



Air-Cooled



Water-Cooled



## **TECHNICAL GUIDE**

**TOUGH GUN™ Automatic  
Air-Cooled MIG Guns  
500 amp & 600 amp**

**TOUGH GUN™ Automatic  
Water-Cooled MIG Guns  
450 amp & 600 amp**

- SAFETY & WARRANTY INFORMATION
- INSTALLATION
- MAINTENANCE GUIDE
- TECHNICAL DATA
- OPTIONS
- EXPLODED VIEW & PARTS LIST
- TROUBLESHOOTING
- ORDERING INFORMATION

Effective September 2010 –  
**QUICK LOAD™ Liners Standard on all  
TOUGH GUN™ Robotic Air-Cooled MIG Guns**

*Certified ISO 9001 : 2008  
Please read instructions prior to use.  
Save this manual for future reference.*

# TABLE OF CONTENTS

<b>THANK YOU...</b> .....	<b>2</b>
<b>WARRANTY</b> .....	<b>3</b>
<b>GENERAL SAFETY</b> .....	<b>3</b>
<b>1.0 – INSTALLATION</b> .....	<b>4</b>
1.1 INSTALLING QUICK CONNECT BLOCK TO FEEDER .....	4
1.2 INSTALLING GUN TO QUICK CONNECT BLOCK.....	4
1.3 INSTALLING TOUGH GUN™ MIG GUNS EQUIPPED WITH “DIRECT PLUG-INS” .....	5
<b>2.0 – MAINTENANCE</b> .....	<b>5</b>
2.1 NOZZLE AND CONTACT TIP SYSTEMS – AIR-COOLED GUNS .....	5
2.2 NOZZLE AND CONTACT TIP SYSTEMS – WATER-COOLED GUNS .....	6
2.3 NECK REPLACEMENT – AIR-COOLED GUNS .....	6
2.4 NECK REPLACEMENT – WATER-COOLED GUNS .....	7
2.5 LINER REPLACEMENT.....	7
2.6 UNICABLE REPLACEMENT – AIR-COOLED GUNS.....	8
2.7 CABLE BUNDLE REPLACEMENT – WATER-COOLED GUNS .....	8
<b>3.0 – TECHNICAL DATA</b> .....	<b>11</b>
3.1 NECK DIMENSIONS – AIR-COOLED GUNS.....	11
3.2 NECK DIMENSIONS – WATER-COOLED GUNS.....	11
3.3 RATINGS AND SPECIFICATIONS.....	11
<b>4.0 – OPTIONS</b> .....	<b>12</b>
4.1 DIRECT PLUG-INS.....	12
4.2 CONNECTOR OPTIONS – AIR-COOLED GUNS.....	12
4.3 CONNECTOR OPTIONS – WATER-COOLED GUNS.....	12
4.4 FEEDER ADAPTORS.....	13
<b>5.0 – TROUBLESHOOTING</b> .....	<b>13</b>
<b>6.0 – EXPLODED VIEW AND PARTS LIST – AIR-COOLED GUNS</b> .....	<b>14</b>
<b>7.0 – EXPLODED VIEW AND PARTS LIST – WATER-COOLED GUNS</b> .....	<b>15</b>
<b>8.0 – ORDERING INFORMATION</b> .....	<b>16</b>
8.1 TOUGH GUN AUTOMATIC AIR-COOLED MIG GUN ORDERING INFORMATION.....	16
8.2 TOUGH GUN AUTOMATIC WATER-COOLED MIG GUN ORDERING INFORMATION.....	16

## THANK YOU...

...for selecting a Tregaskiss™ TOUGH GUN™ MIG Gun. Manufacturing operations demand extremely dependable robotic equipment. As the name implies, the TOUGH GUN MIG Gun is made from durable materials and components engineered to perform in a rugged welding environment. Your TOUGH GUN MIG Gun is completely assembled and ready to weld, and has undergone numerous quality checks to ensure high performance.

The instructions and illustrations in this Technical Guide make it easy for you to maintain your TOUGH GUN MIG Gun. **Please read, understand, and follow all safety procedures.** Keep this booklet as a handy reference when ordering complete guns, parts and special options. **For technical support and special applications, please call the Tregaskiss Technical Service Department at 1-855-MIGWELD (644-9353) or fax 1-877-737-2111.** Our trained technicians are available between 8:00 a.m. and 5:00 p.m. EST, and will answer your application or repair questions. Please contact us immediately if you experience any safety or operating problems.

# WARRANTY

Product is warranted to be free from defects in material and workmanship for the period specified below after the sale by an authorized Buyer. Should there be a defect please refer to our Return Merchandise Policy.

PRODUCT	WARRANTY PERIOD
TOUGH GUN™ Robotic MIG Guns and Components	180 days
TOUGH GUN Reamer	1 year
TOUGH GARD™ Spatter Cleaner	1 year
TOUGH GUN Robotic Peripherals (Clutch, Sprayer, Wire Cutter, Mounting Arms)	1 year
Low-Stress Robotic Unicables (LSR Unicables)	2 years

Tregaskiss reserves the right to repair, replace or refund the purchase price of non-conforming product. Product found not defective will be returned to the Buyer after notification by Customer Service.

Tregaskiss makes no other warranty of any kind, expressed or implied, including, but not limited to the warranties of merchantability or fitness for any purpose. Tregaskiss shall not be liable under any circumstances to Buyer, or to any person who shall purchase from Buyer, for damages of any kind, including, but not limited to any, direct, indirect incidental or consequential damages or loss of production or loss of profits resulting from any cause whatsoever, including, but not limited to, any delay, act, error or omission of Tregaskiss.

Genuine Tregaskiss™ parts must be used for safety and performance reasons or the warranty becomes invalid. Warranty shall not apply if accident, abuse, or misuse damages a product, or if a product is modified in any way except by authorized Tregaskiss personnel.

## GENERAL SAFETY

Before installation or operation of TOUGH GUN MIG Guns, please read the safety precautions listed below.

1. Do not touch live electrical parts. The following should be checked to prevent electrical shock.
  - a. Faulty or damaged equipment is repaired or replaced.
  - b. Equipment is off when not in use.
2. Ensure that all safety devices, guards, shields or barriers are properly in place and connected correctly before allowing operation of the equipment.
3. CSA Standard W117.2 CODE FOR SAFETY IN WELDING AND CUTTING obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.
4. ANSI Standard Z49.1 CODE FOR SAFETY IN WELDING AND CUTTING obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

## CALIFORNIA PROPOSITION 65 WARNING

This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer.

This product contains chemicals, including lead, known to the State of California to cause cancer, and birth defects or other reproductive harm. *Wash hands after use.*

(California Health & Safety Code Section 25249.5 at seq.)



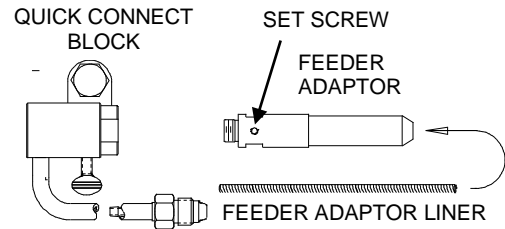
# 1.0 – INSTALLATION

**WARNING:** Ensure water supply is on before operating gun.

## 1.1 INSTALLING QUICK CONNECT BLOCK TO FEEDER

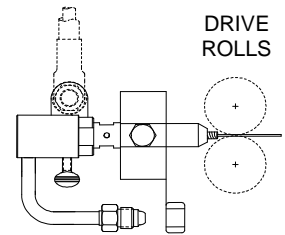
### STEP #1

- Insert the correct feeder adaptor liner for desired wire diameter (2 provided) flush with the threaded end of the feeder adaptor.
- Tighten set screw.
- Thread feeder adaptor into Quick Connect block and tighten.



### STEP #2

- Position assembly into feeder adaptor and trim liner within 1/16" (1.6 mm) of the drive rolls and remove burrs if necessary.
- Secure assembly into feeder.
- Thread gas hose nipple into feeder gas fitting.
- Connect power cable to 1/2" (13 mm) power bolt with appropriate lug.
- **Tighten all connections.**
- Feed welding wire through assembly by hand.

