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

TECHNICAL GUIDE

TOUGH GUN™ G2 Series Robotic MIG Guns

- **SAFETY & WARRANTY INFORMATION**
- **INSTALLATION**
- **MAINTENANCE GUIDE**
- **TECHNICAL DATA**
- **OPTIONS**
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Certified ISO 9001:2008
Please read instructions prior to use.
Save this manual for future reference.

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THANK YOU…

…for selecting a TOUGH GUN™ G2 Series Robotic MIG Gun from Tregaskiss. Manufacturing operations demand extremely dependable robotic equipment. With this in mind, the TOUGH GUN MIG Gun was designed and engineered to be a reliable tool to support high production within a robotic cell. 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 Technical Guide 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.

Tregaskiss employees build TOUGH GUN MIG Guns for the world's welding professionals. We are always striving to improve our products and services, and would appreciate receiving your suggestions or comments. 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.

    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.

    ANSI Standard Z49.1 CODE FOR SAFETY IN WELDING AND CUTTING obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

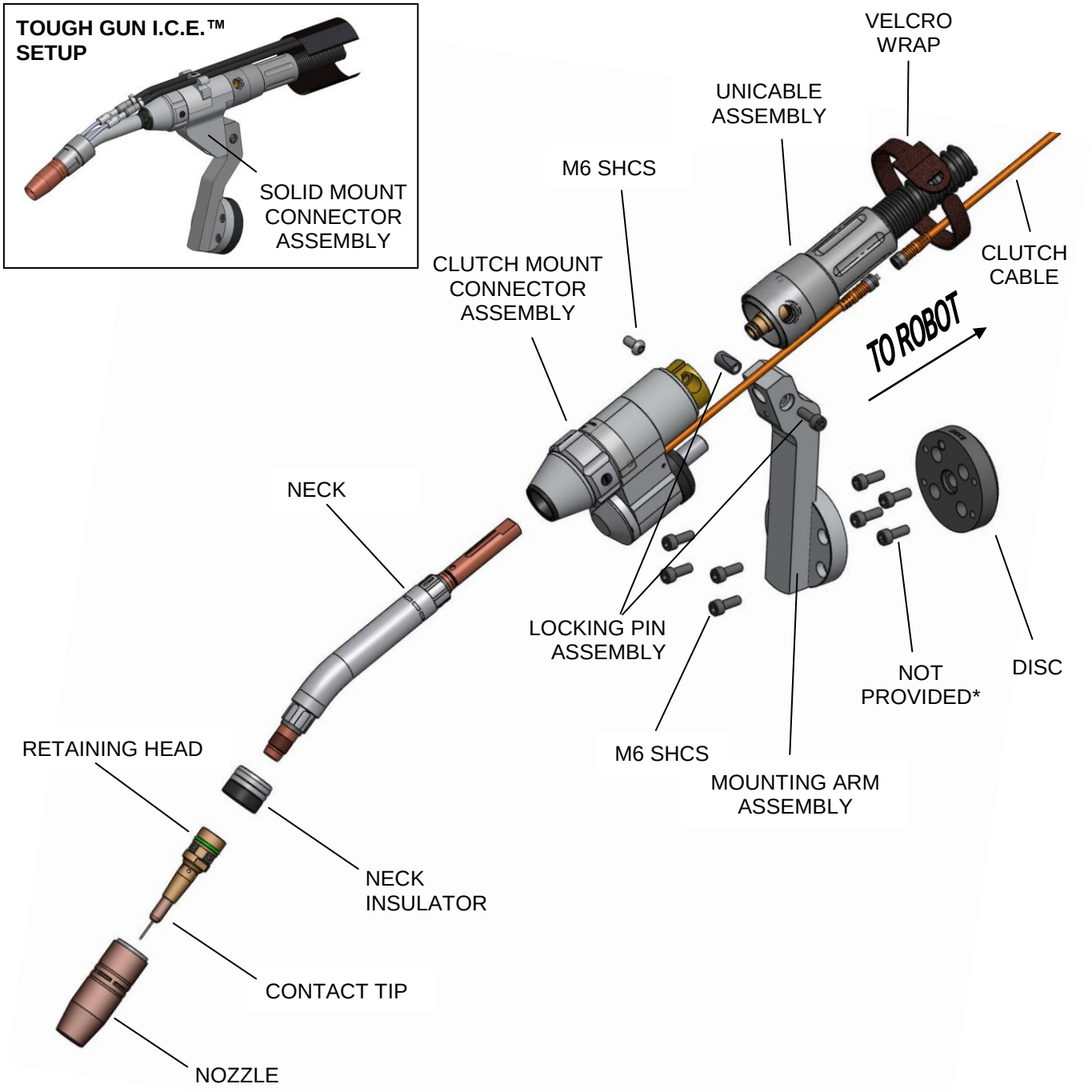
CALIFORNIA PROPOSITION 65 WARNING

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 – COMPLETE ASSEMBLY OVERVIEW

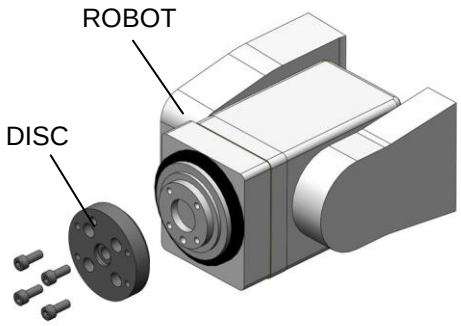


For complete parts list, please proceed to ***Section 7.0 – EXPLODED VIEW AND PARTS*** LIST.

* Check with robot manufacturer for correct fastener.

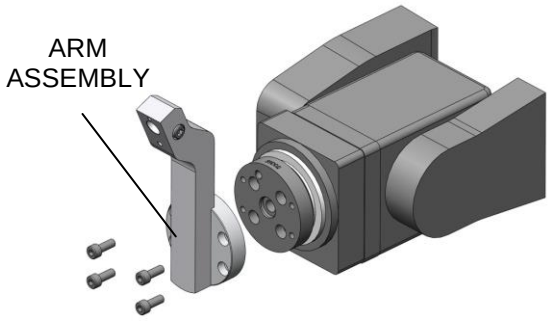
2.0 – INSTALLATION

2.1 INSTALLING THE GUN TO THE ROBOT



STEP 1: Attaching the Disc to the Robot

- **NOTE:** Fasteners are not provided since the size varies by robot.
- **NOTE:** The use of a dowel is recommended and varies by robot manufacturer.
- Install the disc to the robot with fasteners.
- Torque to 45 in.-lbs. (5 Nm).



STEP 2: Attaching the Arm Assembly to the Disc

- Install the arm assembly to the disc on the robot with 6 mm SHCS (provided).
- Torque to 45 in.-lbs. (5 Nm).

STEP 3A: Attaching the Gun to the Arm Assembly

(For Clutch Mount Guns **ONLY**)

- Remove the fastener and pin from the arm assembly (Fig. 1).
- Insert the gun assembly clutch stud into the arm on the robot until it bottoms out.
- **IMPORTANT:** The flat feature of the locking pin must interface with the flat feature on the clutch stud to achieve locking and orientation (See Fig. 2 and 3 below).
- Insert the 6 mm SHCS on the opposite side of the arm and screw it into the locking pin.
- Torque 6 mm SHCS to 60 in.-lbs. (7 Nm).

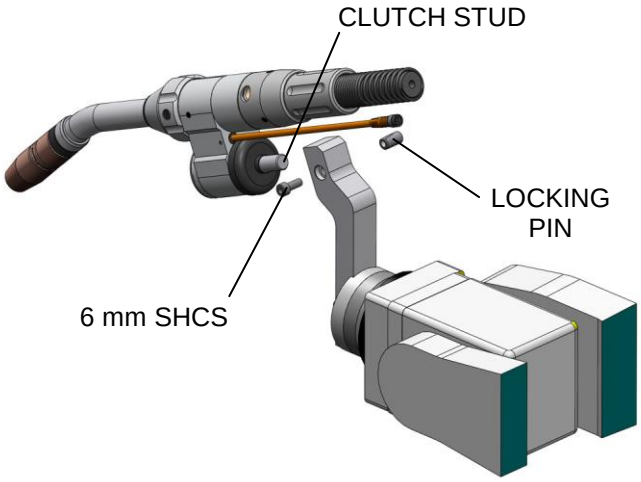


Fig. 1

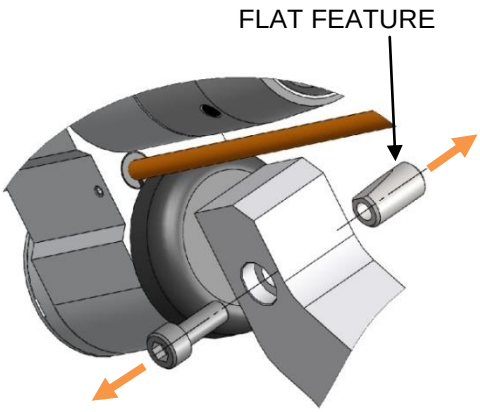


Fig. 2

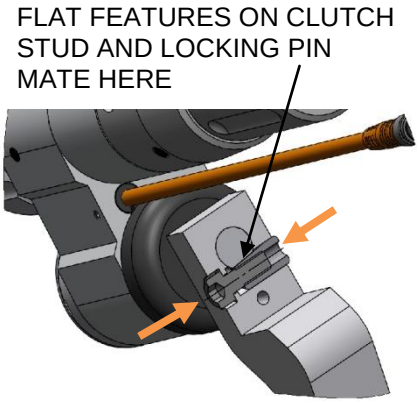
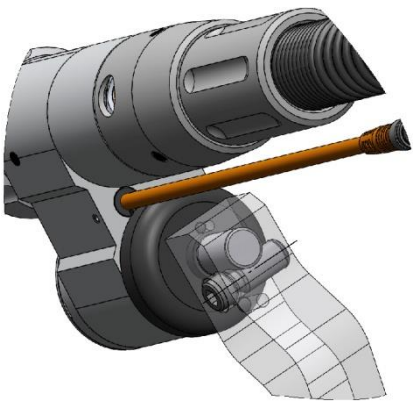


Fig. 3



STEP 3B: Attaching the Gun to the Arm Assembly

(For Solid Mount Guns **ONLY**)

- Remove the fastener and pin from the arm assembly (Fig. 1).
- Insert the solid mount gun assembly stud into the mounting arm on the robot until it bottoms out.
- **IMPORTANT:** The flat feature of the locking pin must interface with the flat feature on the stud to achieve locking and orientation (See Fig. 1 below).
- Insert the 6 mm SHCS on the opposite side of the arm and screw it into the locking pin (See Fig. 2 below).
- Torque 6 mm SHCS to 60 in.-lbs. (7 Nm).
- Insert 5 mm SHCS through solid mount gun assembly and screw it into the mounting arm (See Fig. 2 below).
- Torque 5 mm SHCS to 45 in.-lbs. (5 Nm).

