



Instruction Manual 750-18  
"BIG MIG®" NCM18 1000 Amp  
Revised 02/2018

# D/F MACHINE SPECIALTIES®, INC.

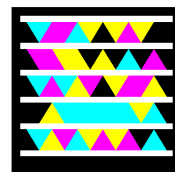
*MIG & TIG Welding Products, Consumables & Accessories*

1750 Howard Drive, North Mankato, MN 56003  
Phone: (507) 625-6200 Fax: (507) 625-6203  
[www.dfmachinespecialties.com](http://www.dfmachinespecialties.com)

## WATER-COOLED "BIG MIG®" MACHINE BARRELS



Models:  
NCM18 - Slip-In Tip  
HTM18 - Threaded Tip



**INSTRUCTIONS, 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) Specifications, (Table 2) Ordering Information .....5

Disassembly, Assembly .....6

Model NCM18 - Parts .....7

Model HTM18 - Parts .....8

(Table 2) Gas Nozzles, (Table 3) Current Tips, (Table 4) Spare Parts.....9

Required Tools List for Disassembly & Assembly..... 10-11

How Do I Cut, Fit, and Install a New Liner?..... 12

What is the Proper Use of the Nozzle Thread Chaser Tap?..... 13

Alignment Tube Assembly - NCM18..... 14

Alignment Tube Assembly - HTM18 ..... 15

Machine Barrel Indirect Mounting..... 16

Utility Station..... 17

Wire Feeder Adapters, Inlets ..... 18

Troubleshooting ..... 19-22

## 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.

---

### IMPORTANT

The D/F torch is famous for the fact, that if it is chilled properly, the welder can grab the chrome front water-cooled barrel (not the copper gas nozzle/cup) of the torch with their bare hand and it will be cold to the touch seconds after welding. With the proper chiller, this can be done even after a 4 hour arc time.

Make certain the cooling water supply is at least the minimum flow rate of 1 gallon per minute (for each inner body), at 40 psi (80 psi maximum) with a 6 gallon reservoir and a recommended 30,000 BTU/hr cooling capacity. Gun ratings are affected by shielding gas used, arc time, cooling time and inlet water temperature. Water outlet temperature should not exceed 27°C (80°F). The torch's water out & power cable is not cooled until the coolant has gone through the torch and out the water out & power cable. If water is not flowing through the D/F torch for at least 1 minute prior to striking an arc, when you apply the power and water hits the "hot" water/out & power cable, you will generate steam. Steam can damage the torches internals in seconds causing a leak. It can also blow out the torches water/out & power cable. A flow switch can be installed after the return line ensuring that coolant is present at the return line prior to striking an arc.

**\*\*When High-Deposition GMAW, high current density, high amperages, preheat, or extended periods of arc time are used, a refrigerated liquid chiller with a larger reservoir is required. Precise temperature control maintains the cooling at a constant 13°C (55°F) temperature, thus prolonging the life of the welding equipment and more specifically extending the service life of the gas nozzle and current tip.**

A water chiller or refrigerated liquid chiller for GMAW may be obtained from:

For normal duty cycle single torch chillers: Dynaflux - 800-334-4420 - [www.dynaflux.com](http://www.dynaflux.com)

**\*\*For extreme duty cycles or multiple torch cooling systems: MTA Refrigerated Chillers - 716-693-8651 - <https://www.mta-it.com/eng/>**

---

## INTRODUCTION

These high current water-cooled machine barrels offer a design with interchangeability of models for mechanized gas metal arc welding, usually referred to as MIG welding.

A unique feature of these water-cooled machine barrels is that the nozzle assembly water chambers are serially connected to each other with removable connectors making it a relatively simple matter to detach the nozzle assembly, thus completely eliminating the need for gaskets in the water passage system.

The model NCM18 as provided will accommodate 4" slip-in current tips fastened by a collet action nut. The suggested current level for the NCM18 with the threaded gas nozzles is 1000 amperes. The model HTM18 as provided will accommodate the 7/16" threaded tips, applied using the adapter nut. The suggested current level for the HTM18 with the threaded gas nozzles is 1000 amperes. The water-cooled nozzle accepts threaded gas nozzles which are available as outlined in Table 2. This barrel is provided primarily for wire diameters from 1/16" thru 1/8".

To select a particular model to be applied to any given welding application, two factors must be considered. First, what will be the wire diameter involved, and secondly, the amount of shielding required over the weld bead width of the molten metal. The model NCM18 which accommodates threaded gas nozzles with bores of 1.570" I.D. will adequately shield the weld pool thru a width of approximately 1.250" to 1.50". Wire diameters with the latter would be 1/16" and 3/32" soft wires, and 3/32" - 7/64" - 1/8" diameter cored wires. The above conditions will also be affected by the application geometry, that is, will it be a fillet weld, deep groove, etc.

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 - SPECIFICATIONS

MODEL	CURRENT CAPACITY	CURRENT CAPACITY W/ TH'D GAS NOZZLE	LENGTH	DIAMETER OF BODY HOUSING	WEIGHT (APPROX.)	COOLING REQ'D	RECOMMENDED WIRE DIAMETER RANGE
NCM18	1000 amp	1000 amp	16"	2.375"	11.8 lbs.	1 gal/min	.030"-5/32" Hard/Cored 3/64"-1/4" AL
HTM18	1000 amp	1000 amp	16"	2.375"	11.8 lbs.	1 gal/min	.030"-5/32" Hard/Cored 3/64"-1/4" AL

## ORDERING INFORMATION

### MODEL NCM18/HTM18 "BIG MIG®" COMPLETE ASSEMBLIES

Description									
Model NCM18/HTM18 "BIG MIG®" with Utilities*									
2 Ft.	3 Ft.	4 Ft.	5 Ft.	6 Ft.	7 Ft.	8 Ft.	10 Ft.	12 Ft.	15 Ft.
11660	11661	11662	11663	11664	11665	11666	11667	11668	11669

\* Current tip type (slip-in or threaded) must be specified when ordering.