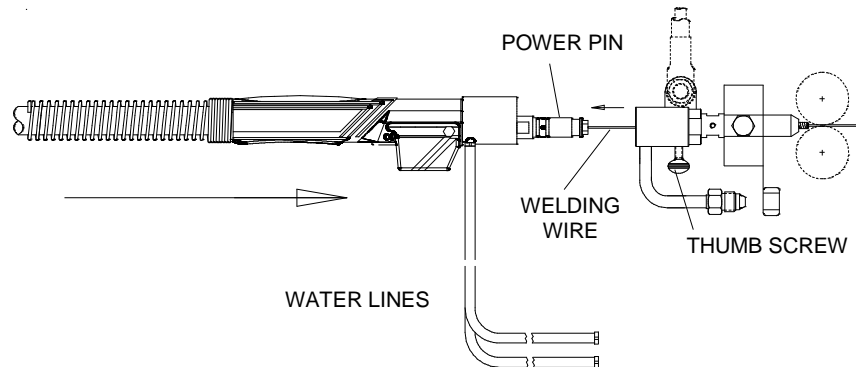


## 1.2 INSTALLING GUN TO QUICK CONNECT BLOCK

**NOTE:** Ensure correct liner and contact tip are utilized. Examine and replace power pin o-rings if necessary.

### STEP #1

- Guide welding wire into power pin.
- Insert power pin to shoulder.
- Tighten thumbscrew securely.
- Connect control plug lead to control housing on gun.
- Insert control plug into feeder.



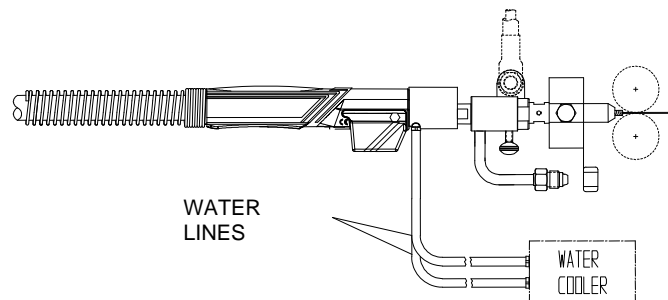
### STEP #2

- If using a water-cooled gun, securely clamp blue hose on rear housing to "Water Out" on water cooler and red hose on rear housing to "Water In" on water cooler.

**WARNING:** To prevent torch damage, it is highly advised that a Flow Sensor rated at 0.5 gpm be used at all times (Part Number 659-50).

**WARNING:** Ensure water supply is on before operation.

- Water flow sensor should be used to ensure water is on.
- Recheck proper gas flow, drive roll pressure, voltage, and wire feed speed.

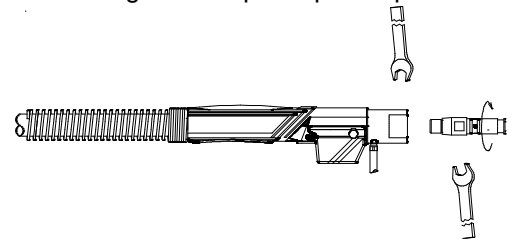


### 1.3 INSTALLING TOUGH GUN™ MIG GUNS EQUIPPED WITH “DIRECT PLUG-INS”

**IMPORTANT:** The thread-in two-piece power pin incorporates a taper to seat and lock in the power pin to the rear handle block. Make sure power pin is tightened in the block with a wrench to insure pin is secure and will not come loose.

**NOTE:** The rear handle and screws do not have to be removed when installing the two-piece power pins.

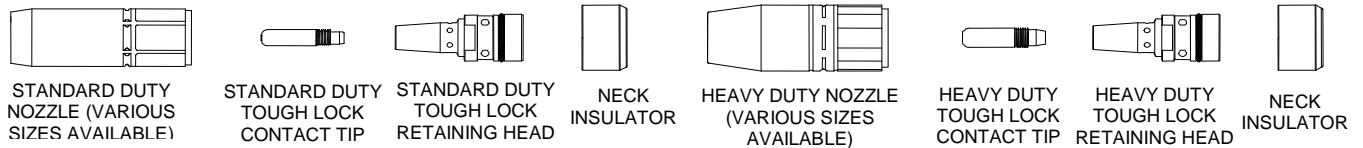
- Thread power pin into the rear handle block.
- Tighten the power pin into the rear block using a 1” (25 mm) wrench on the rear block and a 5/8” (16 mm) or 3/4” (19 mm) wrench on the power pin.
- Install liner (See **Section 2.5 LINER REPLACEMENT**).
- Install gun to feeder (See below).



- **Miller®, Tweco® #4 and #5, Lincoln® and Hobart® Power Pin**
  - Insert power pin to shoulder and secure.
  - Insert control plug to control housing of gun.
  - Insert control plug into feeder.
  - Feed welding wire into power pin by hand and tighten drive rolls.
  - On Lincoln it is necessary to connect gas hose to barbed fitting on power pin.
- **Bernard™ Style and Euro-Connector**
  - Feed welding wire through female adaptor by hand and tighten drive rolls.
  - Guide welding wire into connector on gun, carefully insert connector into female adaptor and tighten Euro hand nut or Bernard style locking collar.
- **ESAB® Power Pin (Non Euro Style)**
  - Insert power pin to shoulder and secure.
  - Feed welding wire into power pin by hand and tighten.

## 2.0 – MAINTENANCE

### 2.1 NOZZLE AND CONTACT TIP SYSTEMS – AIR-COOLED GUNS



#### IMPORTANT:

- Neck insulator must be in place before welding to maintain insulation of neck armor.
- Be sure all parts are tightened well before welding.
- Replace nozzle retainer with deep counter bore toward the neck. Tighten until retainer and shock washer are secure.

#### REMOVAL AND REPLACEMENT

- Pull slip-on nozzles off with a clockwise twisting motion.
- When installing nozzle, exposed insulator should nest inside shock washer to assure concentricity.
- Neck insulators are positioned on the end of the neck with the large insulated counter bore facing the nozzle.

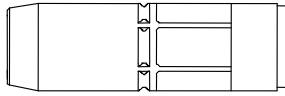
#### THREAD-ON (OPTIONAL)

- Thread-on nozzle system does not require nozzle retainer and cannot be used with heavy duty head.
- Neck insulator must be in place.
- External neck thread can be cleaned with a 9/16” - 18 die.

**NOTE:** Any of the above nozzle and contact tip systems can be used on the TOUGH GUN 350, 450, 550 or 650 amp models.

## 2.2 NOZZLE AND CONTACT TIP SYSTEMS – WATER-COOLED GUNS

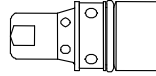
450 AMP



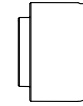
STANDARD DUTY NOZZLE  
VARIOUS LENGTHS



HEAVY DUTY  
CONTACT TIP



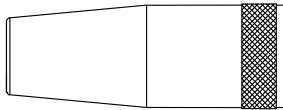
HEAVY DUTY  
GAS



NECK  
INSULATOR

600 AMP

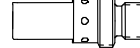
NOZZLE (THREAD ON)



TOUGH LOCK  
CONTACT TIP



TOUGH LOCK  
DIFFUSER



CERAMIC  
INSULATOR



### IMPORTANT

- Neck insulator must be in place before welding to maintain insulation of neck armor.
- Be sure all parts are tightened well before welding.
- When using the heavy duty retaining head make sure it is tightened with a 5/8" (16 mm) wrench to prevent overheating of contact tip.
- To prevent scoring on heavy duty retaining head do not use pliers.