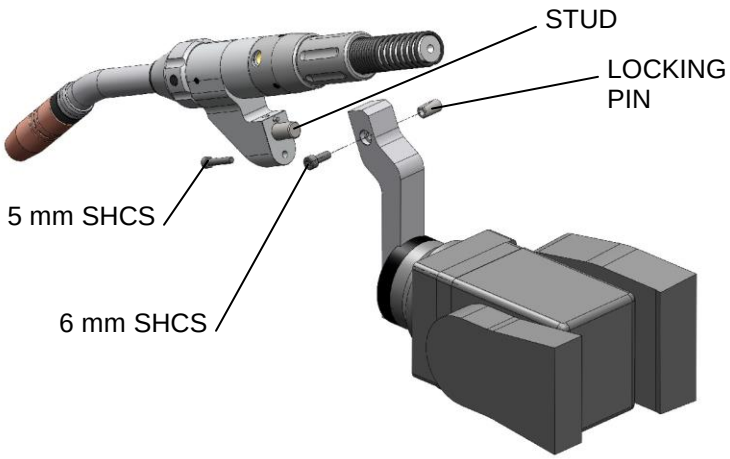


Fig. 1

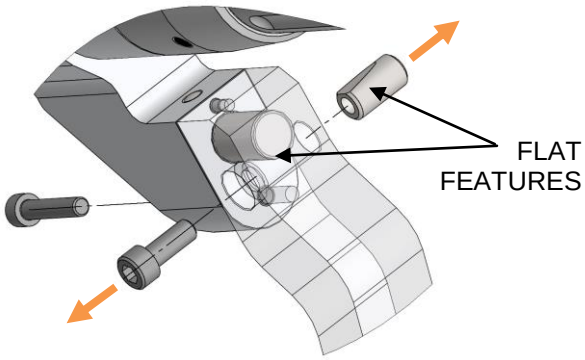
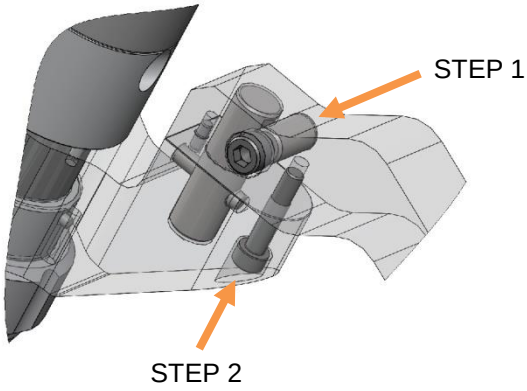
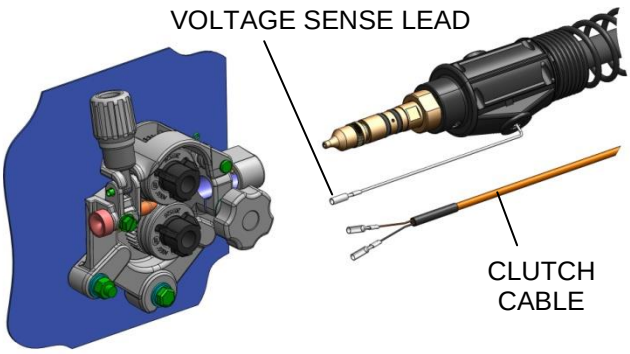


Fig. 2



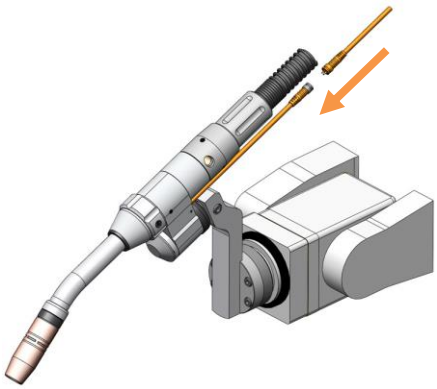
2.2 CONNECTING GUN TO WIRE FEEDER

- Plug gun into feeder and lock in place (see your feeder manual for details).
- OPTIONAL – Connect voltage sense lead (see your feeder manual for details) on the unicable with the male connector on the power jumper cable.
- FOR CLUTCH INSTALLATIONS – Connect clutch cable with either the provided connections (cut and splice required) or one of our jumper cables (sold separately and available for select robot models).



2.3 INSTALLING CLUTCH CABLE TO GUN

- Install the clutch cable supplied with the robotic safety clutch to the switch connection at the clutch.
- Tighten connection by hand.
- Attach clutch cable at five points along the unicable with supplied Velcro straps (or leather jacket for TOUGH GUN I.C.E. components).



3.0 – MAINTENANCE

3.1 NOZZLE AND CONTACT TIP SYSTEMS

IMPORTANT:

- Neck insulator MUST be in place before welding to properly insulate neck armor.
- Check all parts to ensure that connections are tight before welding.
- The heavy duty retaining head MUST be tightened with a 5/8" (16 mm) wrench to prevent the contact tip from overheating.
- DO NOT use pliers to remove or tighten the retaining head or scoring may result.

TOUGH LOCK Consumables

NOZZLE

CONTACT TIP

RETAINING HEAD

NECK INSULATOR

Removal and Replacement

Nozzle

- Pull slip-on nozzles off with a twisting motion.
- When installing the nozzle, ensure that it is fully seated.

Contact Tip

- Thread the contact tip into the retaining head.
- Torque to 30 in.-lbs. (3.5 Nm).
- The Tregaskiss Tip Tool (Part # 450-18 – for heavy-duty tips) or a pair of weld pliers are the optimal tools for contact tip installation.

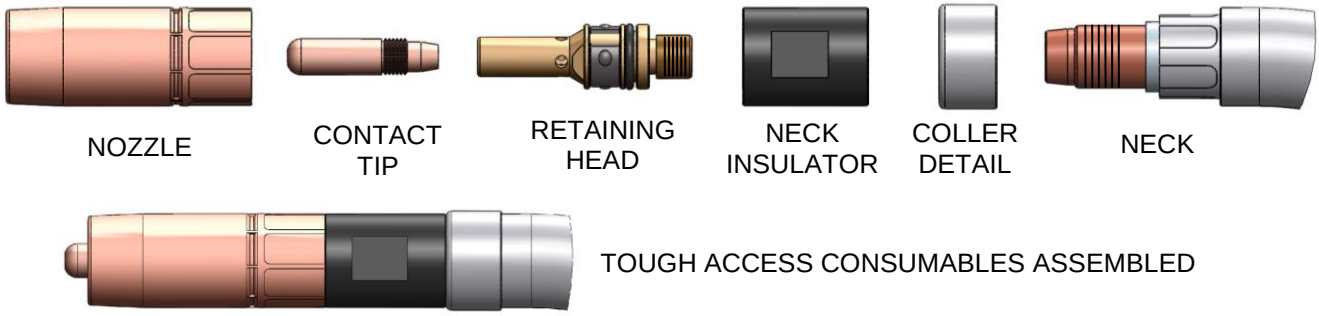
Retaining Head

- Thread retaining head onto neck with a 5/8" (16 mm) wrench.
- Torque to 80 in.-lbs. (9 Nm).
- DO NOT use pliers to remove or tighten the heavy duty retaining head or scoring may result.

Neck Insulator

- The neck insulator is pressed onto the neck by hand with the aluminum side towards the neck and the black insulation towards the nozzle.

TOUGH ACCESS Consumables



TOUGH ACCESS CONSUMABLES ASSEMBLED

IMPORTANT: TCP will be different from standard TOUGH LOCK™ Consumables (See ***Section 4.1 GUN CONFIGURATIONS***).

Removal and Replacement

Nozzle

- Pull slip-on nozzles off with a twisting motion.
- When installing the nozzle, ensure that it is fully seated.

Contact Tip

- Thread the contact tip into the retaining head.
- Torque to 30 in.-lbs. (3.5 Nm).
- The Tregaskiss Tip Tool (Part # 450-18 – for heavy-duty tips) or a pair of weld pliers are the optimal tools for contact tip installation.

Retaining Head

- Thread retaining head onto neck with a 5/8” (16 mm) wrench.
- Torque to 80 in.-lbs. (9 Nm).
- DO NOT use pliers to remove or tighten the heavy duty retaining head or scoring may result.

Neck Insulator and Coller Detail

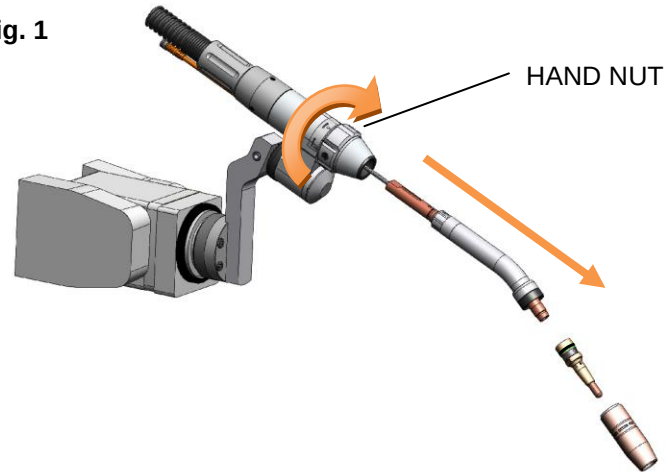
- Press 59GI-2 Coller Detail by hand onto crimped aluminum portion of neck until it is 1.10 inches away from end of copper on neck.
- Thread Neck Insulator onto neck until it is flush with the copper end of the neck.

3.2.1 AIR-COOOLED NECK REPLACEMENT

Neck Removal

1. Remove consumables (See Fig. 1).
2. Twist the hand nut clockwise (See Fig. 2).
3. Hold the hand nut in the unlocked position while pulling the neck from the gun.
4. Release the hand nut – it will return to the locked position (See Fig. 3).

Fig. 1



Neck Replacement

NOTE: Remove consumables (i.e. retaining head, nozzle and contact tip) before installing neck. Failure to do so will result in improper installation.

1. Twist the hand nut clockwise to UNLOCK. **IMPORTANT:** To prevent damage to the neck, ensure that the hand nut is always in the UNLOCKED position when inserting a neck.
2. Insert the neck into the connector housing. **IMPORTANT:** The neck is fully inserted only when the neck bottoms out and the insertion depth guide (INSERT TO HERE) on the neck meets up with the connector housing.
3. Release the hand nut allowing it to return to the LOCKED position. **IMPORTANT:** Do not release the hand nut unless the neck has been fully inserted or damage to the neck may result.

Fig. 2

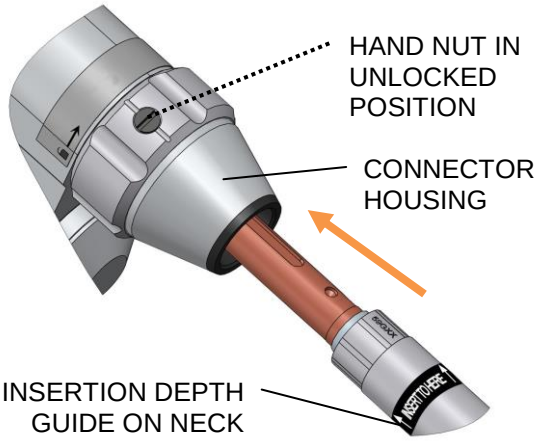
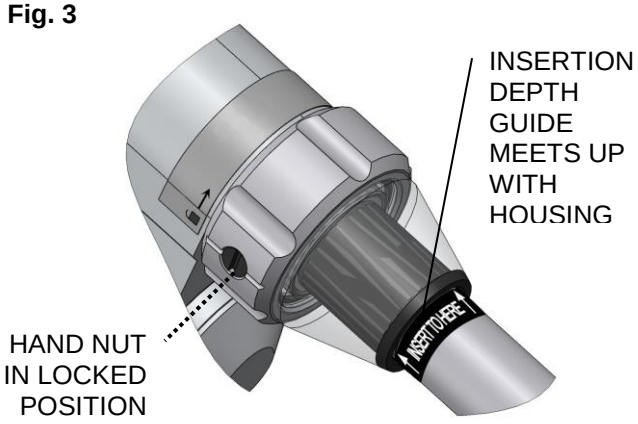


Fig. 3



3.2.2 TOUGH GUN I.C.E. NECK REPLACEMENT

1. Disconnect water lines (See Fig. 4).
2. Follow instructions as outlined in ***Section 3.2.1 AIR-COOLED NECK REPLACEMENT***.
3. Replace water lines (See Fig. 5).

