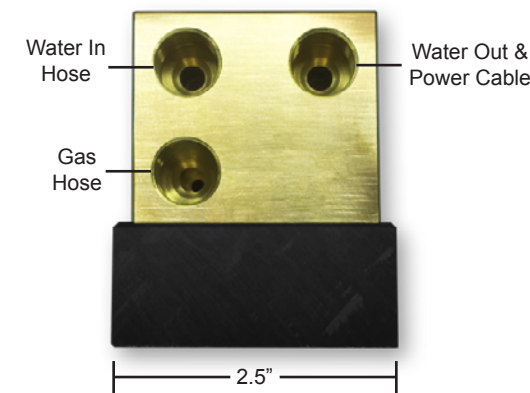
## ORDERING INFORMATION

Description	Code No.
Utility Station	45196
Utility Station - Dual Power Cable	45188

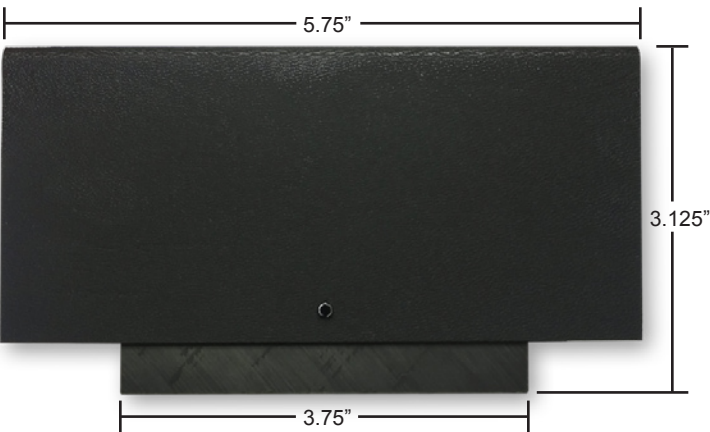
## DIMENSION SPECIFICATIONS

Base Length	3.75"
Overall Length	5.75"
Base Width	2.25"
Overall Width	2.5"
Overall Height	3.125"
Mounting Hole Center Distance	2.75"
Overall Weight	3.5 lbs.

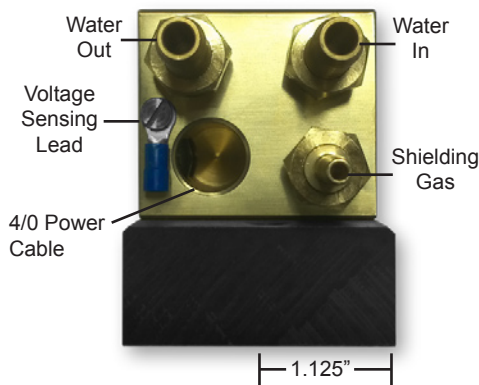
### D/F TORCH CONNECTION



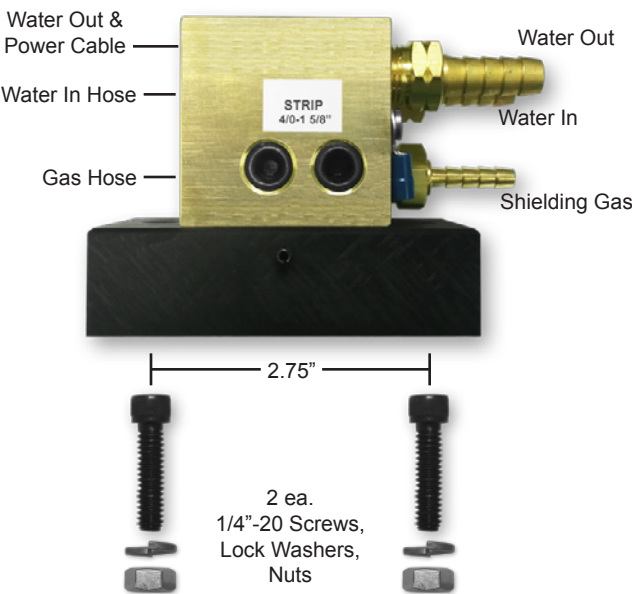
### UTILITY STATION SIDE VIEW WITH COVER