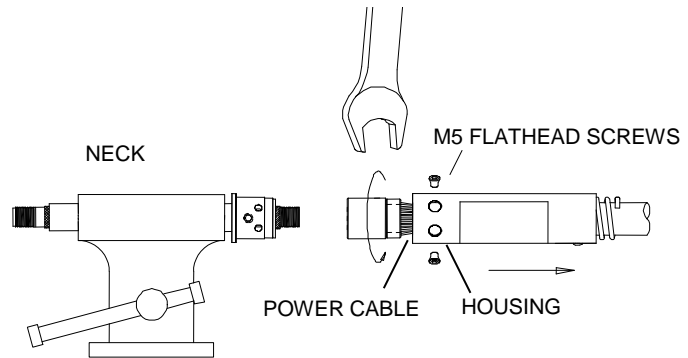
### REMOVAL AND REPLACEMENT

- Pull slip-on nozzles off with a clockwise twisting motion.
- When installing nozzle, exposed insulator should nest inside shock washer to assure concentricity.
- Neck insulators are positioned on the end of the neck with the large insulated counter bore facing the nozzle.
- Replace nozzle retainer with deep counter bore toward the neck. Tighten until retainer and shock washer are secure.

## 2.3 NECK REPLACEMENT – AIR-COOLED GUNS

### STEP #1

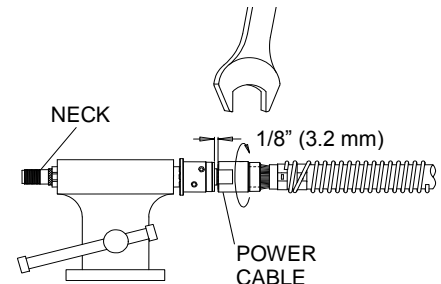
- Place neck in vise.
- Remove all four housing mounting screws with 3 mm (3/32") Allen wrench.
- Slide handle back exposing connector cone and crimp ring.
- Loosen connector cone from neck using a 25 mm (1") wrench.
- Remove from vise and thread out neck by hand.
- Cable connection between cone and crimp ring should not be disturbed.



### STEP #2

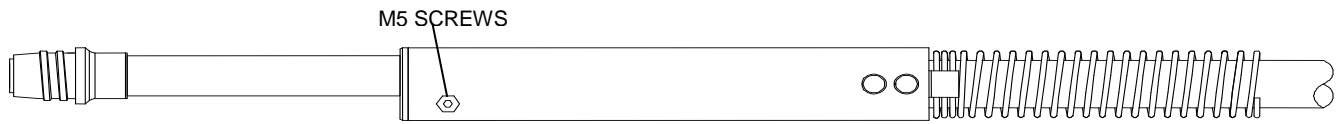
**NOTE:** The neck body is an integral part of the neck and the handle screws are metric (MS). New handle screws must be used when replacing the neck.

- Thread neck into connector cone (hand-tighten).
- Place neck in vise and tighten with 1" (25 mm) wrench to within 1/8" (3.2 mm) spacing between the connector cone and body.
- Slide housing forward and align with screw holes and body.



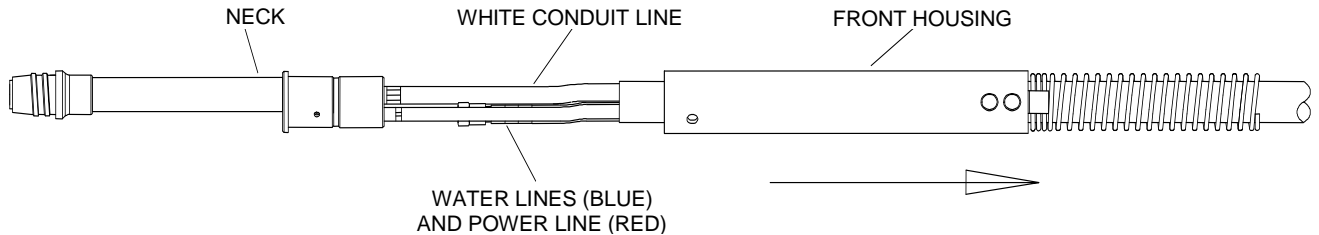
## 2.4 NECK REPLACEMENT – WATER-COOLED GUNS

### STEP #1



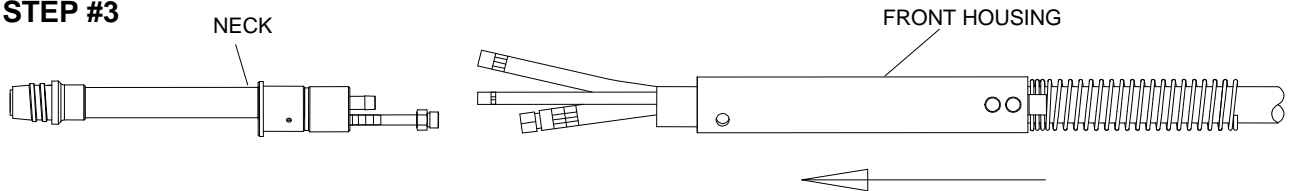
- Remove liner from gun (See **Section 2.5 LINER REPLACEMENT**).
- Remove two front housing screws.

### STEP #2



- Slide housing back.
- Unthread power cable.
- Cut off water line and conduit clamp and pull hoses off of barbed fittings.

### STEP #3

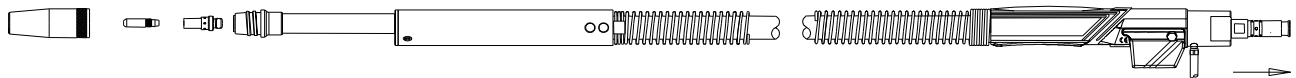


- Slide clamps on water line and conduit.
- Thread power cable on and tighten.
- Push water line and conduit on all the way to base of fittings and crimp.

## 2.5 LINER REPLACEMENT

**NOTE:** For guns equipped with “Direct Plug-Ins”, Bernard, or Euro-connector, the procedure is the same. On Miller style guns, liner is held captive by a guide cap, which must be removed and replaced when changing liner.

### STEP #1

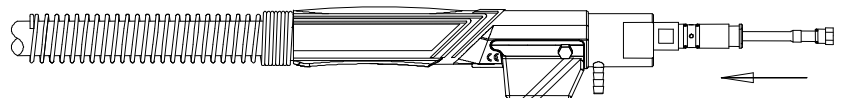


**NOTE:** Ensure power supply is off and gun is removed from feeder before proceeding.

- Remove nozzle, tip and gas diffuser.
- With gun straightened, unthread retainer and remove.

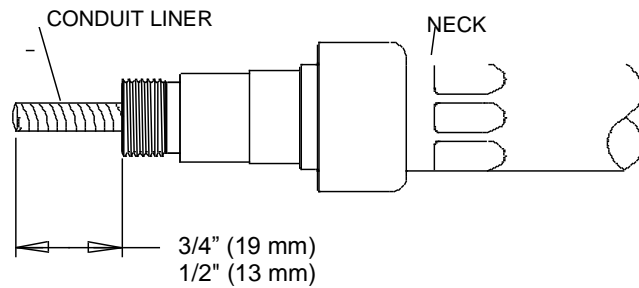
### STEP #2

- Feed replacement liner through gun using short strokes to avoid kinking. Twist liner clockwise if necessary.
- Using a 10 mm wrench, turn thread-in liner retainer in a clockwise direction and tighten in power pin.



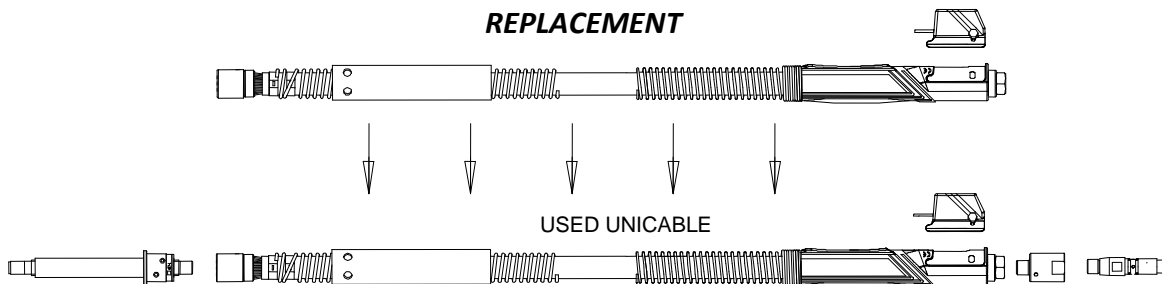
### STEP #3

- Thread liner into power pin.
- Trim conduit liner with 3/4" (19 mm) stick out for Air Cooled (404-20 and 404-3 Retaining Heads) and 1/2" (13 mm) for Water Cooled (454-1 Retaining Heads).
- Remove any burr that may obstruct wire feed, especially on flat wire type conduit liner.
- Replace nozzle, tip and gas diffuser onto neck.