Fig. 4

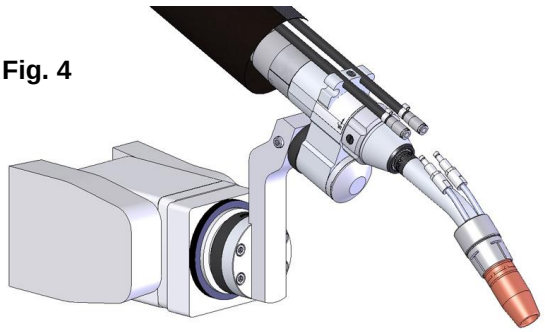
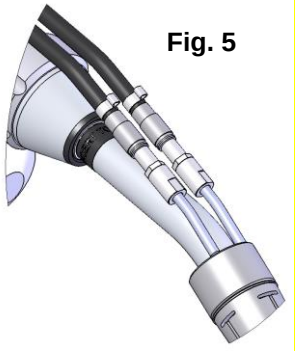
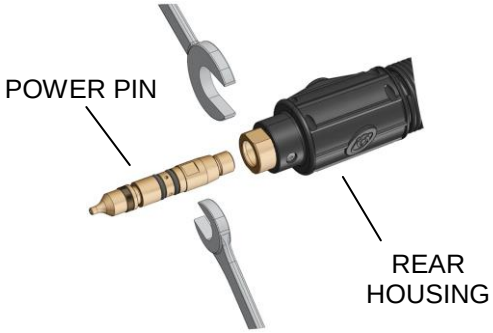


Fig. 5



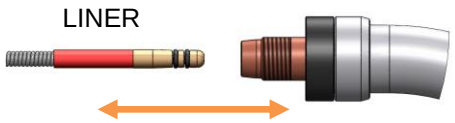
3.3 DIRECT POWER PIN REPLACEMENT

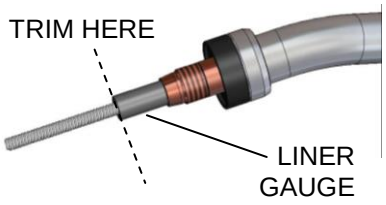
- Thread power pin into rear housing.
- Tighten the power pin into the rear housing using a 3/4" (19 mm) wrench on the rear housing and a 1" wrench on the power pin. Torque to 18 ft.-lbs. (24.4 Nm).
- **IMPORTANT**: The thread-in two-piece power pin has a taper to seat and lock the power pin in the rear handle block. Tighten the power pin in the block with a wrench to ensure that pin remains in place.
- Install liner (See ***Section 3.4 QUICK LOAD™ LINER REPLACEMENT***).



3.4 QUICK LOAD™ LINER REPLACEMENT

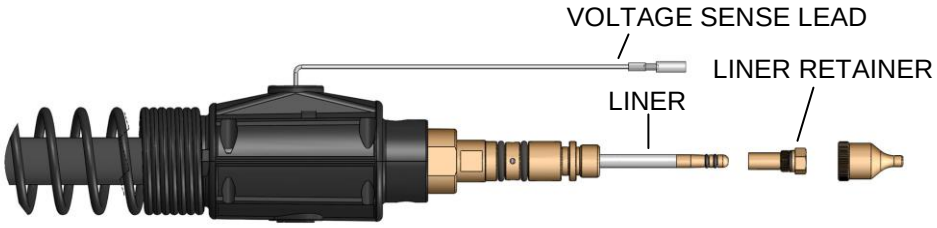
1. Remove consumables (nozzle, contact tip and retaining head).
2. Remove existing QUICK LOAD Liner by pulling it out through the neck.
3. Insert the new QUICK LOAD Liner through the neck using the welding wire as a guide (push the liner in short bursts to help to prevent kinking).
4. Once the liner stops feeding, give it an extra push to ensure it is inserted completely.
5. Push liner back into gun and hold in place. Using liner gauge, trim conduit liner with 3/4" (20 mm) stick out.
6. Feed wire through liner.
7. Reinstall consumables (See ***Nozzles and Contact Tip Systems*** section).





Replacing the QUICK LOAD Liner Retainer

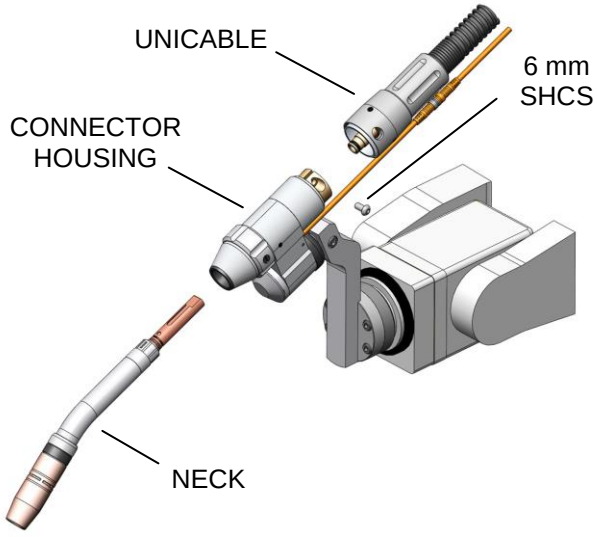
1. Remove consumables (nozzle, contact tip and retaining head).
2. Remove existing QUICK LOAD Liner by pulling it out through the neck.
3. Remove retainer from the power pin at the rear of the gun. This may require removal of a power pin cap depending on your power pin style.
4. Install the QUICK LOAD Liner from the back of the MIG gun with liner retainer attached.
5. Reinstall the power pin cap (if applicable).
6. Push liner back into neck and hold in place. Using liner gauge, trim conduit liner with 3/4" (20 mm) stick out.
7. Feed wire through liner.
8. Reinstall consumables.



3.5.1 AIR-COOLED UNICABLE ASSEMBLY REPLACEMENT

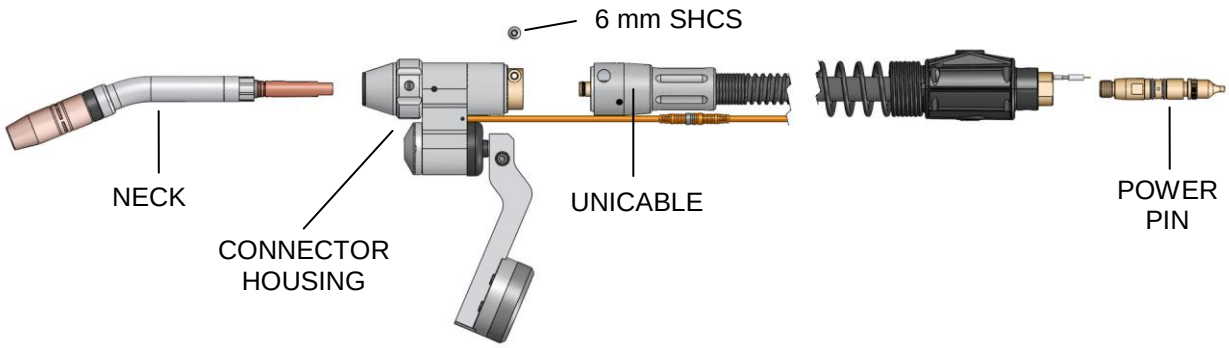
Disconnecting the Old Unicable

1. Remove the neck, liner, and power pin from the gun (See N***eck Removal, Direct Power Pin Replacement, and QUICK LOAD Liner Replacement*** sections).
2. Remove the Velcro straps from the unicable / control cable.
3. Disconnect the clutch cable at the threaded connection.
4. Disconnect the voltage sense lead.
5. Remove the 6 mm SHCS on the connector assembly with an M5 Allen key.
6. Remove the unicable assembly.



Connecting the New Unicable

1. Take the power pin removed from the old unicable and install it on the new unicable (See Direct Power Pin Replacement for details).
2. Insert the unicable into the connector housing. Fasten the cable to the gun by inserting and torquing the 6 mm SHCS to 60 in.-lbs. (7 Nm).
3. Attach clutch cable at five points along the unicable using Velcro straps.
4. Reinstall the neck (see Neck Replacement section for details).
5. Reinstall the QUICK LOAD Liner (See ***Section 2.4 QUICK LOAD LINER REPLACEMENT***).
6. Reconnect the clutch cable and voltage sense lead (See ***Connecting Gun to Wire Feeder*** section).

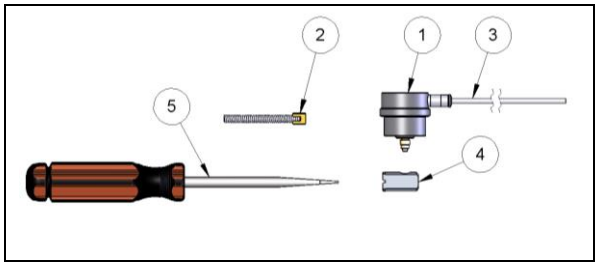


3.5.2 TOUGH GUN I.C.E.™ UNICABLE ASSEMBLY REPLACEMENT

1. Remove leather jacket.
2. Retain water lines.
3. Follow instructions outlined in section ***3.5.1 AIR-COOLED UNICABLE ASSEMBLY REPLACEMENT***.
4. Ensure water lines are included when replacing leather wrap.

3.6 WIRE BRAKE REMOVAL AND INSTALLATION

NOTE: ***This product is factory set for wire equal to or smaller than 0.045”***. If you are using wire 0.052” and larger, please remove and replace the Wire Guide within the neck housing and replace it with the larger size (part #598G2-116) that is supplied with the product.



ITEM	PART #	DESCRIPTION
1	599	PUSHING PIN
2	495-18-35	JUMP LINER FOR ≤ 0.045”
	495-18-116	JUMP LINER FOR ≥ 0.052”
3	499-9-15	AIR LINE 15’
4	598G2	WIRE GUIDE FOR ≤ 0.045”
	598G2-116	WIRE GUIDE FOR ≥ 0.052”
5		FLAT HEAD SCREW DRIVER

1. Unthread the pushing unit (1) and remove the wire guide (4) (See Fig. 1).
   NOTE: Photo of gun housing is not exactly as shown.
2. Using the flat head screw driver (5), insert the wire guide (4) (flats parallel with housing key) into position within the housing (See Fig. 2). Rotate wire guide (4) to align hole with pushing unit pin (1), thread-in the pushing unit (1) (See Fig. 3).
   NOTE: Photo of gun housing is not exactly as shown.