### CUSTOMER UTILITIES CONNECTION



### FROM LEFT: D/F TORCH CONNECTION FROM RIGHT: CUSTOMER UTILITIES CONNECTION





## WIRE FEEDER ADAPTERS & INLETS

Manufacturer	Models	Wire Diameter	Remote Mount Adapter			Direct Mount Adapter	
			Hard or AL	Cored	Stub* Liner	Hard or AL	Cored
ESAB®	D20 (20mm)	.030"-3/32" H/C/AL 5/64"-1/8" H/C	13098	13099	*	13096	13097
ESAB®			18246	18247		18248	18249
EURO			18493	18493		18540	18540
Hobart®	All Models	.030"-3/32" H/C/AL 5/64"-1/8" H/C	13067	16087	*	13068	16225
Lincoln®	LN-7, LN-8, NA5-R	.030"-3/32" H/C/AL 5/64"-1/8" H/C	13110	13112	*	13113	13116
	LN-9	.030"-3/32" H/C/AL 5/64"-1/8" H/C	16581	16582	*	16528	16529
	NA3, NA5	.030"-3/32" H/C/AL 5/64"-1/8" H/C	16879	16878	*	16880	16881
"BIG MIG"	NA3, NA5	.030"-3/32" H/C/AL 5/64"-1/8" H/C	16879	16878	*	16888	16888
Lincoln®	Power-Feed 10, LF-72, LF-74	.030"-3/32" H/C/AL 5/64"-1/8" H/C	13479	13469	*	13480	13468
Linde®	SWM31 SWM34 SWM37 SWM38 EH8	Casing to Feeder (Accepts Linde® Outlet Guide)	13046			13046	
		D/F Insert .035"-.045" Hard .045"-1/16" Hard 5/64"-3/32" Cored 3/64"-1/16" AL	13047 13048 13050	13049		13047 13048 13050	13049
	EH10	.030"-3/32" H/C/AL 5/64"-1/8" H/C	13043	13052	*	13080	13079
					*		
Mavrix®	PA-10	.030"-3/32" H/C/AL 5/64"-1/8" H/C	16556	16568	Requires Inlet		
Miller® (50 Series)		.030"-3/32" H/C/AL 5/64"-1/8" H/C	16557	16559	*	16558	16560
OTC®	Requires Insert	.030"-1/8" .030"-1/8"	18268		*	18275	
	CMRE-741		18282			18282	
Panasonic®	PME-12X YW50AKW1	.030"-1/16" .030"-1/16"	13090 13466	Requires Inlet			
TWECO®	#4	.030"-3/32" H/C/AL 5/64"-1/8" H/C	13479	13469	*	13480	13468
Welding Alloys®		.030"-3/32" H/C/AL 5/64"-1/8" H/C		Requires Liner Requires Inlet		13486	13486

### ORDERING INFORMATION

Each D/F gun is fully assembled and ready to install. In order to make the installation complete, the code number, wire size & type, make/model of wire feeder, and inlet as needed must be specified when ordering. If special welding tools or accessories other than those listed previously are required, please consult with the factory.

### FEEDER ADAPTER INLETS

Wire Size	Steel Code No.	Brass Code No.	Nylon Code No.
.030"	13801	16417	
.035"	13803	16418	
.045"	13806	16419	
.052"	13844	16420	
1/16"	13809	16421	
5/64"	13812	16422	
3/32"	13814	16422	
7/64"	13816		
1/8"	13842		
3/64" AL			13807
1/16" AL			13810
3/32" AL			13815

Esab®, Hobart®, Lincoln®, Linde®, Miller®, OTC®, Panasonic®, ABB®, Fanuc®, Kuka®, Mavrix®, Motoman®, Thermal Arc®, TWECO®, & Welding Alloys® are registered trademarks of their respective companies. Names are mentioned for reference only. D/F Machine Specialties is in no way affiliated with these companies.

\*Stub liners only required in feeder adapter when single-piece casing is used.

# TROUBLESHOOTING: POROSITY (SUMMARY)

NOTE: Most POROSITY is caused by gas problems, followed by base metal contamination.

## Causes of Porosity

### BASE METAL CONTAMINATION

Impurities on base metal

### FILLER METAL CONTAMINATION

Impurities on filler metal (wire)

### ATMOSPHERIC CONTAMINATION

Drafts, wind, fans, etc.

### GAS MIXING APPARATUS

1. Too high a gas flow, causing turbulence, and/or sucking air at hose connections; creating the venturi effect at end of gas nozzle
2. Too low a gas flow, causing insufficient gas coverage
3. Damaged or kinked gas lines
4. Too high an oxygen content
5. Leaks in gas distribution system
6. Other impurities in gas - moisture, etc.
7. Inconsistent gas flow (cfh) at the torch connection

### GAS TURBULENCE

1. Excessive spatter build-up in gas nozzle and on current tip
2. Nozzle damage, causing uneven gas coverage
3. Torch gas ports clogged or deformed
4. Super-heated nozzle, causing shielding gas to expand rapidly and create return effect at end of nozzle
5. Gas diffuser/nozzle insulator missing
6. Too high a gas flow causing the venturi effect

### WELDING PARAMETERS, ETC.

1. Too long a wire stick-out; gas nozzle too far from weld puddle
2. Bad torch position - too sharp a torch incline causing the venturi effect at the end of the nozzle leading to atmospheric contamination
3. Excessively wide weld pool for nozzle I.D.
4. Arc voltage too high
5. Too high a travel speed