## 2.6 UNICABLE REPLACEMENT – AIR-COOLED GUNS

### STEP #1

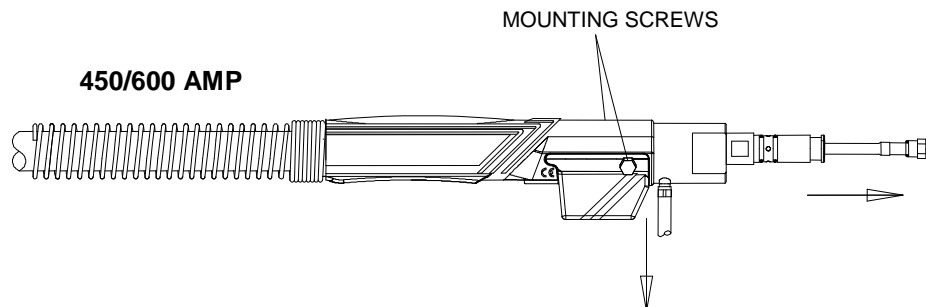


- Remove liner from gun (See **Section 2.5 LINER REPLACEMENT**).
- Mount neck in vise.
- Remove housing screws and slide housing back (front and back).
- Loosen connector cone from neck using 1" (25 mm) wrench.
- Remove from vise and thread out neck by hand.
- Cable connection between cone and crimp ring should not be disturbed.
- Unthread power pin and remove using 1 1/4" (32 mm) on connector cone and a 5/8" (16 mm) or 3/4" (19 mm) wrench on power pin. Install new power pin.
- Retrieve front and rear housing. Slide housings onto new uncable assembly.
- Repeat procedure in reverse to assemble remaining components.

## 2.7 CABLE BUNDLE REPLACEMENT – WATER-COOLED GUNS

### STEP #1

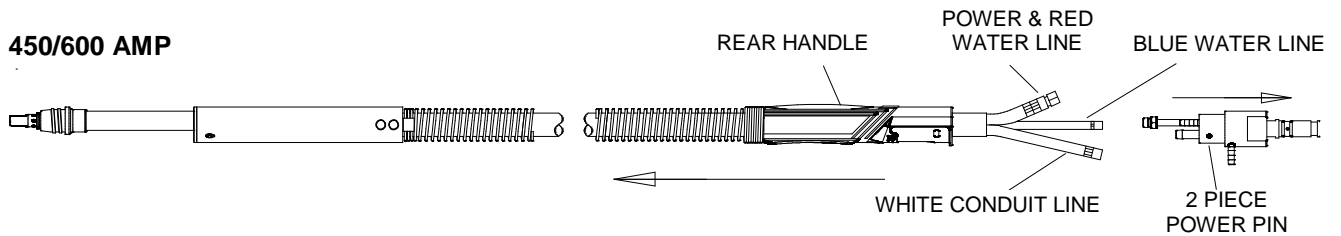
- Remove nozzle, tip and retainer.
- Take out rear housing screws and remove liner.





## STEP #2

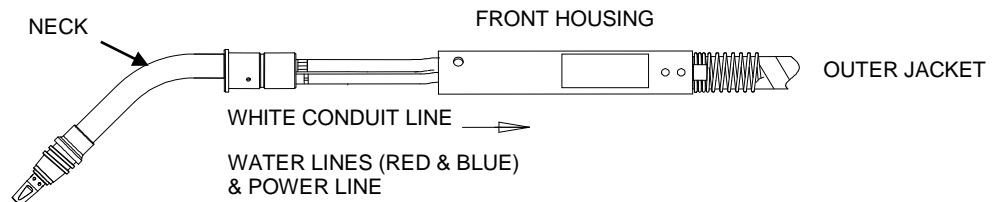
450/600 AMP



- Pull the rear handle up the gun approximately 1 ft.
- Unscrew power cable from rear power block.
- Cut clamps off the water in (blue) line and gas line (white).
- Pull gas and water line off of power block.
- At this point, rear power block will be removed from gun.
- Slide rear handle off gun.

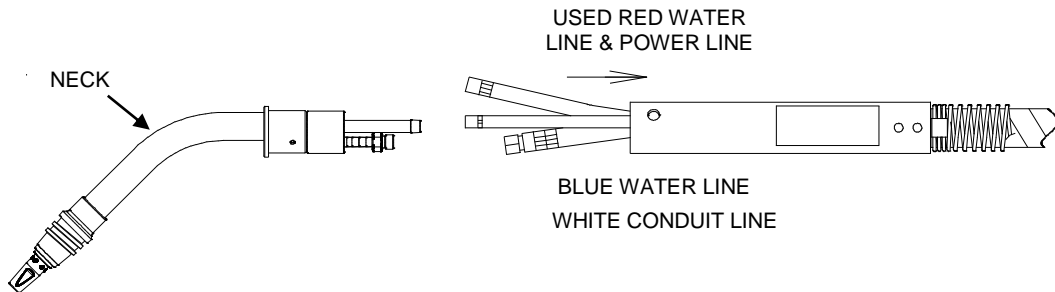
## STEP #3

450/600 AMP



- On front of gun, release front handle from neck.
- Remove outer jacket by pulling outer jacket only from rear of gun; all that remains are the inner hoses attached to the neck.

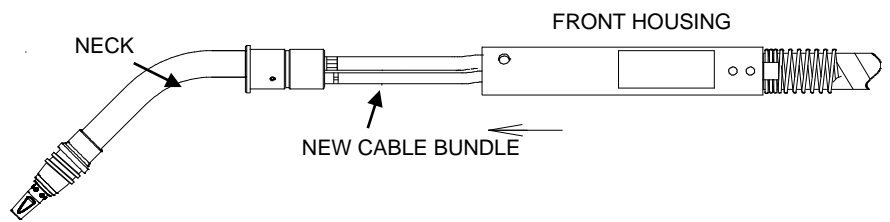
## STEP #4



- Cut clamps off the water (blue) and gas line (white).
- Unscrew power cable from neck.
- Remove old cable bundle.

## STEP #5

- Slide rear handle and front housing on to new cable bundle.
- Thread power cable (red) on to neck.
- Clamp water line (blue) and gas line (white) onto neck.

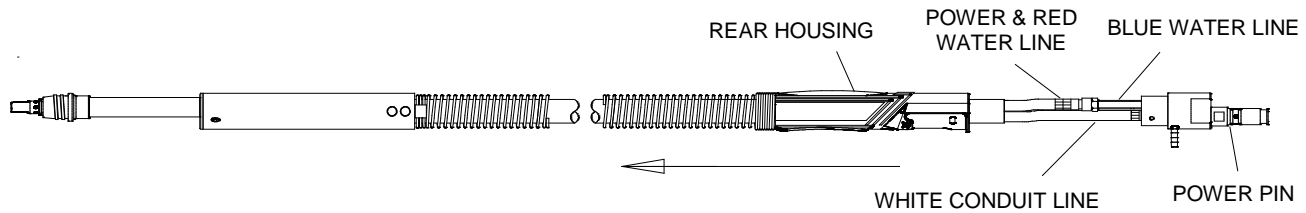


## STEP #6



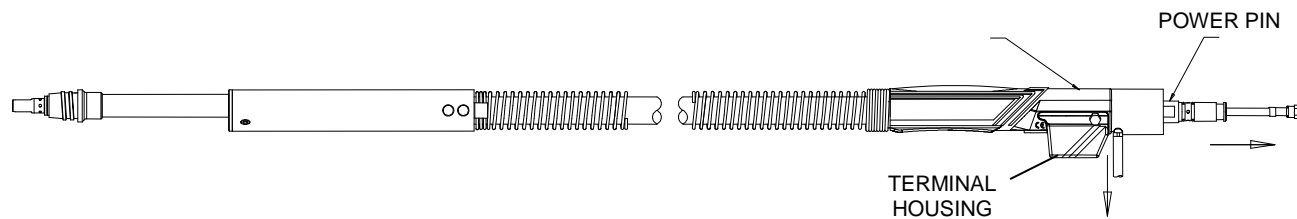
- Slide outer jacket under front handle and bring front handle up to neck and secure.