### MODEL NCM18/HTM18 "BIG MIG®" COMPLETE BARREL ONLY

Description	
Model NCM18/HTM "BIG MIG®" no Utilities*	11659

\* Current tip type (slip-in or threaded) must be specified when ordering.



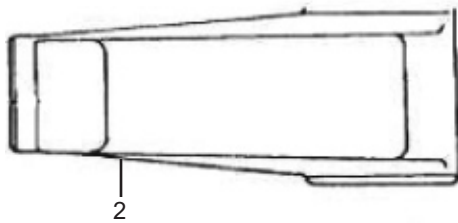
## DISASSEMBLY

1. All repairs and adjustments to barrel assemblies are made with the power source and feeder turned off.
2. Unscrew the collet nut/tip adapter nut (11/16") with wrench (12114) supplied. Remove the forward gas nozzle, current tip with the wrench (12111) supplied, and spatter disc.
3. Remove the knurled nut retaining the water-cooled nozzle assembly.
4. With a screw driver, remove the slotted barrel body holding screws. The upper shell may now be removed from the barrel body.
5. Push the body housing back from the water-cooled nozzle assembly. The nylon insulators at the water-cooled nozzle rear collar are now exposed. Push these insulators into the body housing concaves which will then expose the interconnection water hose fittings.
6. With a 7/16" open end wrench, unscrew the water hose nuts from the water-cooled nozzle assembly.
7. The water-cooled nozzle can now be pulled from the barrel assembly.
8. The barrel housing can now be pulled from the inner body with a slight twisting motion.
9. The alignment tube, used for centering the liner, can be removed after unscrewing the collet nut/tip adapter nut with wrench (12114) by pushing the alignment tube with a screw driver or non-sharp object toward the service connections at the rear of the inner body.
10. If the adapter is worn or damaged proceed as follows. Two (2) 3/4" open end wrenches are needed to remove the adapter/jam nut assembly from the inner body. Break the jam nut loose first, and then remove the assembly.