Fig. 1

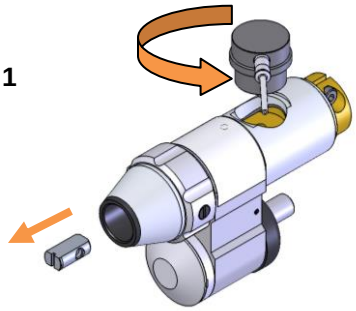


Fig. 2

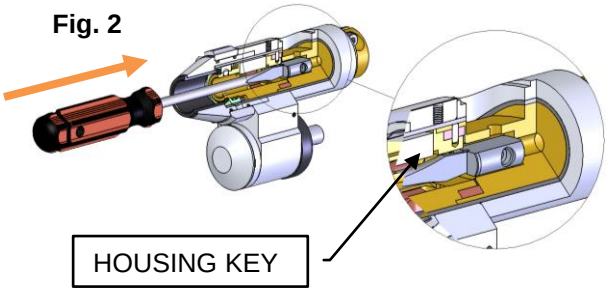
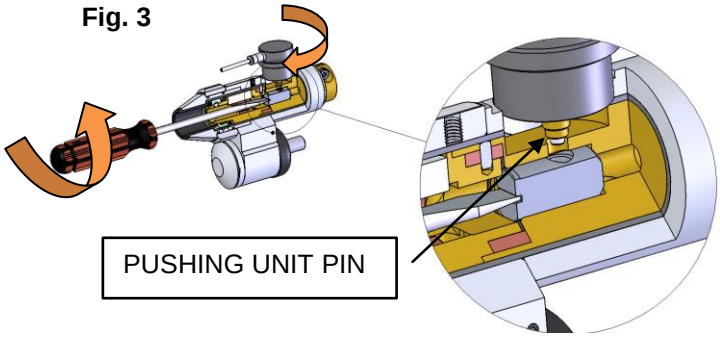


Fig. 3



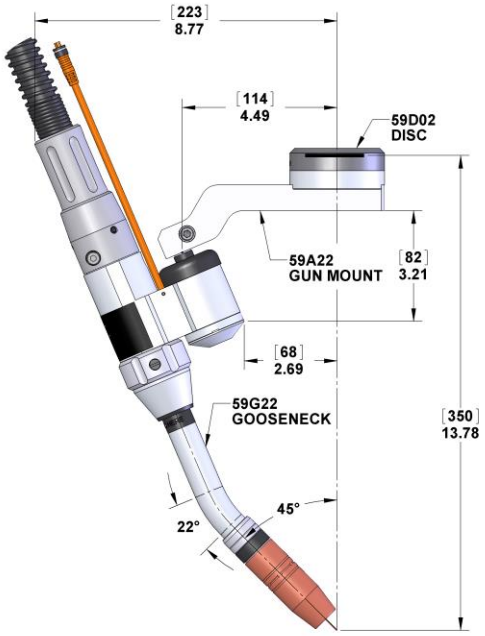
IMPORTANT:
For the Wire Brake to work properly, make sure the pushing unit bottoms-out in the housing/connector.

4.0 – TECHNICAL DATA

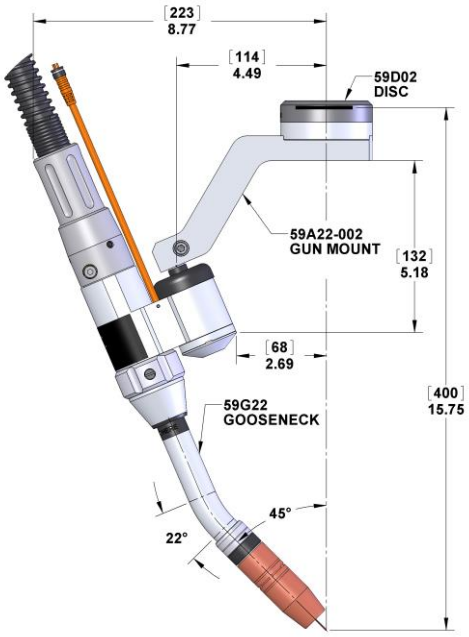
4.1 GUN CONFIGURATIONS

IMPORTANT: All gun configurations have a standard wire stick-out dimension of 15 mm (0.59”) and approach angle of 45 degrees.

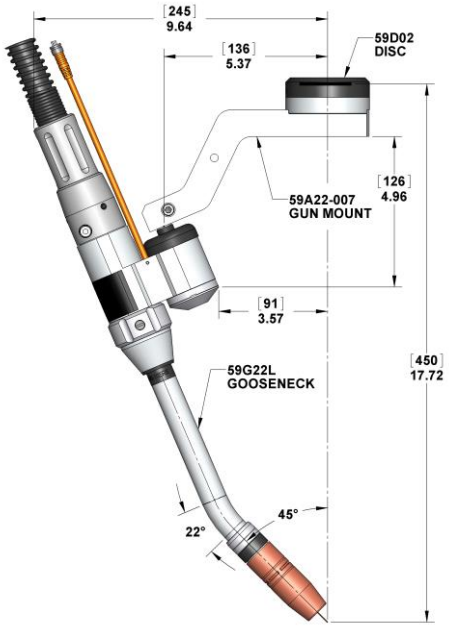
STANDARD CONFIGURATIONS — 22° NECKS



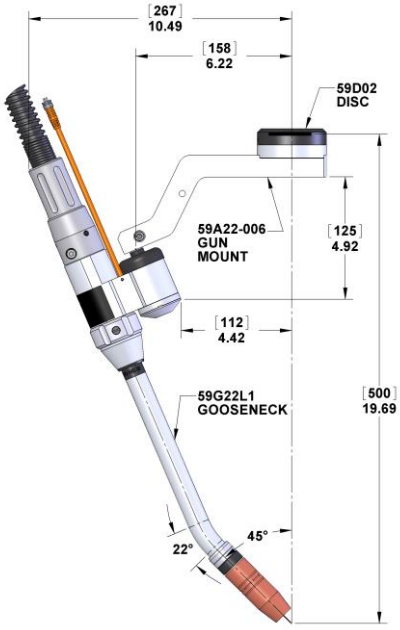
13.78” (350 mm) TCP - 22°



15.75” (400 mm) TCP - 22°

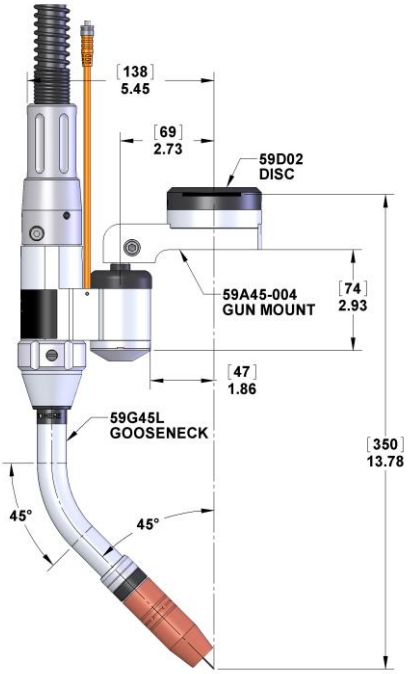


17.72” (450 mm) TCP - 22°

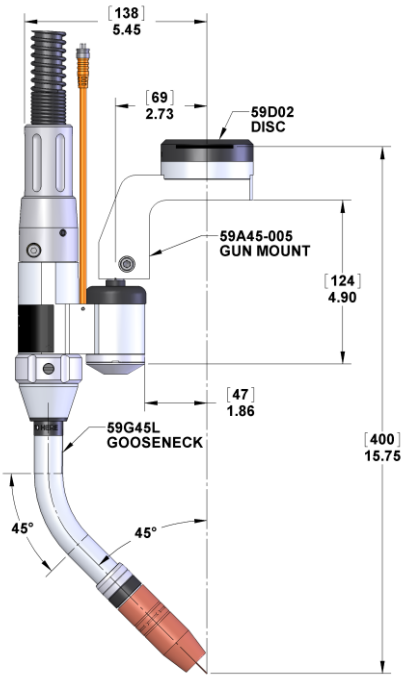


19.69” (500 mm) TCP - 22°

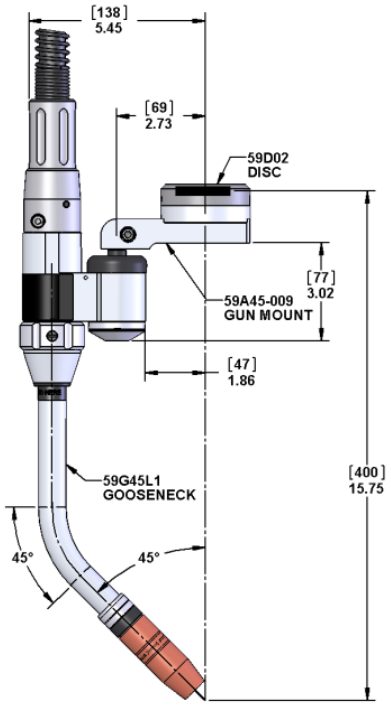
STANDARD CONFIGURATIONS — 45° NECKS



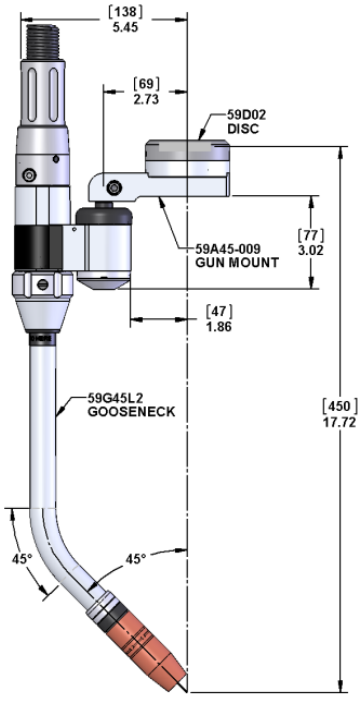
13.78” (350 mm) TCP - 45°



15.75” (400 mm) TCP - 45°

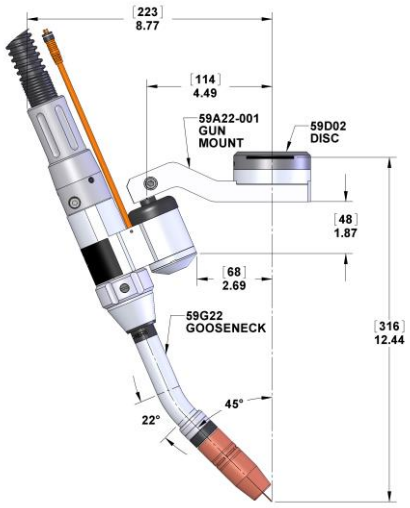


15.75” (400 mm) TCP - 45°

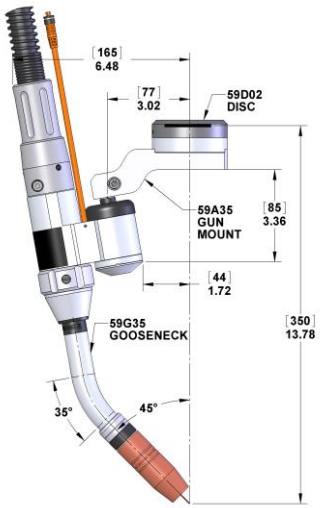


17.72” (450 mm) TCP - 45°

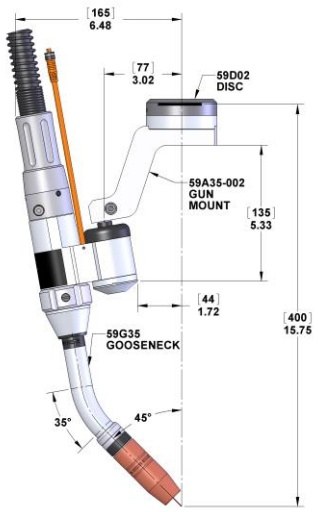
ALTERNATE CONFIGURATIONS



12.44” (316 mm) TCP - 22°
(PREVIOUS TOUGH GUN STANDARD)