## STEP #7



- At rear of gun, slide rear handle up over outer jacket.
- Attach rear power block to power cable.
- Attach the gas line and water line with new clamps and crimp to power block.

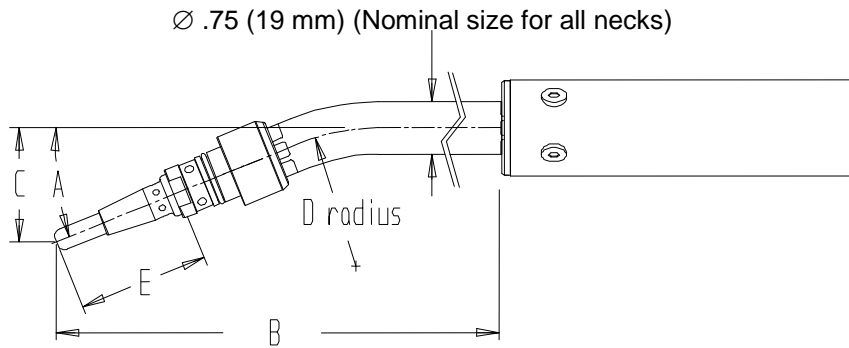
## STEP #8



- Slide rear handle to rear power block and secure housing with mounting screws.
- Thread-on power pin
- Put liner through gun and tighten.
- Install liner (See **Section 2.5 LINER REPLACEMENT**).

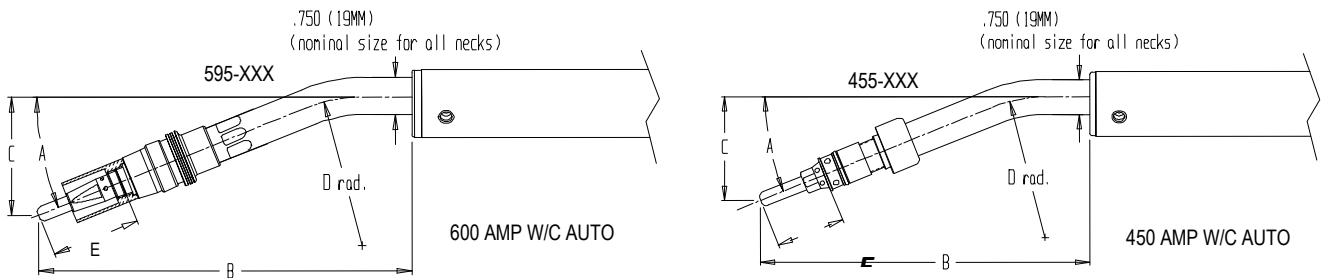
### 3.0 – TECHNICAL DATA

#### 3.1 NECK DIMENSIONS – AIR-COOLED GUNS



NECK	ANGLE	B		C		D		E	
		INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
305-60	60°	4.10	105	4.00	103	2.00	51	1.90	48
405-22	22°	7.10	180	1.63	41	3.00	76	1.90	48
405-45	45°	5.19	132	3.55	90	3.00	76	1.90	48
405-60	60°	4.98	127	4.78	121	3.00	76	1.90	48
405-180	180°	7.38	187	---	---	---	---	1.90	48
505-22	22°	8.29	211	1.72	44	4.00	---	1.90	48
505-45	45°	7.23	184	3.87	98	4.00	102	1.90	48
505-60	60°	6.04	153	5.30	135	4.00	102	1.90	48
505-180	180°	8.63	219	---	---	---	---	1.90	48

#### 3.2 NECK DIMENSIONS – WATER-COOLED GUNS



NECK	ANGLE	B		C		D		E	
		INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
455-180	180°	7.44	189	--	--	--	--	1.48	38
455-22	22°	7.50	191	2.39	61	3.00	76	1.48	38
455-45	45°	6.32	161	4.12	105	3.00	76	1.48	38
455-60	60°	5.95	151	5.66	144	3.00	76	1.48	38
595-180	180°	7.89	200	--	--	--	--	1.78	45
595-22	22°	7.03	179	1.51	38	3.00	76	1.78	45
595-45	45°	6.00	152	3.80	97	3.00	76	1.78	45
595-60	60°	5.72	145	5.27	134	3.00	76	1.78	45

#### 3.3 RATINGS AND SPECIFICATIONS

DESCRIPTION	GUN MODEL			
	MA15	MA16	46xx	64xx
Current Rating	350 amp, 100%	385 amp, 100%	450 amp, 60%	600 amp, 60%
Voltage Rating	≤ 141V			
Min. Liquid Flow	N/A		0.5 L/min (0.13 G/min)	
Min. Liquid Pressure	N/A		280 kPa (40 psi)	
Max. Liquid Pressure	N/A		480 kPa (70 psi)	
Min. Cooling Power	N/A		1000 W (3400 BTU/hr)	2600 W (8800 BTU/hr)

NOTE: Based on tests that comply with IEC 60974-7:2013, GB 15579.7:2013

## 4.0 – OPTIONS

### 4.1 DIRECT PLUG-INS

PART #	DESCRIPTION	USE ON FEEDERS
214	TREGASKISS POWER PIN	TREGASKISS QUICK CONNECT BLOCK, HOBART® 2000 SERIES FEEDERS, TWECO® #4 RECEPTACLE BODY PART #TAK-1, LINCOLN® POWER MIG 300
414-11-2	O-RING - FOR MILLER® POWER PINS	MILLERMATIC® 200 & 250, S21E & S22 SERIES, 52 & 54 SERIES, 60 SERIES
214-1	MILLER® POWER PIN	MILLERMATIC® 200 & 250, S21E & S22 SERIES, 52 & 54 SERIES, 60 SERIES
214-116	GUIDE CAP ONLY - FOR 414-11-116 (NEW STYLE)	
214-332	GUIDE CAP ONLY - FOR 414-11-332 (NEW STYLE)	
414-116	GUIDE CAP ONLY - FOR 414-11-116 (OLD STYLE)	
414-332	GUIDE CAP ONLY - FOR 414-11-332 (OLD STYLE)	
214-12	TWECO® #5 STYLE POWER PIN	ALL FEEDERS SET UP WITH TWECO® #5
414-12-2	O-RING - FOR TWECO® #5 STYLE POWER PIN	RECEPTACLE BODY PART #6TAK-1
214-2	LINCOLN® POWER PIN	LINCOLN® LN7, 8 & 9, LN25 SUITCASE, LN22, NA2
414-21	ESAB® (NON EURO)	A-10
214-13	PANASONIC®	

### 4.2 CONNECTOR OPTIONS – AIR-COOLED GUNS

Euro Connector option - for European style feeders and feeder adaptors for 500 and 600 amp MIG guns.

PART #	DESCRIPTION
425	EURO CONNECTOR ASSEMBLY
416-15	HOUSING ASSEMBLY - BLANK OLD STYLE ONLY
425-10	POWER PIN - A/C EURO
425-11	HAND NUT ASSEMBLY - EURO NEW STYLE
425-6	SPACER - A/C EURO OLD STYLE ONLY
425-8	EURO SPRING PIN
425-9	O-RING - 4 x 1 mm - BUNA
666-10	REAR HOUSING - OLD STYLE ONLY

Bernard Style Connector Option - for Quick Connect feeder adaptors for 500 and 600 amp MIG guns.