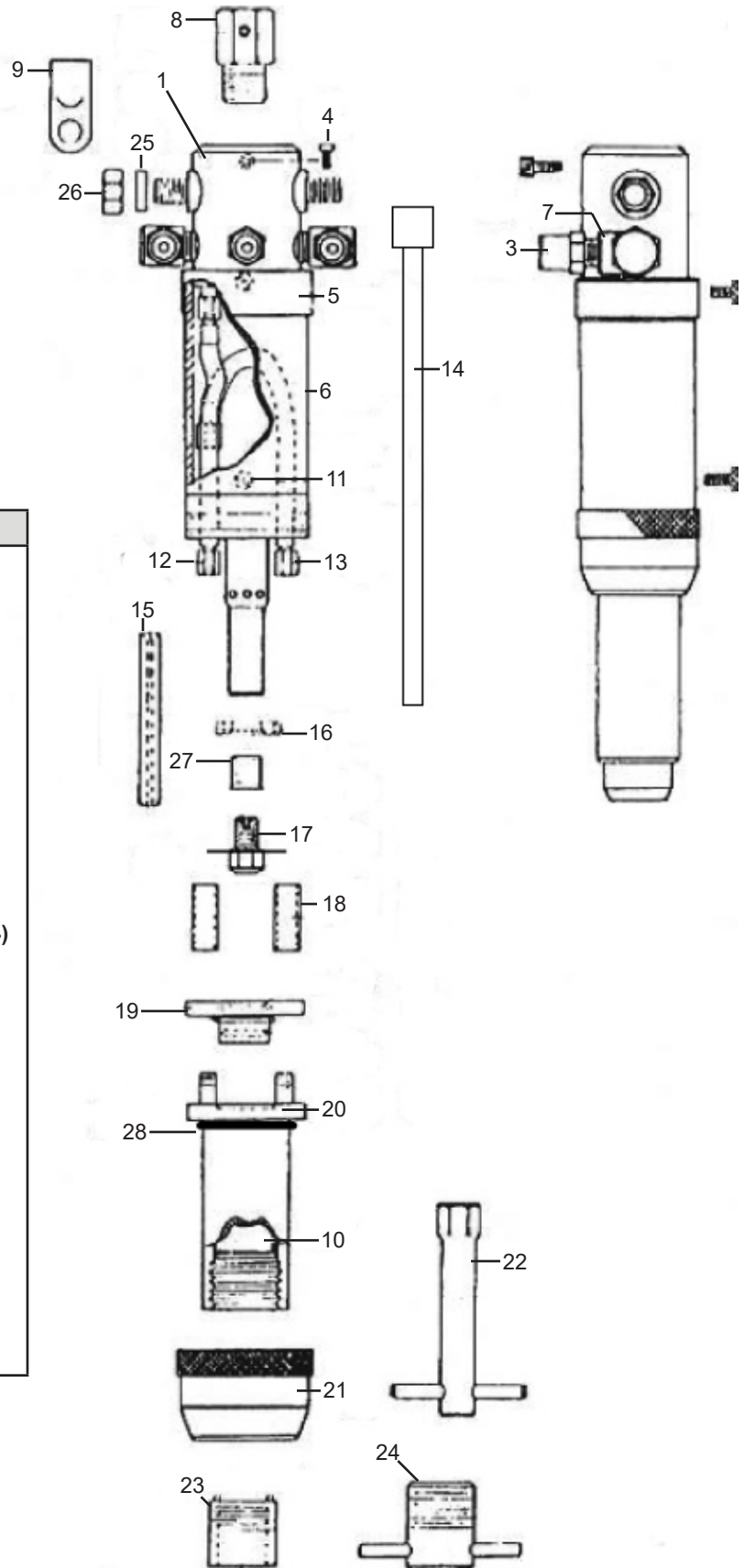
## ASSEMBLY

1. Apply the adapter assembly. Fully tighten the adapter until it is securely seated. Using two (2) 3/4" open ended wrenches, firmly tighten the jam nut to lock in the adapter assembly.
2. To assemble the water-cooled gun, connect all service lines to the inner body, including the interconnection hose assembly which attaches to the water-cooled nozzle. Before connecting a replacement interconnection hose (10971) note position of spring liner within hose assembly. It is mandatory to connect the end of the hose to the inner body water fitting using the end that indicates the spring liner closest to it. If the spring is in the middle of the interconnection hose assembly you must gently tap the spring all the way down towards one of the fittings of the interconnection hose assembly prior to bending it. The fitting with the spring touching it is the one that should be connected to the inner body. In other words the hose 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 manually before applying it to the rear of the inner body.
3. Place the interconnection water hose assembly extending outward from the inner body casting in the upper right hand concave (Note: it may be necessary to temporarily tape the hose to the front end of the inner body), then push the inner body assembly in from the rear of the body housing until the casting is extending forward from the body housing. Insert the two (2) nylon insulating tubes over the interconnection hose fittings.
4. The nylon collar should be placed over the fittings on the rear of the water-cooled nozzle assembly. It is important that the alignment indicator hole (viewed from the rear of the nozzle) be on the same side as the gas service hose/fitting at the rear of the inner body. Carefully tighten the 7/16" nuts of the water-cooled nozzle assembly. If necessary, use long-nosed pliers to pull the 10724 insulators back down from the concaves in the body housing. A slight twisting motion will aid in aligning the body housing concaves as the housing is pulled back into position against the nylon collar. You may now put the upper shell into position and align the screw holes. Same applies to location and alignment of the body screw. Apply the knurled nut to retain the water-cooled nozzle assembly. Replace the water-cooled nozzle insulation tube.
5. On the Model NCM15 place the spatter disc with counter-bored end facing the inner body into the Water-Cooled Nozzle, and apply the current tip with the wrench supplied (12111), collet nut/tip adapter nut with the wrench supplied (12114) and gas nozzle. Always wire brush the gas nozzle threads and blow out the water-cooled nozzle threads before reapplying the gas nozzle.
- 6 CAUTION: Never mount over the "HOT" flat head inner body holding screw (12612).

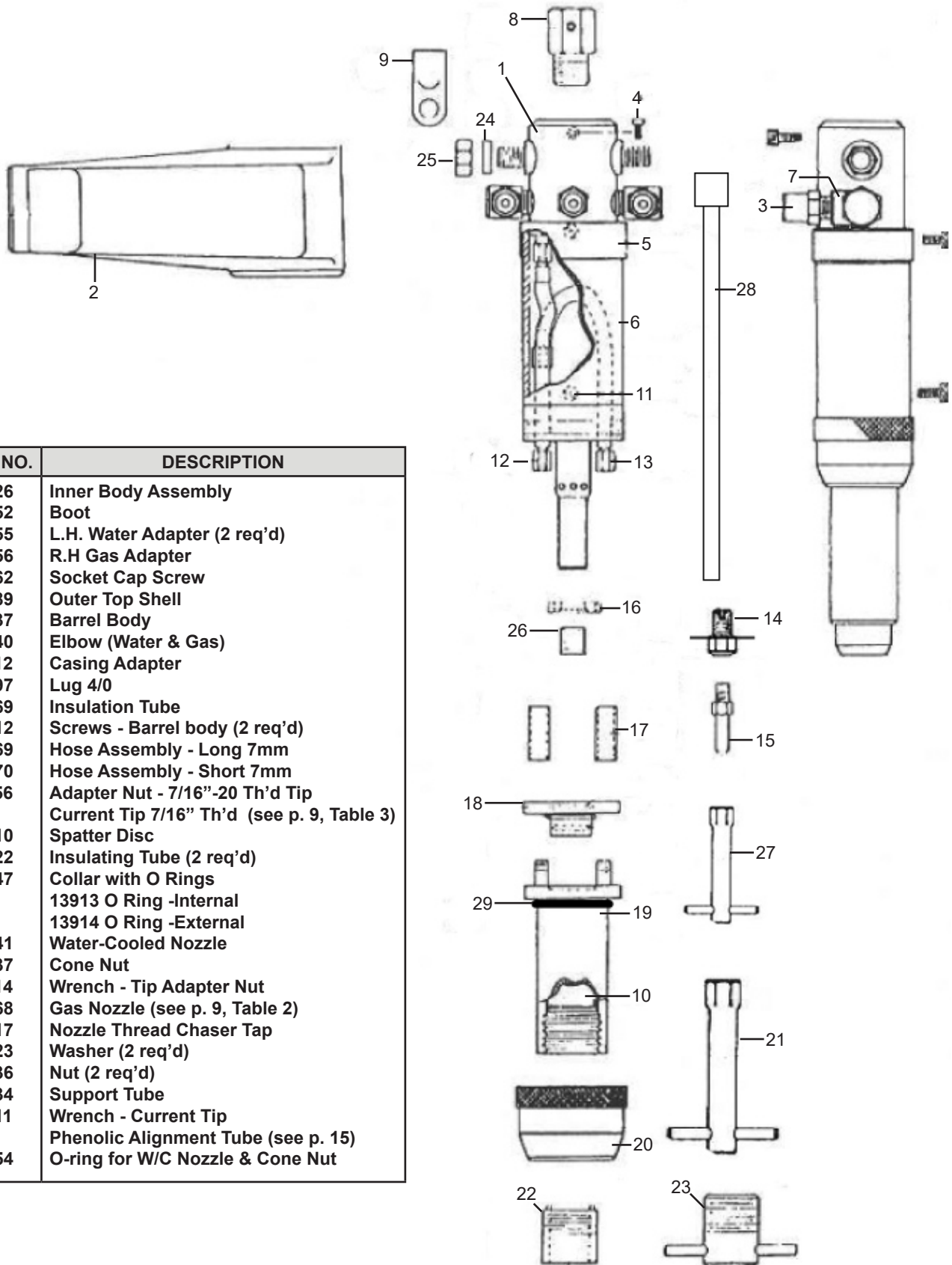
# WATER-COOLED MACHINE BARREL - MODEL NCM18