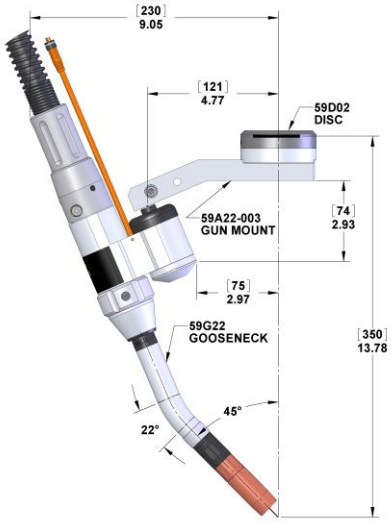


13.78” (350 mm) TCP - 35°

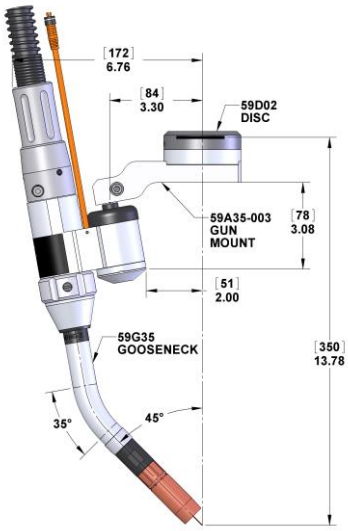


15.75” (400 mm) TCP - 35°

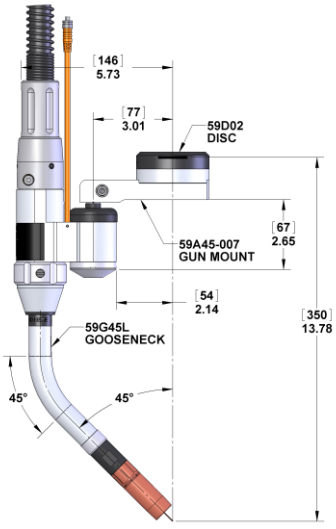
TOUGH ACCESS CONFIGURATIONS



13.78” (350 mm) TCP - 22°
TOUGH ACCESS Consumables

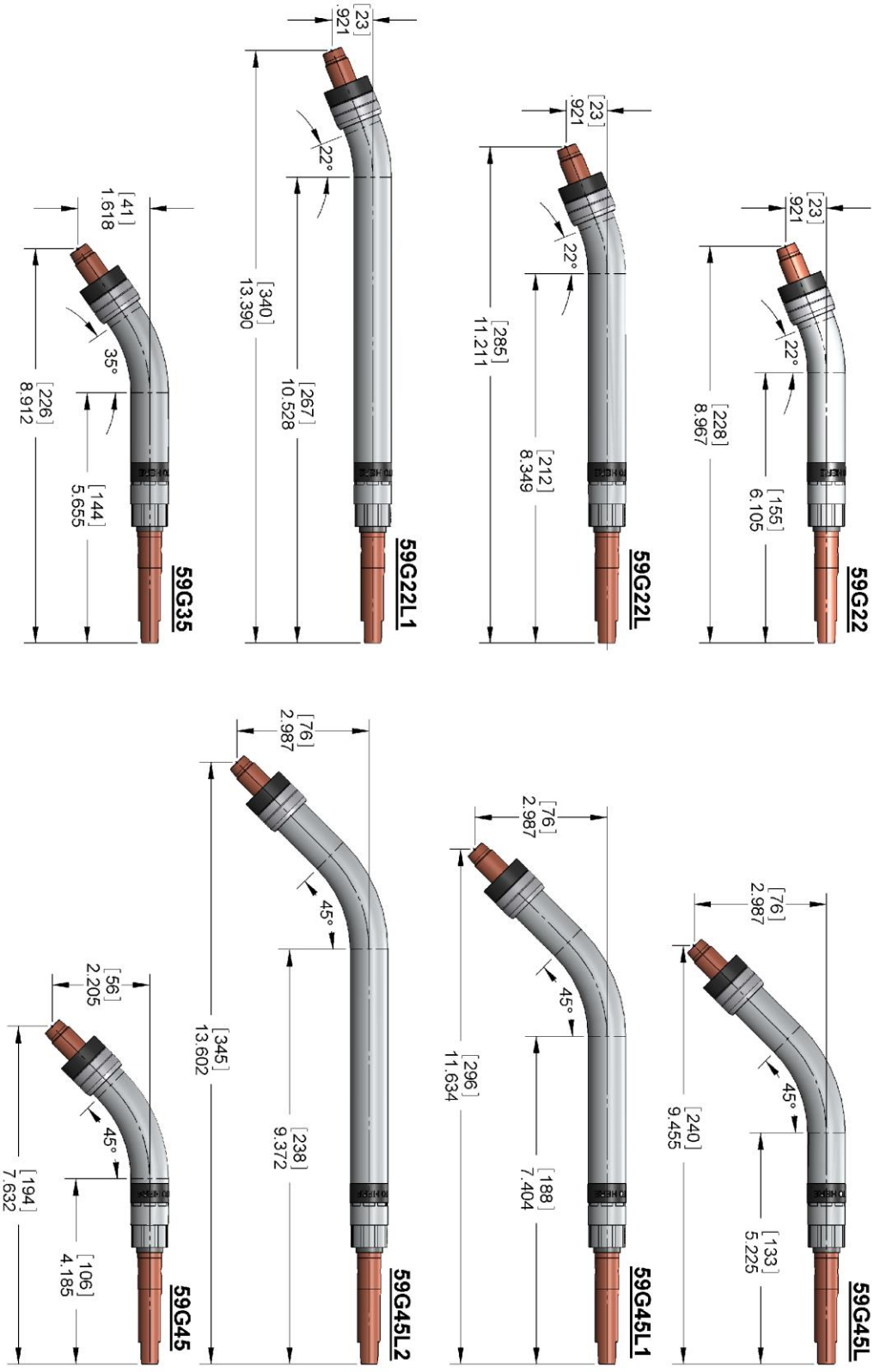


13.78” (350 mm) TCP - 35°
TOUGH ACCESS Consumables

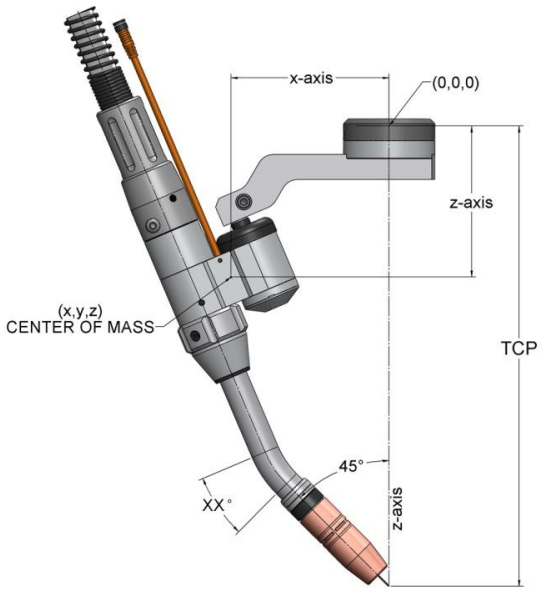


13.78” (350 mm) TCP - 45°
TOUGH ACCESS Consumables

4.2 TOUGH GUN G2 NECK DIMENSIONS



4.3 CENTER OF MASS



CENTER OF MASS – CLUTCH				
STANDARD CONFIGURATIONS	**X INCHES (MM)**	**Y**	**Z INCHES (MM)**	**WEIGHT LBS (KG)**
13.78” (350 mm) TCP - 22 DEGREES	-4.51 (-114.55)	0	-4.27 (-108.46)	5.04 (2.29)
13.78” (350 mm) TCP - 35 DEGREES	-3.57 (-90.68)	0	-4.00 (-101.6)	4.95 (2.25)
13.78” (350 mm) TCP - 45 DEGREES	-3.47 (-88.14)	0	-3.45 (-87.63)	5.01 (2.27)
ALTERNATE CONFIGURATIONS	**X**	**Y**	**Z**	**WEIGHT**
15.75” (400 mm) TCP - 22 DEGREES	-4.47 (-113.54)	0	-5.88 (-149.35)	5.19 (2.35)
15.75” (400 mm) TCP - 35 DEGREES	-3.51 (-89.15)	0	-5.63 (-143.0)	5.12 (2.32)
15.75” (400 mm) TCP - 45 DEGREES	-3.42 (-86.87)	0	-5.06 (-128.52)	5.23 (2.37)
12.44” (316 mm) TCP - 22 DEGREES	-4.51 (-114.55)	0	-3.14 (-79.76)	5.01 (2.27)
TOUGH ACCESS CONFIGURATIONS	**X**	**Y**	**Z**	**WEIGHT**
13.78” (350 mm) TCP - 22 DEGREES	-4.75 (-12.65)	0	-4.03 (-102.362)	5.04 (2.29)
13.78” (350 mm) TCP - 35 DEGREES	-3.82 (-97.03)	0	-3.76 (-95.50)	4.95 (2.25)
13.78” (350 mm) TCP - 45 DEGREES	-3.75 (-95.25)	0	-2.97 (-75.44)	4.84 (2.20)

CENTER OF MASS – SOLID MOUNT				
STANDARD CONFIGURATIONS	**X INCHES (MM)**	**Y**	**Z INCHES (MM)**	**WEIGHT LBS (KG)**
13.78” (350 mm) TCP - 22 DEGREES	-4.31 (-109.47)	0	-4.93 (-125.22)	4.91 (2.23)
13.78” (350 mm) TCP - 35 DEGREES	-3.62 (-91.95)	0	-4.19 (-106.43)	4.53 (2.05)
13.78” (350 mm) TCP - 45 DEGREES	-2.91 (-73.91)	0	-4.72 (-119.89)	4.45 (2.02)
ALTERNATE CONFIGURATIONS	**X**	**Y**	**Z**	**WEIGHT**
15.75” (400 mm) TCP - 22 DEGREES	-4.27 (-108.46)	0	-6.50 (-165.1)	5.05 (2.29)
15.75” (400 mm) TCP - 35 DEGREES	-3.55 (-90.17)	0	-5.78 (-146.81)	4.69 (2.13)
15.75” (400 mm) TCP - 45 DEGREES	-2.85 (-72.39)	0	-6.11 (-155.19)	4.54 (2.06)
12.44” (316 mm) TCP - 22 DEGREES	-4.31 (-109.47)	0	-3.81 (-96.77)	4.87 (2.21)
TOUGH ACCESS CONFIGURATIONS	**X**	**Y**	**Z**	**WEIGHT**
13.78” (350 mm) TCP - 22 DEGREES	-7.02 (-178.31)	0	0.71 (18.03)	4.85 (2.2)
13.78” (350 mm) TCP - 35 DEGREES	-3.92 (-99.57)	0	-3.55 (-90.17)	4.31 (1.95)
13.78” (350 mm) TCP - 45 DEGREES	-3.83 (-97.28)	0	-2.99 (-75.95)	4.33 (1.97)

4.4 GUN AMPERAGES

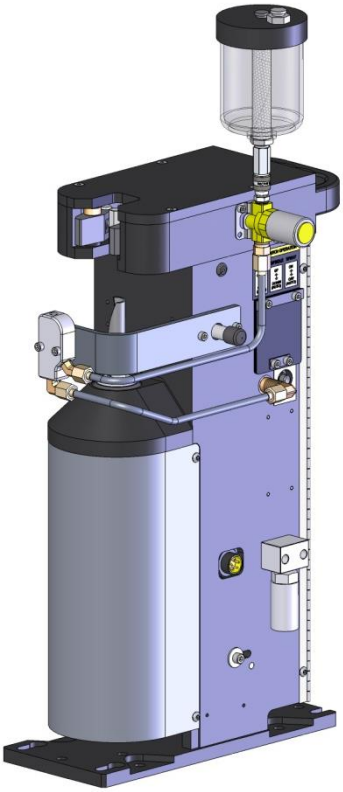
MODEL	60% DUTY CYCLE - MIXED GASES OR 100% DUTY CYCLE - CO_2
300 amp	300 amp
500 amp	500 amp

NOTE: Ratings are based on tests that comply with IEC 60974-7 standards.

5.0 – RECOMMENDED ACCESSORIES

5.1 TOUGH GUN™ REAMER NOZZLE CLEANING STATION

By minimizing spatter accumulation, the TOUGH GUN Reamer extends the life of robotic MIG guns and consumables, resulting in increased uptime and lower operating costs.