PART #	DESCRIPTION
426	BERNARD STYLE CONNECTOR ASSEMBLY
416-15	HOUSING ASSEMBLY - BLANK
426-1	POWER PIN - BERNARD
426-2	LOCKING COLLAR
426-3	WASHER
426-5	CONTROL PINS
426-6	O-RINGS - 009 - BUNA
666-10	REAR HOUSING

### 4.3 CONNECTOR OPTIONS – WATER-COOLED GUNS

Euro Connector option - for European style feeders and feeder adaptors for 450 and 600 amp TOUGH GUN™ MIG Guns.

PART #	DESCRIPTION
675-2	EURO HOUSING - W/C
675-10	EURO CONNECTION
425-5M	HOUSING SCREWS
425-2	EURO HAND NUT
675-10-4	RETAINING RING
675-4	EURO HOUSING BAND

#### 4.4 FEEDER ADAPTORS

To be used with 417 (Tweco #4), 417-50 (Euro) or 417-60 (Tweco #5) Quick-Connect Block.

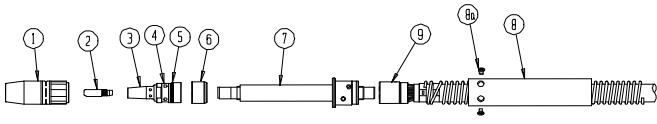
PART #	USE ON FEEDERS
418-1	AIRCO: AHF-E1, AHF-G, AHF-L1, AHF-N, AHF-R, AHF-SAHF-T, AHF-U, AHF-V, MOBILMATIC, LITTLE DIPPER, DIPSTIC-160, DIP-PAC-200, DIP-COR-300
418-3	ESAB (NON EURO): A10, SMASH-WELD-180, MEC 30/44, MIGGY 125, OPTIMATIC 30/44
418-4	HOBART: 27, 27A, DUALMATIC 27/70, H3S, H4S, H6S, 44, 70, 70S, SP100
418-5	LINDE/L-TEC: EH-8, MIG-32, 160, V160, 3IN1, L-TEC 225, SWM-20, SWM-22, SWM-31, SWM-32, SWM-34, SWM-37
418-6	LINCOLN: LN7, LN8, LN9, LN22, LN25
418-7	LINDE/L-TEC: MM253, SWM14
418-8	LINDE/L-TEC: DIGIMIG & DIGIMIG DUAL, EH1, EH5, EH10, EH11, SHE-4, SHE-5, SWM11, SWM11B, SWM12, SWM13, SWM23, SWM24, SWM25, SWM26, SWM35, VAM2, L-TEC35, MIG35, DIGIPULSE, SEH4/5
418-9	MILLER: 10A, 10E, 30A, 30B, 30E, 70A, 80A, SPOOLMATIC 150, MILLERMATIC 35 (OLD STYLE)
418-10	MILLER: INTELLIMATIC, SIDEKICK, D-51A, MILLERMATIC 90,120, 130, 150, 200, 250, MM-35 (NEW), NEW AUTOMATIC 1, PORTOMIG, S-42GL, S-52A, S-54A, SWING ARC-DUAL, SWING ARC-SINGLE, S-32S, 52D, 54D, 52E, 54E, ALL 22 AND 60 SERIES FEEDERS
418-14	OTC: CM2321
418-21	GILLILAND, SAN DIEGO
418-25	LINCOLN: LN7 (SHORT)
418-27	PANASONIC
418-28	HOBART/TWECO #4: BETA-MIG (NEW STYLE) BETA-MIG 250 AND 251, DUAL FEEDER, DIGITAL 2000, DUAL DIGITAL, PORTA FEED 17, ULTRA FEED 1000, 2000, 2400, HANDLER, OSCAWA, HEFTY CV/CC

#### 5.0 – TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE
<b>POOR WIRE FEED</b>	<ul style="list-style-type: none"> <li>• CONDUIT LINER IS CLOGGED OR KINKED</li> <li>• INCORRECT LINER SIZE OR CONTACT TIP</li> <li>• LINER CUT TOO SHORT AND NOT SEATING PROPERLY IN GAS DIFFUSER</li> <li>• DRIVE ROLLS TOO TIGHT, RESULTING IN SCORING OF WELDING WIRE</li> <li>• WELDING WIRE DIRTY, RUSTY, OR TOO MUCH CAST</li> </ul>
<b>SHORT TIP LIFE</b>	<ul style="list-style-type: none"> <li>• DRIVE ROLLS TOO TIGHT, RESULTING IN SCORING OF WELDING WIRE</li> <li>• WELDING WIRE DIRTY, RUSTY, OR TOO MUCH CAST</li> <li>• UNCOATED WIRE BEING USED, INCREASING USAGE</li> <li>• WRONG WIRE SIZE</li> <li>• GUN BEING RUN BEYOND ITS AMPERAGE RANGE</li> <li>• LOOSE CONSUMABLES</li> </ul>
<b>GUN OVERHEATING</b>	<ul style="list-style-type: none"> <li>• LOOSE RETAINING SCREW ON QUICK CONNECT BLOCK</li> <li>• INSUFFICIENT GAUGE POWER CABLE AND/OR GROUND CABLE</li> <li>• LOOSE CONNECTOR CONES AND/OR CONE NUTS</li> <li>• GUN BEING RUN BEYOND ITS AMPERAGE RANGE</li> <li>• ELECTRICAL MALFUNCTION IN POWER SOURCE</li> <li>• LOOSE CONSUMABLES</li> </ul>
<b>WELD POROSITY</b>	<ul style="list-style-type: none"> <li>• SPATTER BUILT UP IN NOZZLE, BLOCKING GAS</li> <li>• LEAKS IN GAS HOSE OR IMPROPER CONNECTION</li> <li>• O-RINGS ON POWER PIN ARE CUT OR DAMAGED</li> <li>• INNER TUBE LOOSE FROM CONNECTOR CONE</li> <li>• POOR WIRE FEED (SEE ABOVE)</li> <li>• IMPROPER SHIELDING GAS OR WELDING WIRE</li> <li>• RUSTY OR POOR QUALITY WELDING WIRE</li> <li>• GAS FLOW IMPROPERLY SET</li> </ul>

# 6.0 – EXPLODED VIEW AND PARTS LIST – AIR-COOLED GUNS

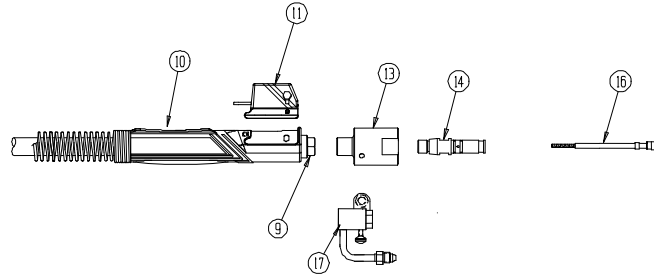
## Air-Cooled Front-End



Numbers in this column correspond to the exploded view images above.