REF.	CODE NO.	DESCRIPTION
1	14026	Inner Body Assembly
2	14052	Boot
3	14555	L.H. Water Adapter (2 req'd)
	14556	R.H. Gas Adapter
4	14262	Socket Cap Screw
5	13989	Outer Top Shell
6	14037	Barrel Body
7	16040	Elbow (Water & Gas)
8	14112	Casing Adapter
9	14397	Lug 4/0
10	41669	Insulation Tube
11	12612	Screws - Barrel body (2 req'd)
12	10969	Hose Assembly - Long 7mm
13	10970	Hose Assembly - Short 7mm
14		Phenolic Alignment Tube (see p. 14)
15		Current Tip 4" (see p. 9, Table 3)
16	10410	Spatter Disc/Gas Diffuser
17	11948	Collet Nut
18	10722	Insulating Tube (2 req'd)
19	10747	Collar with O Rings 13913 O Ring -Internal 13914 O Ring -External
20	41641	Water-Cooled Nozzle
21	41637	Cone Nut
22	12114	Wrench - Collet Nut
23	41668	Gas Nozzle (see p. 9, Table 2)
24	14617	Nozzle Thread Chaser Tap
25	14323	Washer (2 req'd)
26	14336	Nut (2 req'd)
27	19334	Support Tube
28	10954	O-ring for W/C Nozzle & Cone Nut



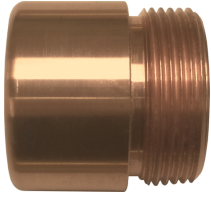
# WATER-COOLED MACHINE BARREL - HTM18



REF.	CODE NO.	DESCRIPTION
1	14026	Inner Body Assembly
2	14052	Boot
3	14555	L.H. Water Adapter (2 req'd)
	14556	R.H Gas Adapter
4	14262	Socket Cap Screw
5	13989	Outer Top Shell
6	14037	Barrel Body
7	16040	Elbow (Water & Gas)
8	14112	Casing Adapter
9	14397	Lug 4/0
10	41669	Insulation Tube
11	12612	Screws - Barrel body (2 req'd)
12	10969	Hose Assembly - Long 7mm
13	10970	Hose Assembly - Short 7mm
14	11956	Adapter Nut - 7/16"-20 Th'd Tip
15		Current Tip 7/16" Th'd (see p. 9, Table 3)
16	10410	Spatter Disc
17	10722	Insulating Tube (2 req'd)
18	10747	Collar with O Rings
		13913 O Ring -Internal
		13914 O Ring -External
19	41641	Water-Cooled Nozzle
20	41637	Cone Nut
21	12114	Wrench - Tip Adapter Nut
22	41668	Gas Nozzle (see p. 9, Table 2)
23	14617	Nozzle Thread Chaser Tap
24	14323	Washer (2 req'd)
25	14336	Nut (2 req'd)
26	19334	Support Tube
27	12111	Wrench - Current Tip
28		Phenolic Alignment Tube (see p. 15)
29	10954	O-ring for W/C Nozzle & Cone Nut



## TABLE 2 - GAS NOZZLES



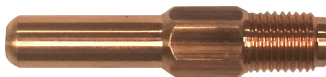
(Used Only With Models NCM18/HTM18)

Code No.	Type	I.D.
41668	Copper	1.562

## TABLE 3 - CURRENT TIPS

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



CURRENT TIPS - 7/16" DIAMETER SLIP-IN

Gun/Barrel Model	Wire Size	Wire Type	Code No.
NCM15 (Tip provides 3/8" set back)	1/16"	Hard/Cored	15181
	5/64"	Hard/Cored	15182
	3/32"	Hard/Cored	15183
	7/64"	Hard/Cored	15184
	1/8"	Hard/Cored	15185
	5/32"	Hard/Cored	15186
NCM15 (Tip provides 1/8" set back)	1/16"	Aluminum	10798
	3/32"	Aluminum	10799
	1/8"	Aluminum	10800
	5/32"	Aluminum	15186
	3/16"	Aluminum	15169
	7/32"	Aluminum	15170