Safe and Accurate Setup:

- External setup switches allow independent operation of the sprayer, clamp and spindle during manual setup.
- Cutter blade lifts into position but does not spin when activated by the spindle setup switch.
- New v-block has 4 sides for compatibility with most Tregaskiss Nozzles.

Improved Reliability:

- All pneumatic valves are internally mounted.
- Seals protect points of entry.
- Protected external setup switches.
- Electric Check-Valve ensures more consistent operation.

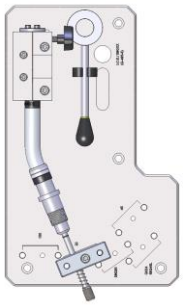
Maintenance-Friendly:

- Quick-Change Base Plate allows easy and accurate removal and replacement of reamer.
- Convenient carry handle.
- Quick-disconnect wiring – valves can be replaced without rewiring.

For more information on this product, please visit Tregaskiss.com or contact your Tregaskiss representative.

5.2 TOUGH GUN NECK INSPECTION FIXTURE

The TOUGH GUN Neck Inspection Fixture tests the tolerance of a robotic MIG gun's neck to tool center point (TCP). If the neck is out of tolerance due to impact or prolonged usage, the fixture can be used to realign the neck.



PART NUMBER: G-59

Benefits:

- Realigns neck to tool center point.
- Accommodates all standard-sized necks.
- Prolongs the life of your necks -- readjust a bent neck instead of replacing it.
- Prevents costly rework due to missed weld joints.
- Prevents downtime for reprogramming the robot to match a bent neck.

For more information on this product, please visit Tregaskiss.com or contact your Tregaskiss representative.

6.0 – TROUBLESHOOTING

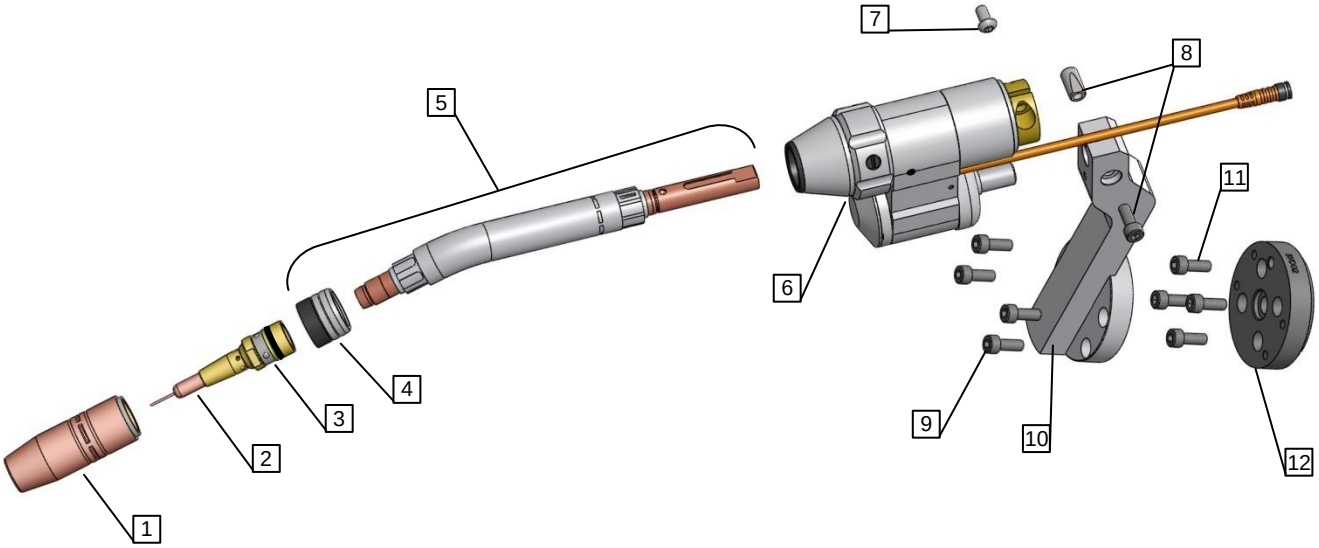
PROBLEM	POTENTIAL CAUSE	POSSIBLE SOLUTION
CONTACT TIP WEAR	• CONTACT TIP SIZE	REPLACE WITH PROPER SIZE.
	• ELECTRODE ERODING CONTACT TIP	INSPECT AND/OR CHANGE DRIVE ROLLS.
	• EXCEEDING DUTY CYCLE	REPLACE WITH PROPERLY RATED GUN.
CONTACT TIP BURN BACK	• IMPROPER VOLTAGE AND/OR WIRE FEED SPEED	SET PARAMETERS.
	• ERRATIC WIRE FEEDING	SEE **POOR WIRE FEEDABILITY.**
	• IMPROPER STICK-OUT	ADJUST NOZZLE/TIP RELATIONSHIP.
	• IMPROPER ELECTRODE STICK-OUT	ADJUST GUN TO BASE METAL RELATIONSHIP.
	• FAULTY GROUND	REPAIR ALL CABLES AND CONNECTIONS .
WELD POROSITY	• WIRE STICK-OUT TOO LONG, GAS NOZZLE TOO FAR FROM WELD POOL	USE LONGER NOZZLE.
	• BAD GUN POSITION – TOO SHARP GUN INCLINE CAUSING VENTURI EFFECT AT THE END OF NOZZLE LEADING TO ATMOSPHERIC CONTAMINATION	CORRECT GUN ANGLE.
	• EXCESSIVE WIDE WELD POOL FOR NOXXLE I.D.	USE LARGER BORE NOZZLE.
	• ARC VOLTAGE TOO HIGH	REDUCE VOLTAGE, VERIFY PARAMETERS.
	• DRAFTS, WIND, FANS, EXHAUST DUCTS, ETC.	PROTECT THE WORK PIECE FROM DRAFTS WITH CURTAINS OR SCREENS. DRAFTS CAN EASILY DRAW AWAY THE SHIELDING GAS FROM THE WELD POOL LEAVING IT WITHOUT SUFFICIENT GAS PROTECTIONS.
	• IMPURITIES IN THE BASE METAL	REMOVE ALL CONTAMINATION FROM THE SURFACES TO BE WELDED. PAINT, MILL SCALE, RUST GREASE, AND OTHER CONTAMINATION CAN CAUSE POROSITY IN THE WELD.
	• UNSUITABLE JOINT FIT-UP	MINIMIZE GAPS OR PROVIDE BACKING.
	• SPATTER IN NOZZLE AND ON CONTACT TIP	CLEAN THE NOZZLE AND THE CONTACT TIP REGULARLY. SPATTER ON THESE PARTS CAUSES TURBULENCE ON THE GAS FLOW, CAUSING AIR TO BECOME MIXED INTO THE SHIELDING GAS RESULTING IN POROSITY. DO NOT HIT THE NOZZLE TO REMOVE SPATTER – USE A SUITABLE SCRAPER.
	• GAS FLOW RATE TOO HIGH OR TOO LOW	CONSULT YOUR WELDING ENGINEER FOR PROPER FLOW RATE. TOO LOW A GAS FLOW RATE GIVES INSUFFICIENT PROTECTION TO THE WELD POOL. TOO HIGH A GAS FLOW RATE CAUSES TURBULENCE IN THE GAS SHIELD, WHICH IN TURN CAN SUCK IN AIR RESULTING IN POROSITY.
	• NOZZLE DAMAGED	REPLACE NOZZLE. A NOZZLE WITH UNEVEN EDGES GIVES RISE TO TURBULENCE IN THE GAS FLOW. DO NOT HIT NOZZLE TO REMOVE SPATTER – USE A SUITABLE SCRAPER.
	• STICK-OUT TOO LONG	GENERALLY, SET THE STICK-OUT AT ABOUT 15 TIMES THE DIAMETER OF THE WIRE BEING USED.
	• DAMAGED, KINKED, OR LEAKING GAS HOSE	INSPECT AND REPAIR OR REPLACE AS NECESSARY.
	• DAMAGED OR MISSING NOZZLE INSULATOR OR GAS DIFFUSER	INSPECT AND REPLACE AS NECESSARY.
SPATTER	• WIRE FEED TOO FAST OR SOO SLOW IN RELATION TO THE ARC VOLTAGE	SET THE WIRE FEED RATE AND VOLTAGE IN ACCORDANCE WITH GOOD WELDING PRACTICES AS RECOMMENDED BY A QUALIFIED WELDING ENGINEER.
	• ARC TOO LONG	ADJUST THE WIRE FEED AND VOLTAGE SO THAT THE ARC IS IN ACCORDANCE WITH GOOD WELDING PRACTICES FOR THE JOINT TO BE WELDED. THE DISTANCE FROMT EH WELDING GUN TO THE WORK-PIECE SHOULD BE ABOUT 1/2" TO 1”. IF THE ARC IS TOO LONG, THERE WILL BE SPATTER; USUALLY IN THE DIRECTION OF THE WELD.
	• DAMAGED CONTACT TIP	IF THE CONTACT TIP BECOMES WORN, THE FILLER WILL NOT BE IN CONSTANT CONTACT WITH THE CONTACT TIP CAUSING THE ARC TO BECOME UNSTABLE. A CONTACT TIP CONTAMINATED WITH SPATTER WILL CAUSE UNEVEN WIRE FEED RESULTING IN FURTHER SPATTER.

	• FAULTY POWER SOURCE	HAVE THE POWER SOURCE CHECKED FOR FAULTY CONDITIONS SUCH AS BROKEN WIRES OR FAULTY CONTACT.
	• INCORRECT START	A LOT OF SPATTER OCCURS IF THE STICK-OUT IS TOO GREAT AND IF THE WELDING GUN IS HELD TOO FAR FROM THE WORK-PIECE WHEN STRIKING THE ARC. TRY TO START WITH AS SHORT OF A STICK-OUT AS POSSIBLE AND WITH THE WELDING GUN AS CLOSE TO THE STARTING POINT AS POSSIBLE. IF A LARGE BALL FORMS 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 WELDING GROUND CONNECTION.
	• INCORRECT PULSE PARAMETERS	CONSULT THE USER MANUAL FOR YOUR POWER SUPPLY OR A QUALIFIED WELDING ENGINEER.
	• UNEVEN WIRE FEED	UNEVEN WIRE FEED GIVES RISE TO HEAVY SPATTER. FIND THE CAUSE OF THE DISTURBANCE AND CORRECT THE CONDITION BEFORE PROCEEDING.
	• POOR GROUND CONTACT	INSPECT GROUND CABLE FOR LOOSE CONNECTION, FRAYING AND CUTS. CORRECT THE PROBLEM AREAS FOUND AND ATTACH THE GROUND CABLE DIRECTLY TO THE WORK-PIECE AFTER HAVING CLEANED THE CONTACT SURFACE FIRST. POOR GROUND CONTACT IS THE MOST COMMON CAUSE OF UNSTABLE MIG WELDING CONDITIONS.
	• STICK-OUT TOO LONG (SHORT ARC WELDING)	THE STICK-OUT SHOULD BE 15 TIMES THE DIAMETER OF THE ELECTRODE BEING USED. WITH INCREASING STICK-OUT, THE CURRENT IS REDUCED AND THE ARC VOLTAGE RISES, GIVING A LONGER UNSTABLE ARC AND INCREASED SPATTER.
POOR WIRE FEEDABILITY	• 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 AND MAY CAUSE COPPER COATING TO LOOSEN FROM STEEL WIRES OR METAL SHAVINGS TO BE FORMED (FROM SOFT WIRE LIKE ALUMINUM) WHICH WILL 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 POWERS TO ESCAPE.
	• CLOGGED OR WORN LINER	DUST, PARTICLES OF COPPER, DRAWING LUBRICANTS, METAL OR FLUX AND OTHER FORMS OF CONTAMINATION CAN RAPIDLY CLOG THE LINER SO THAT THE FEED IS IMPEDED. A LINER WHICH HAS BEEN IN USE FOR AN EXTENDED PERIOD OF TIME BECOMES WORN AND SATURATED WITH DUST AND MUST BE REPLACED. WHEN CHANGING WIRE, REMOVE THE CONTACT TIP FROM THE FRONT END OF THE GUN AND BLOW OUT THE LINER WITH CLEAN, DRY COMPRESSED AIR FROM THE BACK OF THE GUN. NOTE: WEAR SAFETY GOGGLES WHEN USING COMPRESSED AIR TO CLEAN LINER. ENSURE PROPER SAFETY PROCEDURES ARE FOLLOWED TO AVOID POSSIBLE SERIOUS EYE INJURY.
	• LINER TOO LONG OR TOO SHORT	CHECK THE LENGTH OF THE LINER AND EITHER TRIM IF TOO LONG OR REPLACE THE LINER IF TOO SHORT. PROPER FEED OF THE WELDING WIRE IS DEPENDENT UPON THE CORRECT LENGTH OF THE LINER.
	• DEBRIS ON 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 AND CLEAN WIRE AND KEEP IT PROTECTED WITH A COVER.
	• WIRE 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 TANGLES OF THE WIRE, IRREGULAR TENSION IN THE FEED MECHANISM, AND IRREGULAR ARC CHARACTERISTICS.
OVERHEATING	• POOR GROUND	INSPECT GROUND CABLE FOR LOOSE CONNECTION, FRAYING AND CUTS. CORRECT ANY PROBLEM AREAS FOUND. CLEAN CLAMPING AREA TO ENSURE GOOD CONTACT. SECURELY ATTACH GROUND CABLE TO WORK-PIECE AS CLOSE AS POSSIBLE TO THE POINT OF WELDING. ENSURE GOOD CONNECTION TO WELDING POWER SOURCE.