	DESCRIPTION
<b>1</b>	<b>STANDARD NOZZLES (Self Insulated)</b>
401-40-38	SUPER TAPERED NOZZLE - 3/8" BORE (BRASS)
404-4-38	3/8" (10 mm) BORE - 1/8" (3 mm) TIP RECESS
401-4-50	1/2" (13 mm) BORE - 1/8" (3 mm) TIP RECESS
401-4-62	5/8" (16 mm) BORE - 1/8" (3 mm) TIP RECESS
401-4-75	3/4" (19 mm) BORE - 1/8" (3 mm)
	<b>SHORT ARC NOZZLE</b>
401-8-62	1/8" (3 mm) TIP STICK OUT
	<b>HEAVY DUTY NOZZLES</b>
401-5-62	5/8" (16 mm) BORE - 1/4" (6 mm) TIP RECESS
401-5-75	3/4" (19 mm) BORE - 1/4" (6 mm) TIP RECESS
401-6-60	1/2" (13 mm) BORE - 1/8" (3 mm) TIP RECESS
401-6-62	5/8" (16 mm) BORE - 1/8" (3 mm) TIP RECESS
401-6-75	3/4" (19 mm) BORE - 1/8" (3 mm) TIP RECESS
401-7-62	5/8" (16 mm) BORE - 1/4" (6 mm) TIP RECESS
<b>2</b>	<b>HEAVY DUTY TOUGH LOCK™ CONTACT TIPS</b>
403-20-30	FOR .030" (0.6 mm) WIRE
403-20-30-25	FOR .030" (0.6 mm) WIRE
403-20-35	FOR .035" (0.9 mm) WIRE
403-20-35-25	FOR .035" (0.9 mm) WIRE
403-20-1.0	FOR 1 mm WIRE
403-20-1.0-25	FOR 1 mm WIRE
403-20-45	FOR .045" (1.2 mm) WIRE
403-20- 5-25	FOR .045" (1.2 mm) WIRE
403-20-364	FOR .052" (1.3 mm) WIRE
403-20-364-25	FOR .052" (1.3 mm) WIRE
403-20-52	FOR 1/16" (1.6 mm) WIRE
403-20-52-25	FOR 1/16" (1.6 mm) WIRE
403-20-1.4	FOR 1.4" (1.4 mm) WIRE
403-20-1.4-25	FOR 1.4" (1.4 mm) WIRE
403-20-116	FOR 1/16" (1.6 mm) WIRE
403-20-116-25	FOR 1/16" (1.6 mm) WIRE
403-20-78	FOR .078" (1.8 mm) WIRE
403-20-564	FOR 5/64" (2.0 mm) WIRE
403-20-564-25	FOR 5/64" (2.0 mm) WIRE
403-20-332	FOR 3/32" (2.4 mm) WIRE
	<b>TOUGH LOCK™ TAPERED CONTACT TIPS</b>
403-21-30	FOR .030" (0.6 mm) WIRE
403-21-30-35	FOR .030" (0.6 mm) WIRE
403-21-35	FOR .035" (0.9 mm) WIRE
403-21-35-25	FOR .035" (0.9 mm) WIRE
403-21-1.0	FOR 1 mm WIRE
403-21-1.0-25	FOR 1 mm WIRE
403-21-45	FOR .045" (1.2 mm) WIRE
403-21-45-25	FOR .045" (1.2 mm) WIRE
<b>3</b>	404-32 HEAVY DUTY RETAINING HEAD - TOUGH LOCK™
<b>4</b>	454-1-2 RETAINING RING ONLY
<b>5</b>	402-16 O-RING ONLY
<b>6</b>	402-11 NECK INSULATOR
<b>7</b>	405-180 NECK STRAIGHT
<b>8</b>	410-10 HOUSING - FRONT - 400 & 500 AMP
	610-10 HOUSING - FRONT - 600 AMP
<b>8a</b>	410-12m HOUSING SCREW - LOW PROFILE

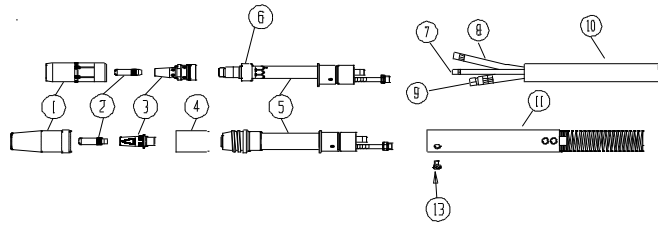
## Air-Cooled Back-End



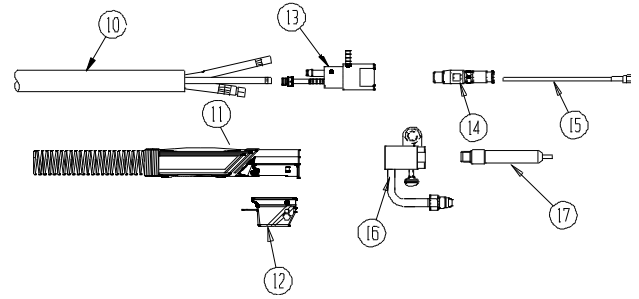
PART #	DESCRIPTION
<b>9</b>	<b>UNICABLE ASSEMBLY</b>
513-104	4' (1.2 m) SERVICE - 500 AMP
513-106	6' (1.8 m) SERVICE - 500 AMP
513-108	8' (2.4 m) SERVICE - 500 AMP
513-110	10' (3.06 m) SERVICE - 500 AMP
613-104	4' (1.2 m) SERVICE - 600 AMP
613-106	6' (1.8 m) SERVICE - 600 AMP
613-108	8' (2.4 m) SERVICE - 600 AMP
613-110	10' (3.06 m) SERVICE - 600 AMP
<b>10</b>	666-10 HANDLE ASSEMBLY
<b>11</b>	416-15 HOUSING
<b>13</b>	414-400 POWER PIN BLOCK
<b>14</b>	214 TWECO® #4
	214-6-116 MILLER®
	214-6-332 MILLER®
	214-2 LINCOLN®
	214-4 L-TEC MT SERIES®
	214-12 TWECO® #5
	214-13 PANASONIC®
	214-14 PANASONIC® SHORT
<b>16</b>	<b>QUICK LOAD™ LINERS</b>
415-26	LINER RETAINER (LINER DOES NOT COME WITH RETAINER)
415-35-6Q	FOR .035" - .045" (0.9 mm - 1.2 mm) WIRE - 6' (1.8 m)
415-35-10Q	FOR .035" - .045" (0.9 mm - 1.2 mm) WIRE - 10' (3 m)
415-35-15Q	FOR .035" - .045" (0.9 mm - 1.2 mm) WIRE - 15' (5 m)
415-35-25Q	FOR .035" - .045" (0.9 mm - 1.2 mm) WIRE - 25' (8 m)
415-116-6Q	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 10' (1.8 m)
415-116-10Q	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 10' (3 m)
415-116-15Q	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 15' (5 m)
415-116-25Q	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 25' (8 m)
	<b>CONVENTIONAL LINERS</b>
415-23-15	FOR .023" (0.6 mm) WIRE - 15' (5 m)
415-30-15	FOR .030" (0.8 mm) WIRE - 15' (5 m)
415-35-10	FOR .035" - .045" (0.9 mm - 1.2 mm) WIRE - 10' (3 m)
415-35-15	FOR .035" - .045" (0.9 mm - 1.2 mm) WIRE - 15' (5 m)
415-35-25	FOR .035" - .045" (0.9 mm - 1.2 mm) WIRE - 25' (8 m)
415-35-2	FOR .035" (0.9 mm) WIRE - 15' (5 m)
415-116-6	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 6' (1.8 m)
415-116-10	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 10' (3 m)
415-116-21	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 6' (1.8 m)
415-116-22	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 10' (3 m)
415-116-23	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 15' (3 m)
415-116-25	FOR .045" - 1/16" (1.2 mm - 1.6 mm) WIRE - 25' (8 m)
415-116-2	FOR 3/64" - 1/16" (1.2 mm - 2.4 mm) ALUMINUM WIRE - 15' (5 m)
415-564-15	FOR ALL 5/64" (2.0 mm) WIRE & 1/16" (1.6 mm) FLUX CORE WIRE
415-1	LINER O-RING (NOT SHOWN)
<b>17</b>	<b>FEEDER ADAPTOR REQUIREMENTS (SOLD SEPARATELY)</b>
417	QUICK CONNECT BLOCK ASSEMBLY (TWECO #4)