## Possible Solutions

- a. Remove contamination; clean surfaces
- b. Use of specific wire/gas mix for specific types of impurities

- a. Replace wire
- b. Install wire-cleaning system
- c. Prevent industrial dust/dirt/grit from contaminating wire during storage or use
- d. Prevent build-up of aluminum oxide on exposed aluminum wire surface by using up quickly
- e. Remove wire from wire drive unit and store in a sealed plastic bag when not in use for long periods

- a. Protect weld from drafts (curtains/screens)
- b. Use tapered or bottleneck gas nozzles when drafts cannot be avoided

- 1a. Reduce gas flow
- 1b. Tighten all hose connection points
2. Increase gas flow
3. Repair or replace
4. Adjust mixer
5. Repair leaks
6. Overhaul system; fit filters and/or dryers
7. Regulate pressure into flow meter for consistent cfh delivery of gas

1. Clean nozzle and tip regularly; spray with anti-spatter fluid
2. Replace nozzle
3. Clean or replace
4. Check duty cycle rating of torch
5. Replace
6. Reduce gas flow

1. Use longer nozzle or adjust stick-out (3/8" minimum or 15 times wire diameter)
2. Correct torch angle
3. Width of the weld pool should be 1.3 times the nozzle I.D.; use suitable wider gas nozzle
4. Reduce voltage
5. Reduce speed

# TROUBLESHOOTING: SPATTER

## Problems/Causes

### SPATTER

Too fast or too slow wire feed for the arc voltage

Too long an arc

Damaged current tip

Inclination of welding gun too great

Faulty power source

Incorrect start

Incorrect pulse parameters

Uneven wire feed

Impurities on the base metal

Poor ground contact

Too long stick-out (short-arc welding)

Incorrect polarity

## Possible Solutions

Set the wire feed rate and voltage in accordance with good welding practices as recommended by a qualified welding engineer.

Adjust the wire feed and voltage so that the arc is in accordance with good welding practice for the joint to be welded. The distance from the current tip to the workpiece should be 15 times the welding wire diameter. If the arc is too long there will be spatter, usually in the direction of the weld.

If the current tip becomes worn the welding wire will not be in constant contact with the tip and the arc will become unstable. A current tip contaminated with spatter will cause uneven wire feed resulting in further spatter.

The angle of the gas nozzle relative to the workpiece should be between 45 and 90 degrees. If the angle is too small, the wire runs parallel to the weld pool, resulting in spatter in the direction of the welding.

Have the power source checked for faulty conditions such as broken wires and faulty contacts.

A great deal of spatter occurs if the stick-out is too great and if the welding gun is held too far from the workpiece when striking the arc. Try to start with as short a stick-out as possible and with the welding gun as close to the starting point as possible. If a large ball end is formed on the end of the welding wire, remove it by cutting the wire with sharp wire cutters. It is helpful if the wire is cut to a point. Always remove the ball end before striking an aluminum arc. Check the welding ground connection.

Check the user manual for your power supply or consult a qualified welding engineer.

Uneven wire feed gives rise to heavy spatter. Find the cause of the disturbance and correct the condition before proceeding.

Paint, mill scale, rust and other contamination on the base metal form an insulating layer causing an unstable arc that results in heavy spatter. Clean the surfaces to be welded.

Inspect ground cable for loose connections, fraying and cuts. Correct any problem areas found and attach the ground cable directly to the workpiece after having cleaned the contact surface first. POOR GROUND CONTACT IS THE MOST COMMON CAUSE OF UNSTABLE MIG WELDING CONDITIONS.

The stick-out should be 15 times the diameter of the wire electrode being used. With increasing stick-out, the current is reduced and the arc voltage rises, giving a longer unstable arc and increased spatter.

Check for correct polarity. Follow the electrode manufacturer's recommendations.

# TROUBLESHOOTING: GENERAL GUIDE

## Problems/Causes

## Possible Solutions

### ERRATIC WIRE FEED

Slipping feed rolls

Check that the feed roll size is correct for the wire size being used. Increase the drive roll pressure until the wire feed is even. Do not apply excessive pressure as this can damage the wire surface, causing copper coating to loosen from steel wires or metal shavings to be formed from soft wires like aluminum. These metal fragments or shavings can be drawn into the wire feed conduit and will rapidly clog the liner. When welding with flux-cored wires, excessive drive roll pressure may open the wire seam and allow flux or metal powders to escape.

Clogged or worn gun liner

a. Dust, particles of copper, drawing lubricants, metal or flux and other forms of contamination can all clog the liner so that the wire feed is slowed or impeded. A liner that has been in use for an extended period of time becomes worn and filled with dirt and must be replaced.

b. When changing the welding wire, remove the tip from the front end of the gun and blow out the body liner with clean, dry compressed air from the back of the gun. Repeat with the casing and liner assembly. Note: Wear safety goggles when using compressed air to clean the liners. Make sure proper safety procedures are followed in order to avoid possible serious eye injury.