	• LOOSE POWER CONNECTION	CHECK TO ENSURE POWER CONNECTION ON POWER SOURCE IS TIGHT, THE CONNECTION ON THE WIRE FEEDER IS TIGHT, THE CONNECTION ON 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 CONTACT TIP AND CONTACT TIP HOLDER / GAS DIFFUSER FOR WEAR AND TIGHTNESS; REPLACE OR TIGHTEN IF NECESSARY.
	• CAPACITY OF GUN BEING EXCEEDED	NOTE COMPLETE WELD PARAMETER INCLUDING WELDING CURRENT IN AMPS, DUTY CYCLE, WELDING VOLTAGE, WIRE FEED SPEED, TYPE AND SIZE OF WIRE, TYPE OF GAS AND FLOW RATE OF GAS.
	• DIRTY CONNECTION	REMOVE NECK AND INSPECT INTERFACE FOR DIRT AND BUILD-UP. PERIODIC CLEANING IS NECESSARY.
ERRATIC 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 BURNS EVENLY AND STABLE. IN SPRAY ARC WELDING, SET THE WIRE FEED SO THAT SHORT-CIRCULATING CEASES AND SO THAT THE FILLER METAL IS TRANSFERRED IN A SPRAY ACROSS THE ARC.
	• DEFECTS IN WIRE FEED	FIND THE CAUSE OF THE INTERFERENCE AND CORRECT THE CONDITION.
	• WORN CONTACT TIPS	WHEN THE OPENING OF THE CONTACT TIP HAS BECOME TOO BADLY WORN, THE WIRE WILL NO LONGER BE IN CONTINUOUS ELECTRICAL CONTACT, WHICH WILL RESULT IN AN UNSTABLE ARC AND AN INCREASE IN SPATTER.
	• POOR CONTACT BETWEEN GROUND CABLE AND WORK-PIECE	SECURELY ATTACH THE GROUND CABLE AS CLOSE TO THE POINT OF WELDING AS POSSIBLE ON THE WORK-PIECE. CLEAN THE SURFACES TO ENSURE GOOD CONTACT.
	• LOOSE POWER CONNECTION	CHECK TO ENSURE WELDING POWER CONNECTION ON THE POWER IS TIGHT, THE CONNECTION ON THE WIRE FEEDER IS TIGHT, THE CONNECTION ON THE ADAPTOR BLOCK IS TIGHT, AND THE CONNECTION OF THE GUN TO THE ADAPTOR BLOCK IS TIGHT.
	• STICK-OUT TOO LONG	ADJUST THE CONTACT TIP TO WORK DISTANCE TO A MINIMUM OF 3/8” FOR SHORT ARC WELDING WITH SMALL DIAMETER WIRES.
ARCING IN THE NOZZLE	• SPATTER BUILD-UP IS BRIDGING BETWEEN THE NOZZLE AND CONTACT TIPS OR DIFFUSERS	REMOVE SPATTER BUILD-UP ON A REGULAR BASIS. ADJUST WELD PROCEDURE TO REDUCE SPATTER.
	• THE NOZZLE BORE IS TOO SMALL FOR THE APPLICATION	SWITCH TO A LARGER BORE NOZZLE.
	• THE GUN IS NOT INSULATED FROM THE FIXTURE	MAKE SURE THE GUN IS ON AN INSULATED MOUNT.
CONTINUOUS CLUTCH ACTIVATION	• SWITCH MALFUNCTION	REPLACE SWITCH.
TCP VARIATION	• INCORRECT GUN INSTALLATION	CHECK ALL JOINTS.
	• INCORRECT TCP AFTER CRASH	VERIFY TCP ON CHECKING FIXTURE.

7.0 – EXPLODED VIEW AND PARTS LIST

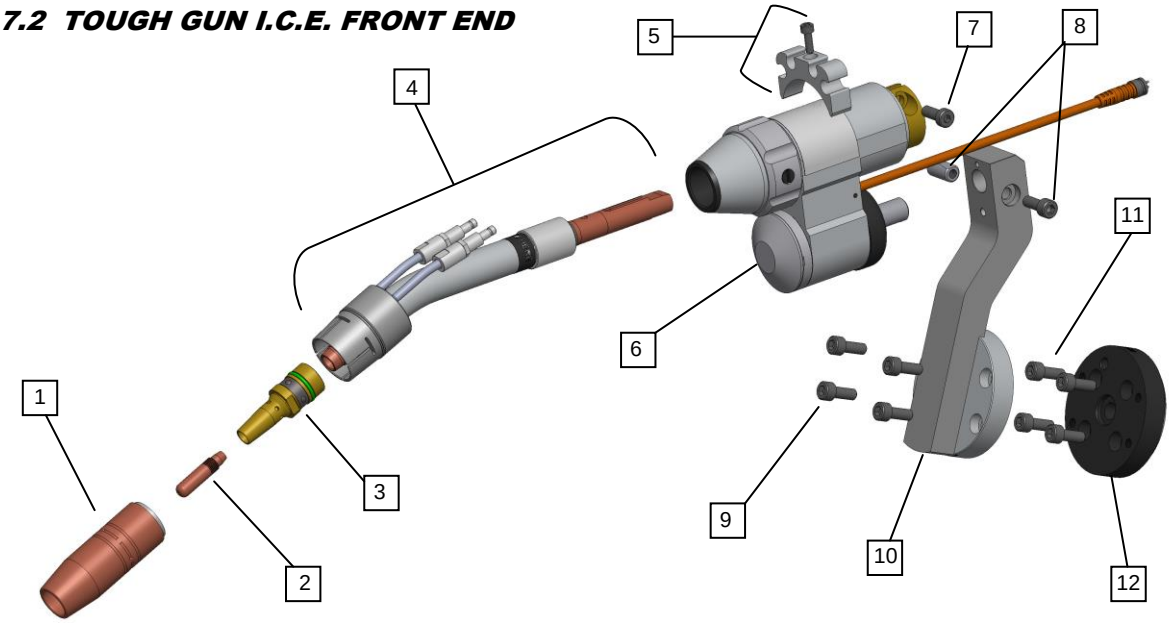
7.1 AIR-COOLED FRONT END



ITEM	PART #	DESCRIPTION
1		**STANDARD NOZZLES** (SELF INSULATED)
	401-4-62	5/8" BORE, 1/8" RECESS - SHORT TAPER
	401-54-50	TOUGH ACCESS (SD) 1/2" BORE, 1/8" RECESS
	401-8-62	5/8" BORE, 1/8" STK. OUT - SHORT TAPER
	401-44-62	5/8" BORE, 1/4" STK. OUT - SHORT TAPER
		HEAVY DUTY NOZZLES (SELF INSULATED)
	401-56-62	TOUGH ACCESS (HD) 5/8" BORE, 1/8" STK. OUT
	401-6-62	5/8" BORE, 1/8" RECESS - LONG TAPER (STRAIGHT BORE)
	401-71-62	5/8" BORE, 1/8" RECESS - LONG TAPER (STRAIGHT BORE)
	401-81-62	5/8" BORE, 1/8" STK. OUT - LONG TAPER
	401-87-62	5/8" BORE, 1/8" STK. OUT - LONG TAPER
	401-91-62	5/8" BORE, 1/8" STK. OUT - LONG TAPER (STRAIGHT BORE)
		BOTTLENECK NOZZLES
	401-42-50	1/2" BORE, 1/4" STK. OUT - BOTTLENECK
	401-42-50C	1/2" BORE, 1/8" RECESS - BOTTLENECK
	401-44-50	1/2" BORE, 1/4" STK. OUT - BOTTLENECK
	401-48-50	1/2" BORE, 1/8" STK. OUT - BOTTLENECK
	401-48-50C	1/2" BORE, 1/8" STK. OUT - BOTTLENECK
	401-48-62	5/8" BORE, FLUSH TIP - BOTTLENECK
	401-49-50	1/2" BORE, FLUSH TIP - BOTTLENECK
2		**TOUGH LOCK™ CONTACT TIPS**
	403-14-XX	TOUGH LOCK STANDARD DUTY CONTACT TIPS
	403-21-XX	TOUGH LOCK TAPERED CONTACT TIPS
	403-20-XX	TOUGH LOCK HEAVY DUTY CONTACT TIPS
	403-27-XX	TOUGH LOCK EXTENDED LIFE HEAVY DUTY (EXHD)
3	404-32	**RETAINING HEAD - TOUGH LOCK**
NOT SHOWN	454-1-2	RETAINING RING ONLY
4	59GI	**G2 NECK INSULATOR (QTY 100)**
	59GI-25	**G2 NECK INSULATOR (QTY 25)**
5		**NECKS (SUPPLIED WITH NECK INSULATOR)**
	59G22	22° QC-STANDARD
	59G22L	22° QC-STANDARD MEDIUM LENGTH
	59G22L1	22° QC-STANDARD LONG LENGTH
	59G35	35° QC-STANDARD
	59G45L	45° QC-STANDARD
	59G45L1	45° QC-STANDARD MEDIUM LENGTH
	59G45L2	45° QC-STANDARD LONG LENGTH