## TABLE 4 - SPARE PARTS

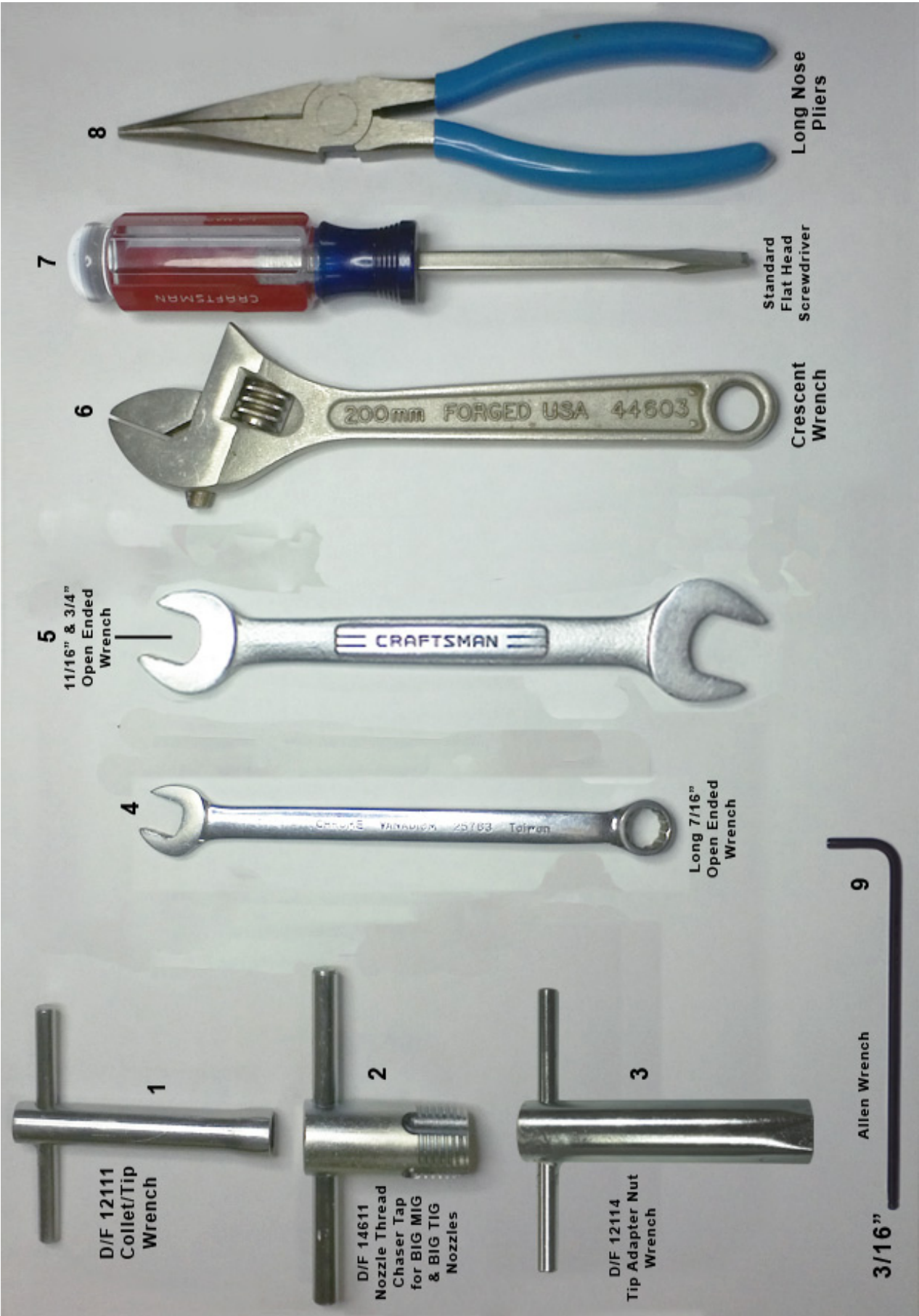
D/F recommends the spare parts below to be prepared for an accident or unexpected down-time with each torch.

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

## 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 14611 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. **D/F 12114 Tip Adapter Nut Wrench** - This is the only tool that should ever be used to tighten the tip adapter nut. Pressure should be 30 lbs., or as snug as hand tightened. Never use another wrench to apply more torque to this wrench.
4. **Long 7/16" Open Ended Wrench**
  - A. A short wrench will work, however we prefer the feel and comfort of the long 7/16" open ended wrench. This is used to loosen or tighten interconnection hoses to the fitting on the inner body.
  - B. Also use this wrench to connect the torch's water-cooled nozzle assembly to the interconnection hoses.
5. **11/16" & 3/4" Open Ended Wrench**
  - A. The 3/4" Open Ended Wrench is used on the inner body's water in and gas elbow fittings to secure them to the torch's inner body. 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 also use the 3/4" Open Ended Wrench to secure the water in and gas adapters to the elbows, and the water out adapter to the inner body.
  - B. The 11/16" Open Ended Wrench is used to secure the gas hose and water in/water out & power cables or hoses to the torch's inner body.
  - C. The 3/4" Open Ended Wrench is also used to secure the adapter and jam nut that hold the tip adapter nut which holds the current tip in the inner body. In your left hand hold the inner body, and with your right hand thread up the adapter using the 3/4" 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 another 3/4" Open Ended Wrench, place it on the adapter and push it down (counter-clockwise) securing the adapter to the inner body.
6. **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.
7. **Standard Flat Head Screwdriver** - This is used to tighten or secure the torch's body screw. 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.
8. **Long Nose Pliers** - These are used to grab the small white insulation tubes (10724) 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.
9. **3/16" Allen Wrench** - This is used to secure the socket cap screw that holds the casing adapter in the inner body. It is also used to secure the socket cap screw that holds the casing in the casing adapter.