# 7.0 – EXPLODED VIEW AND PARTS LIST – WATER-COOLED GUNS

## Water-Cooled Front-End



## Water-Cooled Back-End



PART #	DESCRIPTION	
	450 amp	600 amp
1		<b>STANDARD NOZZLES</b> 601 NOZZLES ARE THREAD ON 5/8" (16 mm) BORE - 1/4" (6 mm) TIP RECESS 3/4" (19 mm) BORE - 1/4" (6 mm) TIP RECESS 5/8" (16 mm) BORE - 1/8" (3 mm) TIP RECESS 3/4" (19 mm) BORE - 1/8" (3 mm) TIP RECESS 5/8" (16 mm) BORE - 1/8" (3 mm) TIP STICKOUT
2		<b>HEAVY DUTY TOUGH LOCK™ CONTACT TIPS – 5/16" (7.9 mm) O.D.</b> FOR .030" (0.8 mm) WIRE FOR .035" (0.9 mm) WIRE FOR 1 mm WIRE FOR .045" (1.2 mm) WIRE FOR 3/64" (1.2 mm) WIRE FOR 1.4 mm WIRE FOR .052" (1.3 mm) WIRE FOR 1/16" (1.6 mm) WIRE FOR 5/64" (2.0 mm) WIRE
3		O-RING ONLY TOUGH LOCK™ RETAINING HEAD – FOR HD TIPS HEAVY DUTY RETAINING HEAD TOUGH LOCK DIFFUSER O-RING
4		CERAMIC INSULATOR
5		NECKS (INCL. (1) 656-1 AND (1) 657-1 CLAMP NECK - 45° NECK - 60° NECK - STRAIGHT
6		NECK INSULATOR - USE WITH 454-1 HEAD NECK INSULATOR - USE WITH 404-20 HEAD
7		INTERNAL WATER LINE (C/W (2) 656-1 CLAMPS) 15' SERVICE
8		CONDUIT 15' RED WATER LINE - OUT (C/W (1) 656-1 CLAMP) BLUE WATER LINE - IN (C/W (1) 656-1 CLAMP) (LOCATED AT QUICK CONNECT POWER BLOCK ASSEMBLY)
9		<b>POWER CABLE ASSEMBLY</b> 10' SERVICE (ACTUAL LENGTH - 9.5') 12' SERVICE (ACTUAL LENGTH - 11.5') 15' SERVICE (ACTUAL LENGTH - 14.5')
10		<b>CABLE BUNDLE (COMPLETE WITH CLAMPS)</b> 10' SERVICE (OUTER JACKET ONLY 663-1-10) 12' SERVICE (OUTER JACKET ONLY 663-1-12) 15' SERVICE (OUTER JACKET ONLY 663-1-15)
11		HOUSING FRONT
12		HOUSING
13		POWER PIN BLOCK

PART #	DESCRIPTION	
	450 amp	600 amp
14		<b>QUICK LOAD™ LINERS</b> LINER RETAINER (LINER DOES NOT COME WITH RETAINER) FOR .035" - .045" (0.9 - 1.2 mm) WIRE - 6' (1.8 m) FOR .035" - .045" (0.9 - 1.2 mm) WIRE - 10' (3 m) FOR .035" - .045" (0.9 - 1.2 mm) WIRE - 15' (5 m) FOR .035" - .045" (0.9 - 1.2 mm) WIRE - 25' (8 m) FOR .045" - 1/16" (1.2 - 1.6 mm) WIRE - 6' (1.8m) FOR .045" - 1/16" (1.2 - 1.6 mm) WIRE - 10' (3 m) FOR .045" - 1/16" (1.2 - 1.6 mm) WIRE - 15' (5 m) FOR .045" - 1/16" (1.2 - 1.6 mm) WIRE - 25' (8 m) <b>CONVENTIONAL LINERS</b> FOR .023" (0.6 mm) WIRE - 15' (5 m) FOR .030" (0.8 mm) WIRE - 15' (5 m) FOR .035" - .045" (0.9 - 1.2 mm) WIRE - 10' (3 m) FOR .035" - .045" (0.9 - 1.2 mm) WIRE - 15' (5 m) FOR .035" - .045" (0.9 - 1.2 mm) WIRE - 25' (8 m) FOR .035" (0.9 mm) ALUMINUM WIRE - 15' (5 m) FOR .045" - 1/16" (1.2 - 1.6 mm) WIRE - 10' (3 m) FOR .045" - 1/16" (1.2 - 1.6 mm) WIRE - 15' (5 m) FOR .045" - 1/16" (1.2 - 1.6 mm) WIRE - 25' (8 m) FOR 3/64" - 1/16" (1.2 - 1.6 mm) ALUM. WIRE - 15' (5 m)
15		FOR ALL 5/64" (2.0 mm) WIRE & 1/16" (1.6 mm) FLUX CORE WIRE For .078" - 3/32" (2.24 mm) WIRE - 15' (5 m) FLAT WOUND
16		<b>FEEDER ADAPTOR REQUIREMENTS (SOLD SEPARATELY)</b> QUICK CONNECT BLOCK ASSEMBLY - TWECO #4 QUICK CONNECT BLOCK ASSEMBLY - EURO QUICK CONNECT BLOCK ASSEMBLY - TWECO #5
17		FEEDER ADAPTORS (TO BE USED WITH QUICK CONNECT BLOCK)
18		HANDLE ASSEMBLY

# 8.0 – ORDERING INFORMATION

## 8.1 TOUGH GUN AUTOMATIC AIR-COOLED MIG GUN ORDERING INFORMATION

Automatic Series			Amperage	Neck	Option 1	Retaining Head	Cable Length	Nozzle	Option 2	Wire Size	Power Pin
M	A	1	5	K	0	2	R	C	0	E	T
			5 500 amp 6* 600 amp	<i>Air-Cooled</i> <i>Short Length</i> A 22 degrees 405-22 B 45 degrees 405-45 C 60 degrees 405-60 D 180 degrees 405-180 <i>Medium Length</i> E 22 degrees 505-22 F 45 degrees 505-45 G 60 degrees 505-60 H 180 degrees 505-180 <i>Long Length</i> J 45 degrees 405-45LL K 60 degrees 405-60LL <i>TOUGH GUN I.C.E.*</i> M 22 degrees 591-22 N 45 degrees 591-45 P 60 degrees 591-60 Q 180 degrees 591-180	0 No options	1 TOUGH LOCK™ Heavy Duty 2 HD Retaining Head 3 HD Diffuser 4 SD Diffuser	A 3.0' B 3.5' C 4.0' D 4.5' E 5.0' F 5.5' G 6.0' H 6.5' J 7.0' K 7.5' L 8.0' M 8.5' N 9.0' P 9.5' R 10' S 12' T 15'	A 401-6-62 B 401-5-62 C 401-6-50 D 401-42-50 E 401-7-62 F 401-7-75 G 401-4-38 H 401-4-50 J 401-7-87	0 No Options	B 0.030" C 0.035" D 1.0 mm E 0.045" F 3/64" G 0.052" H 1.4 mm J 1/16" K 1.8 mm L 5/64" M 3/32" <i>Aluminum</i> R 0.035" S 3/64" T 1/16" U 0.045" V 1.4 mm W 0.052"	B Bernard™ E Euro F Fronius® L Lincoln® M Miller® C L-Tec® P Panasonic® T Tweco #4 W Tweco #5 <i>AutoLength™ Pin**</i> 1 Tweco #4 2 Lincoln 3 Tweco #5 4 Miller 6 Panasonic 7 Fronius

\*TOUGH GUN I.C.E. Technology is not available with 600 amp model  
\*\*AutoLength™ Pins not compatible with wire sizes for aluminum wire

## 8.2 TOUGH GUN AUTOMATIC WATER-COOLED MIG GUN ORDERING INFORMATION

Power Pin	Gun Model	Cable Length	Wire Size	Nozzle	Optional Neck	Liner Options	Additional Options
M	46	6	-45	-5	-460	-9	-A
M Miller®	46 450 amp	04 4.0'	-35 0.035"	450 amp	450 amp	-9 for Aluminum wire	-A Air blast
LN Lincoln®	64 600 amp	4.5* 4.5'	-1.0 1.0 mm	-5 451-5-62	-460 60 degrees		
TW Tweco® #5		05 5.0'	-45 0.045"	-5H 401-5-62 (includes	-445 45 degrees		
E Euro		06 6.0'	-364 3/64"	403-20-xx TOUGH	-422 22 degrees		
PA Panasonic®		08 8.0'	-52 0.052"	LOCK™ Contact	600 amp		
		10 10.0'	-116 1/16"	Tip and 452-3	-660 60 degrees		
		12 12.0'	-564 5/64"	Neck Insulator	-645 45 degrees		
		15 15.0'	-332 3/32"	600 amp	-622 22 degrees		
		*600 amp only		-5 601-5-62			
				-6 601-6-62			



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