Liners too long or too short

Check the lengths of the liners and trim or replace if too long or too short. The efficient feeding of the welding wire is dependent on the liners fitting correctly.

Spatter on the wire

An unprotected coil of wire quickly collects dust and other airborne contamination. If grinding is being performed in the vicinity, particles can become attached to the wire, severely interfering with the wire feed. Replace with clean wire and keep it protected with a cover. Make sure spare wire rolls are stored in a clean, dry place.

Coil brake incorrectly adjusted

Set the brake so that the coil immediately stops rotating as soon as welding is interrupted. If the brake is applied too hard it will cause the feed rolls to slip, resulting in uneven wire feed. If it is too loose, overrun of the wire will occur, causing wire tangles, inconsistent tension on the feed mechanism and irregular arc characteristics.

### UNSTABLE ARC

Incorrect setting of voltage and/or current

Set the wire feed in relation to the arc voltage in such a way that the arc is stable and burns evenly. In spray arc welding, set the wire feed so that there are no short circuits and the filler metal is transferred in a spray across the arc. Find the cause of the interference and correct it. (See ERRATIC WIRE FEED above)

Problems in wire feeding: worn current tip

When the internal diameter of the current tip becomes worn from the passage of wire through it, the wire may no longer stay in continuous electrical contact with the tip. This results in an unstable arc and an increase in spatter. Paint, mill scale, silicon scale, rust or flux deposits from previous weld runs may form an insulating layer causing an unstable arc. Clean the surfaces to be welded.

Impurities on the base metal

Securely attach the ground cable as close to the point of welding as possible on the workpiece. Clean the surfaces thoroughly to ensure good contact.

Poor contact between ground cable and work-piece or loose power connection

Check to insure the welding power connection on the power source is tight, the and workpiece. Connection on the wire feeder is tight, the connection to the adaptor block is tight, Loose power connection and the connection of the gun to the adaptor block is tight.

Stick-out too long

Adjust the current tip to work distance to a minimum of 3/8" for short arc welding. A more precise distance is 15 times the wire diameter.

# TROUBLESHOOTING: GENERAL GUIDE

## Problems/Causes

## Possible Solutions

### AIR-COOLED GUN RUNNING TOO HOT

Poor ground

Inspect ground cable for loose connections, fraying and cuts. Correct any problem areas found. Clean clamping area to insure good contact. Securely attach the ground cable to the workpiece, as close as possible to the point of welding. Make sure there is a good connection to the welding power source.

Loose power connection

Check to make sure the power connection on the power source is tight, the connection on the wire feeder is tight, the connection to the adaptor block is tight, and the connection of the gun to the adaptor block is tight.

Consumable items loose or worn

Remove nozzle from gun and inspect current tip, collet nut (tip holder) and spatter disc (gas diffuser) for wear and tightness; replace or tighten as necessary.

Capacity of gun being exceeded

Note complete weld parameters, including welding current (Amps), welding voltage, wire feed speed, type and size of wire, type of gas and flow rate of gas and consult your local Authorized D/F Machine Specialties Distributor or contact the factory.

Dirty connection

Remove torch and inspect parts for dirt build-up. Periodic cleaning is necessary.





# D/F MACHINE SPECIALTIES, INC.

*MIG & TIG Welding Products, Consumables & Accessories*

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## WARRANTY

This Equipment is sold by D/F MACHINE SPECIALTIES, Incorporated, under the warranty set forth in the following paragraph. Such warranty is extended only to the buyer who purchases the equipment directly from D/F or its authorized distributor as new merchandise.

The barrel and cable assemblies are warranted by D/F to be free from manufacturing defects for 90 days after delivery by D/F, provided that the equipment is properly operated under conditions of normal use and that regular periodic maintenance and service is performed. Expendable parts are not warranted for any specific time. Expendable parts referred to herein would be the nozzles, current tips, spatter discs, insulators, casing liners, and wire inlets. D/F's sole obligation under this warranty is limited to making replacement at its manufacturing facility for barrel assemblies which are returned to it with transportation charges prepaid, and upon D/F's examination have been found to be so defective.

Genuine D/F MACHINE SPECIALTIES, Inc. Parts, Accessories, and Consumables must be used for safety and performance reasons. The use of anything other than genuine D/F MACHINE SPECIALTIES, Inc. Parts, Accessories, or Consumables will void this Warranty. All units returned for warranty repair are subject to Warranty Inspection. Warranty and repair work shall not apply to goods that have been altered or repaired, have been subject to misuse or used while any parts are loose, broken, or damaged, or used with other than original D/F® parts, consumables, or accessories which may affect performance and safety.

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