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



# ALIGNMENT TUBE ASSEMBLY

## NCM18 (4" Slip-In Tip)

### Phenolic Alignment Tube - Aluminum Wire

\*Replacement Barrel Liner

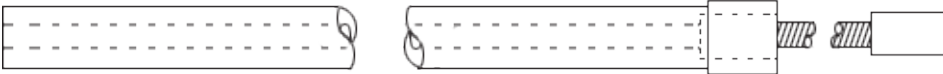


Phenolic Alignment Tube Accepts Barrel Liner for 4" Assembly	
Description	Code No.
1/16" Dia. AL Wire	14401
3/32" Dia. AL Wire	14403
1/8" Dia. AL Wire	14413
5/32" Dia. AL Wire	14407
3/16" Dia. AL Wire	14416
7/32" Dia. AL Wire	14417
1/4" Dia. AL Wire	14418
5/16" Dia. AL Wire	14425

*Barrel Liner For Replacement 4" Tip	
Description	Code No.
1/16" Dia. AL Wire	14203
3/32" Dia. AL Wire	14205
1/8" Dia. AL Wire	14207
5/32" Dia. AL Wire	14208

### Phenolic Alignment Tube - Stainless Steel/Hard/Cored Wire

\*Replacement Barrel Liner



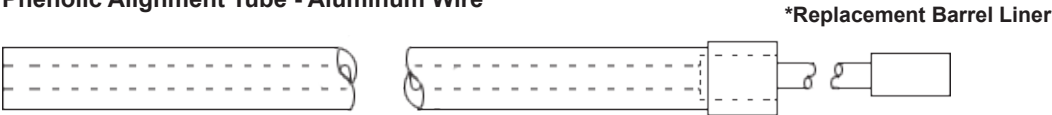
Phenolic Alignment Tube Accepts Barrel Liner for 4" Assembly	
Description	Code No.
.045"-1/16" Dia. SS/Hard/Cored Wire	14420
5/64" - 1/8" Dia. SS/Hard/Cored Wire	14421
5/32" - 3/16" Dia. SS/Hard/Cored Wire	14426
7/32" - 1/4" Dia. SS/Hard/Cored Wire	14414
5/16" Dia. SS/Hard/Cored Wire	14415

*Barrel Liner For Replacement 4" Tip	
Description	Code No.
.045"-1/16" Dia. SS/Hard/Cored Wire	14182
5/64" - 1/8" Dia. SS/Hard/Cored Wire	14424
5/32" - 3/16" Dia. SS/Hard/Cored Wire	14193
7/32" - 1/4" Dia. SS/Hard/Cored Wire	14194
5/16" Dia. SS/Hard/Cored Wire	14195

# ALIGNMENT TUBE ASSEMBLY

## HTM18 (7/16” Threaded Tip)

### Phenolic Alignment Tube - Aluminum Wire



Phenolic Alignment Tube Accepts Barrel Liner for 7/16” Assembly	
Description	Code No.
1/16” Dia. AL Wire	14400
3/32” Dia. AL Wire	14402
1/8” Dia. AL Wire	14442
5/32” Dia. AL Wire	14406
3/16” Dia. AL Wire	14408
7/32” Dia. AL Wire	14409
1/4” Dia. AL Wire	14410
5/16” Dia. AL Wire	14411

*Barrel Liner For Replacement 7/16” Tip	
Description	Code No.
1/16” Dia. AL Wire	14203
3/32” Dia. AL Wire	14205
1/8” Dia. AL Wire	14207
5/32” Dia. AL Wire	14208

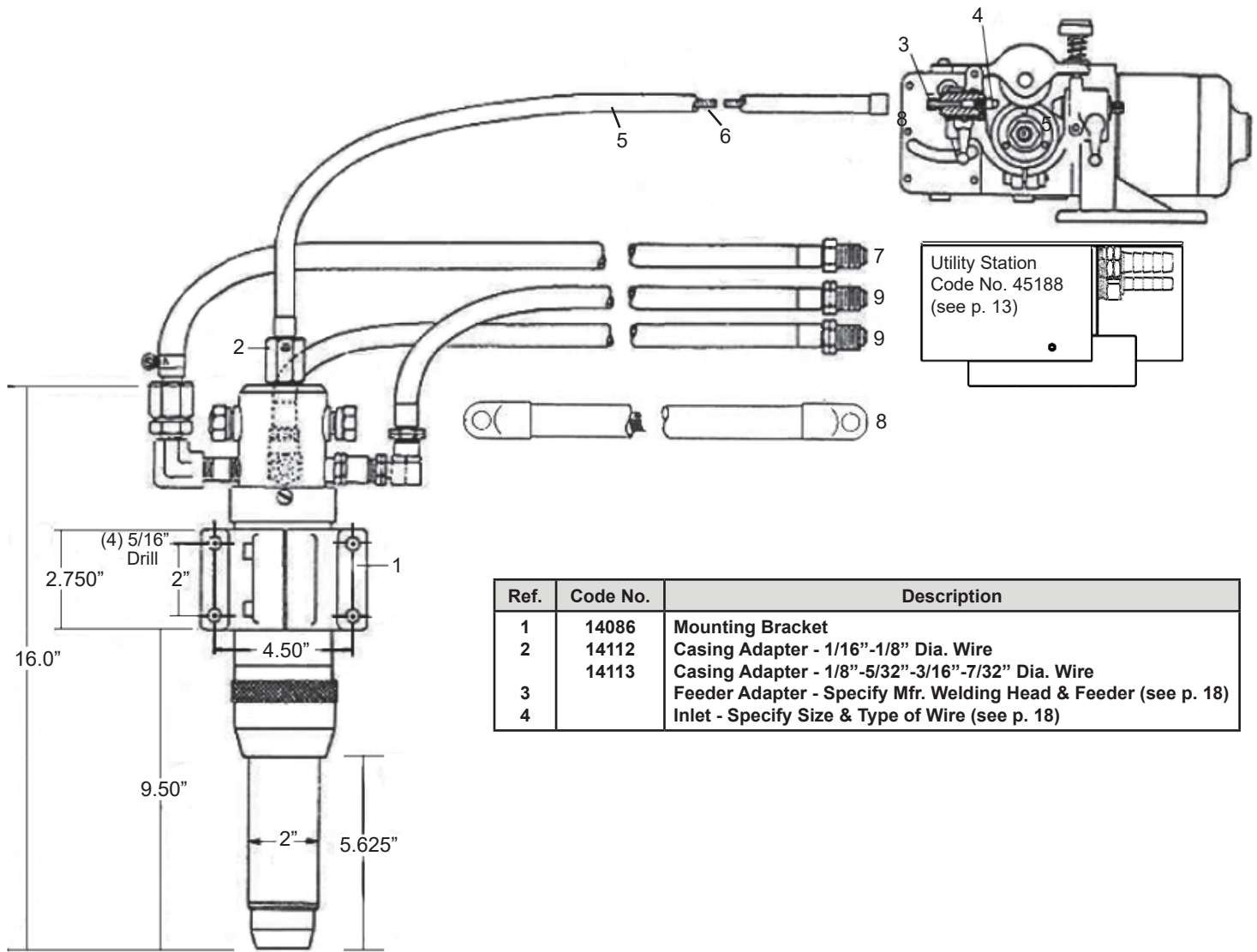
### Phenolic Alignment Tube - Stainless Steel/Hard/Cored Wire



Phenolic Alignment Tube Accepts Barrel Liner for 7/16” Assembly	
Description	Code No.
.045”-1/16” Dia. SS/Hard/Cored Wire	14419
5/64”-1/8” Dia. SS/Hard/Cored Wire	14422
5/32”-3/16” Dia. SS/Hard/Cored Wire	14423
7/32”-1/4” Dia. SS/Hard/Cored Wire	14427
5/16” Dia. SS/Hard/Cored Wire	14428

*Barrel Liner For Replacement 7/16” Tip	
Description	Code No.
.045”-1/16” Dia. SS/Hard/Cored Wire	14182
5/64” - 1/8” Dia. SS/Hard/Cored Wire	14424
5/32” - 3/16” Dia. SS/Hard/Cored Wire	14193
7/32” - 1/4” Dia. SS/Hard/Cored Wire	14194
5/16” Dia. SS/Hard/Cored Wire	14195

# MACHINE BARREL REMOTE MOUNTING



Ref.	Code No.	Description
1	14086	Mounting Bracket
2	14112	Casing Adapter - 1/16"-1/8" Dia. Wire
3	14113	Casing Adapter - 1/8"-5/32"-3/16"-7/32" Dia. Wire
4		Feeder Adapter - Specify Mfr. Welding Head & Feeder (see p. 18)
		Inlet - Specify Size & Type of Wire (see p. 18)

Ref.	Description	2 Ft.	3 Ft.	4 Ft.	5 Ft.	6 Ft.	8 Ft.	10 Ft.	12 Ft.	15 Ft.
5	Casing Assembly (Flexible)									
	Requires Replacement Liner Below									
	.030"-.035" (Select Liner)	46350-2	46350-3	46350-4	-5	-6	-8	-10	-12	-15
	.035"-1/16" (Select Liner)	46370-2	46370-3	46370-4	-5	-6	-8	-10	-12	-15
	Casing Assembly (Reinforced)									
	Single Piece - .035"-.045"	46420-2	46420-3	46420-4	-5	-6	-8	-10	-12	-15
	Single Piece - .045"-1/16"	46440-2	46440-3	46440-4	-5	-6	-8	-10	-12	-15
	Single Piece - 5/64"-3/32"	46460-2	46460-3	46460-4	-5	-6	-8	-10	-12	-15
	Single Piece - 7/64"-1/8"	46480-2	46480-3	46480-4	-5	-6	-8	-10	-12	-15
6	Wire Liner - Hard Wire .030"	47020-2	47020-3	47020-4	-5	-6	-8	-10	-12	-15
	Wire Liner - Hard Wire .035"-.045"	47021-2	47021-3	47021-4	-5	-6	-8	-10	-12	-15
	Wire Liner - Hard/Cored .045"-1/16"	47022-2	47022-3	47022-4	-5	-6	-8	-10	-12	-15
	Soft Liner for Aluminum 3/64"	47023-2	47023-3	47023-4	-5	-6	-8	-10	-12	-15
	Soft Liner for Aluminum 1/16"	47024-2	47024-3	47024-4	-5	-6	-8	-10	-12	-15
	Soft Liner for Aluminum 3/32"	47025-2	47025-3	47025-4	-5	-6	-8	-10	-12	-15
7	Gas Hose Assembly 3/8" Hose	16575-2	16575-3	16575-4	-5	-6	-8	-10	-12	-15
8	Power Cable 2/0	15263-2	15263-3	15263-4	-5	-6	-8	-10	-12	-15
	Power Cable 4/0	15270-2	15270-3	15270-4	-5	-6	-8	-10	-12	-15
9	Water In/Out & Cable Assy (L.H. Nut Each End)	19645-2	19645-3	19645-4	-5	-6	-8	-10	-12	-15
	Water In/Out Hose Assy - 3/8" Hose (NO CABLE)	14510	14511	14512	14513	14514				

# UTILITY STATION 45188 - DUAL POWER

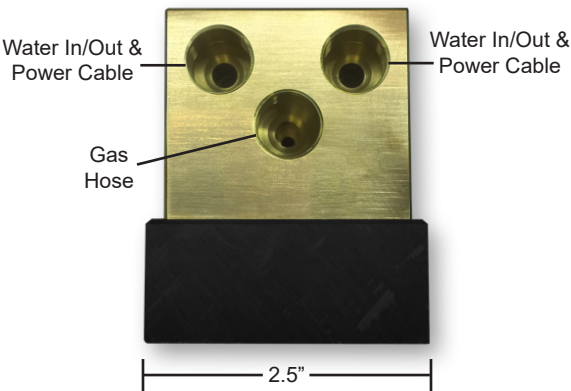
## ORDERING INFORMATION

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

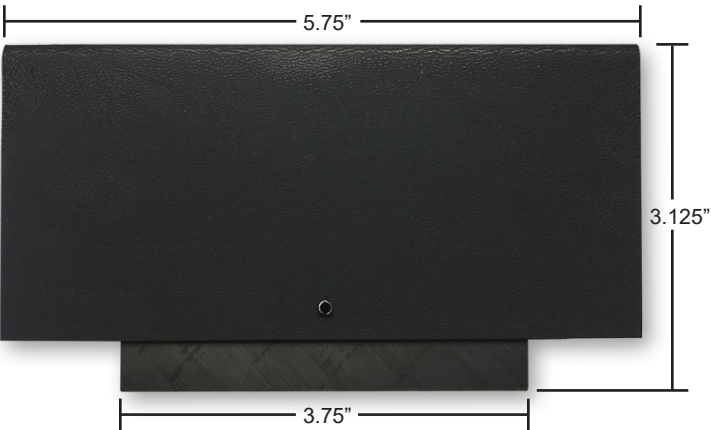
## DIMENSION SPECIFICATIONS

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.

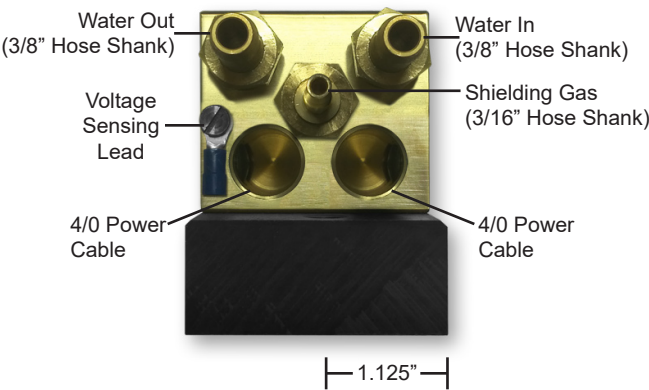
### D/F TORCH CONNECTION



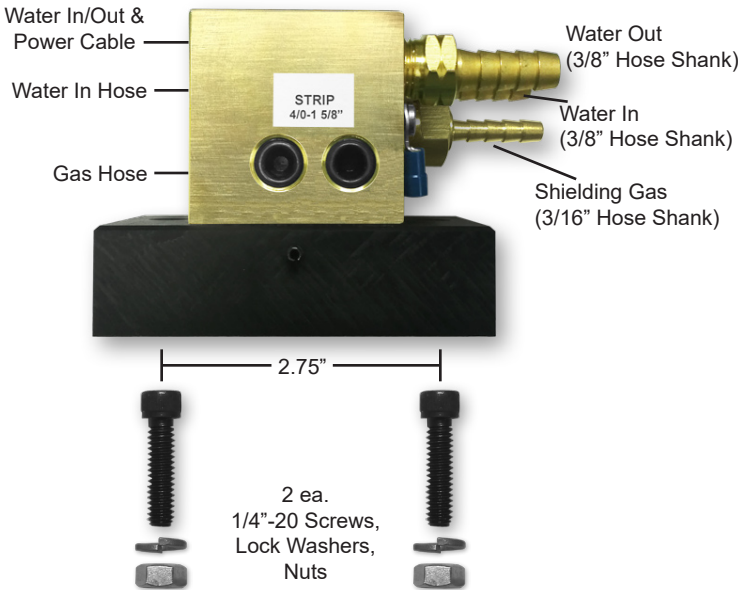
### UTILITY STATION SIDE VIEW WITH COVER



### 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
Linde® "BIG MIG®"						13082	
Lincoln® "BIG MIG®"	NA3, NA4, NA5	.030"-3/32" H/C/AL 5/64"-1/8" H/C	16879	16878	Specify	16888	16888
Miller® "BIG MIG®"						13139	

### 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.

Lincoln®, Linde®, & Miller® 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.

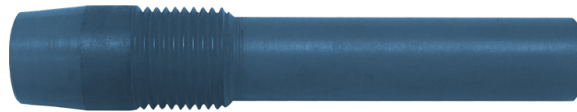
\*Stub liners only required in feeder adapter when single-piece casing is used.



**13082 Wire Feeder Adapter**  
Use with Linde® SEH-3 Welding Head

### ORDERING INFORMATION - SOFT INLET

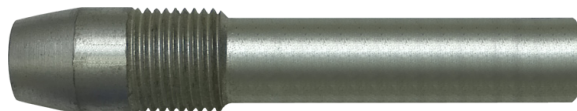
Code No.	Wire Size	Color
13817	1/16"	White
13818	3/32"	Blue
13819	1/8"	Yellow
13820	5/32"	Brown
13821	3/16"	Green
13822	7/32"	Orange
13823	1/4"	Black
13824	5/16"	Purple
13825	3/8"	Pink



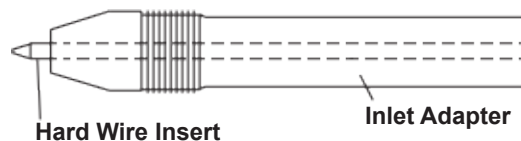
**Soft Inlet (#13818 3/32" Blue Inlet Shown)**

### ORDERING INFORMATION - HARD INLET

Code No.	Wire Size	Description
13826	1/16"	Inlet
13827	5/64"	Inlet
13828	3/32"	Inlet
13829	7/64"	Inlet
13830	1/8"	Inlet
16596	Inlet Adapter .045"-1/16" Wire	
16615	.045"	Insert
16616	1/16"	Insert
16617	5/64"-3/32"	Insert



**Hard Inlet**





# 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*

---

## 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.

---



Rev. 160817-2

**D/F MACHINE SPECIALTIES®, INC.**

**1750 Howard Drive**

**North Mankato, MN 56003**

**Phone: (507) 625-6200**

**Fax: (507) 625-6203**

**[www.dfmachinespecialties.com](http://www.dfmachinespecialties.com)**