ITEM	PART #	DESCRIPTION
6		**CONNECTOR HOUSINGS**
	59C	CLUTCH MOUNT (SHOWN)
	59S	SOLID MOUNT
	59CW	CLUTCH CONNECTOR HOUSING (WIRE BRAKE)
	59SW	SOLID MOUNT CONNECTOR HOUSING (WIRE BRAKE)
7		**M6 SHCS**
8	580-3	**LOCKING PIN ASSEMBLY**
9		**6 MM SHCS**
10		**MOUNTING ARMS**
	59A22	G2 MOUNTING ARM FOR 59G22 @ 350 mm
	59A22-001	G2 MOUNTING ARM FOR 59G22 @ 350 mm (ORIGINAL TOUGH GUN TCP FOR 22 DEGREES)
	59A22-002	G2 MOUNTING ARM FOR 59G22 @ 400 mm
	59A22-003	G2 MOUNTING ARM FOR 59G22 @ 350 mm TOUGH ACCESS CONSUMABLES
	59A22-006	G2 MOUNTING ARM FOR 59G22L1 @ 500 mm
	59A22-007	G2 MOUNTING ARM FOR 59G22L @ 450 mm
	59A35	G2 MOUNTING ARM FOR 59G35 @ 350 mm
	59A35-002	G2 MOUNTING ARM FOR 59G35 @ 400 mm
	59A35-003	G2 MOUNTING ARM FOR 59G35 @ 350 mm TOUGH ACCESS CONSUMABLES
	59A45-004	G2 MOUNTING ARM FOR 59G45L @ 350 mm
	59A45-005	G2 MOUNTING ARM FOR 59G45L @ 400 mm
	59A45-007	G2 MOUNTING ARM FOR 59G45L @ 350 mm TOUGH ACCESS CONSUMABLES
	59A45-009	G2 MOUNTING ARM FOR 59G45L1 @ 400 mm AND 59G45L2 @ 450 mm
11		**DIMENSIONS VARY BY ROBOT**
12		**INSULATING DISCS**
	59D01	MOTOMAN® K6SB, K10, SK16X, UP6, UP20, MRV6, ABB® IRB 1400M97A, IRB 2400L
	59D02	MOTOMAN® SK6, SK16 FANUC® 100, 100I, 120I, S-6, M710-20L, ABB® IRB 6, 1400, 1500, 2000, 2400 OTC® MRV-6, EX-V6, EX-V6L, EX-V16, DR4400 DAIHEN® DR-4000, DR-4200 MILLER® MRV-2
	59D03	PANASONIC® VR-008A, VR-006A, VR-005C, VR-006ALII, AW-10A, AW-8010, AW-005A&C&CL, AWOO6A, VR-006AL
	59D04	ABB: IRB-2400/10, IRB-2400/16, IRB-440L
	59D05	FANUC: ARCMATE 50iB
	59D06	KUKA: KR 16, KR 16 S, KR 16, KS

7.2 TOUGH GUN I.C.E. FRONT END

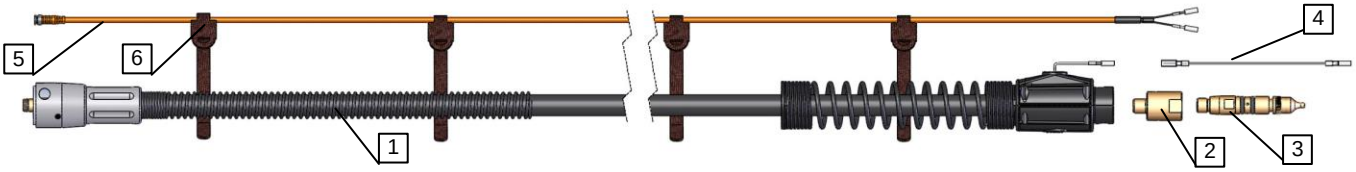


ITEM	PART #	DESCRIPTION
1		**STANDARD NOZZLES** (SELF INSULATED)
	401-4-62	5/8" BORE, 1/8" RECESS - SHORT TAPER
	401-54-50	TOUGH ACCESS (SD) 1/2" BORE, 1/8" RECESS
	401-8-62	5/8" BORE, 1/8" STK. OUT - SHORT TAPER
	401-44-62	5/8" BORE, 1/4" STK. OUT - SHORT TAPER
		HEAVY DUTY NOZZLES (SELF INSULATED)
	401-56-62	TOUGH ACCESS (HD) 5/8" BORE, 1/8" STK. OUT
	401-6-62	5/8" BORE, 1/8" RECESS - LONG TAPER (STRAIGHT BORE)
	401-71-62	5/8" BORE, 1/8" RECESS - LONG TAPER (STRAIGHT BORE)
	401-81-62	5/8" BORE, 1/8" STK. OUT - LONG TAPER
	401-87-62	5/8" BORE, 1/8" STK. OUT - LONG TAPER
	401-91-62	5/8" BORE, 1/8" STK. OUT - LONG TAPER (STRAIGHT BORE)
		BOTTLENECK NOZZLES
	401-42-50	1/2" BORE, 1/4" STK. OUT - BOTTLENECK
	401-42-50C	1/2" BORE, 1/8" RECESS - BOTTLENECK
	401-44-50	1/2" BORE, 1/4" STK. OUT - BOTTLENECK
	401-48-50	1/2" BORE, 1/8" STK. OUT - BOTTLENECK
	401-48-50C	1/2" BORE, 1/8" STK. OUT - BOTTLENECK
	401-48-62	5/8" BORE, FLUSH TIP - BOTTLENECK
	401-49-50	1/2" BORE, FLUSH TIP - BOTTLENECK
2		**TOUGH LOCK™ CONTACT TIPS**
	403-14-XX	TOUGH LOCK STANDARD DUTY CONTACT TIPS
	403-21-XX	TOUGH LOCK TAPERED CONTACT TIPS
	403-20-XX	TOUGH LOCK HEAVY DUTY CONTACT TIPS
	403-27-XX	TOUGH LOCK EXTENDED LIFE HEAVY DUTY (EXHD)
3	404-32	**RETAINING HEAD - TOUGH LOCK**
NOT SHOWN	454-1-2	RETAINING RING ONLY
4		**TOUGH GUN I.C.E. (G2) NECK**
	593-22-A	22° - 1.062 OD NOZZLES
	593-22-B	22° - 1.106 OD NOZZLES
	593-22-C	22° - 0.938 OD NOZZLES
	593-22L-A	22L° - 1.062 OD NOZZLES
	593-22L-B	22L° - 1.106 OD NOZZLES
	593-22L-C	22L° - 0.938 OD NOZZLES
	593-22L1-A	22L1° - 1.062 OD NOZZLES
	593-22L1-B	22L1° - 1.106 OD NOZZLES
	593-22L1-C	22L1° - 0.938 OD NOZZLES
	593-35-A	35° - 1.062 OD NOZZLES
	593-35-B	35° - 1.106 OD NOZZLES
	593-35-C	35° - 0.938 OD NOZZLES
	593-45L-A	45L° - 1.062 OD NOZZLES
	593-45L-B	45L° - 1.106 OD NOZZLES
	593-45L-C	45L° - 0.938 OD NOZZLES
	593-45L1-A	45L1° - 1.062 OD NOZZLES
	593-45L1-B	45L1° - 1.106 OD NOZZLES
	593-45L1-C	45L1° - 0.938 OD NOZZLES
	593-45L2-A	45L2° - 1.062 OD NOZZLES
	593-45L2-B	45L2° - 1.106 OD NOZZLES
	593-45L2-C	45L2° - 0.938 OD NOZZLES

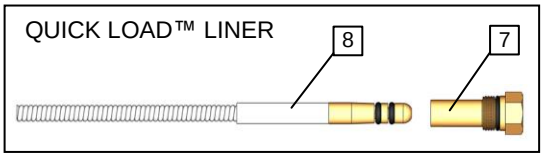
ITEM	PART #	DESCRIPTION
5	593-5	**G2 I.C.E. HOUSING CLAMP** (INCLUDES FASTENER)
6		**CONNECTOR HOUSINGS**
	59C	CLUTCH MOUNT (SHOWN)
	59S	SOLID MOUNT
	59CW	CLUTCH CONNECTOR HOUSING (WIRE BRAKE)
	59SW	SOLID MOUNT CONNECTOR HOUSING (WIRE BRAKE)
7		**M6 SHCS**
8	580-3	**LOCKING PIN ASSEMBLY**
9		**6 MM SHCS**
10		**MOUNTING ARMS**
	59A22	G2 MOUNTING ARM FOR 59G22 @ 350 mm
	59A22-001	G2 MOUNTING ARM FOR 59G22 @ 350 mm (ORIGINAL TOUGH GUN TCP FOR 22 DEGREES)
	59A22-002	G2 MOUNTING ARM FOR 59G22 @ 400 mm
	59A22-003	G2 MOUNTING ARM FOR 59G22 @ 350 mm TOUGH ACCESS CONSUMABLES
	59A22-006	G2 MOUNTING ARM FOR 59G22L1 @ 500 mm
	59A22-007	G2 MOUNTING ARM FOR 59G22L @ 450 mm
	59A35	G2 MOUNTING ARM FOR 59G35 @ 350 mm
	59A35-002	G2 MOUNTING ARM FOR 59G35 @ 400 mm
	59A35-003	G2 MOUNTING ARM FOR 59G35 @ 350 mm TOUGH ACCESS CONSUMABLES
	59A45-004	G2 MOUNTING ARM FOR 59G45L @ 350 mm
	59A45-005	G2 MOUNTING ARM FOR 59G45L @ 400 mm
	59A45-007	G2 MOUNTING ARM FOR 59G45L @ 350 mm
	59A45-009	G2 MOUNTING ARM FOR 59G45L1 @ 400 mm AND 59G45L2 @ 450 mm
11		**DIMENSIONS VARY BY ROBOT**
12		**INSULATING DISCS**
	59D01	MOTOMAN® K6SB, K10, SK16X, UP6, UP20, MRV6, ABB® IRB 1400M97A, IRB 2400L
	59D02	MOTOMAN® SK6, SK16 FANUC® 100, 100I, 120I, S-6, M710-20L, ABB® IRB 6, 1400, 1500, 2000, 2400 OTC® MRV-6, EX-V6, EX-V6L, EX-V16, DR4400 DAIHEN® DR-4000, DR-4200 MILLER® MRV-2
	59D03	PANASONIC® VR-008A, VR-006A, VR-005C, VR-006ALII, AW-10A, AW-8010, AW-005A&C&CL, AWOO6A, VR-006AL
	59D04	ABB: IRB-2400/10, IRB-2400/16, IRB-440L
	59D05	FANUC: ARCMATE 50iB
	59D06	KUKA: KR 16, KR 16 S, KR 16, KS

7.3 AIR-COOLED AND TOUGH GUN I.C.E. BACK END

Air-Cooled Setup



TOUGH GUN I.C.E. Setup



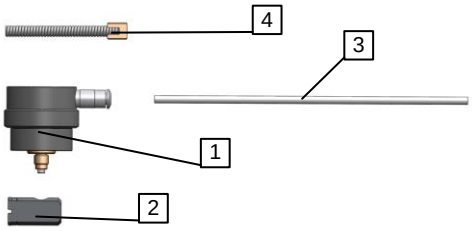
	PART #		DESCRIPTION
	300 AMP	500 AMP	
1	**59UXXX**	**59UXXX**	**UNICABLE ASSEMBLY (500 A & 300 A)**
	59U303	59U503	CABLE ASSEMBLY - 3' (0.9 m)
	59U303.5	59U503.5	CABLE ASSEMBLY - 3.5' (1.1 m)
	59U304	59U504	CABLE ASSEMBLY - 4' (1.2 m)
	59U304.5	59U504.5	CABLE ASSEMBLY - 4.5' (1.4 m)
	59U305	59U505	CABLE ASSEMBLY - 5' (1.5 m)
	59U305.5	59U505.5	CABLE ASSEMBLY - 5.5' (1.7 m)
	59U306	59U506	CABLE ASSEMBLY - 6' (1.8 m)
	59U306.5	59U506.5	CABLE ASSEMBLY - 6.5' (2.0 m)
	59U307	59U507	CABLE ASSEMBLY - 7' (2.1 m)
	59U307.5	59U507.5	CABLE ASSEMBLY - 7.5' (2.3 m)
	59U308	59U508	CABLE ASSEMBLY - 8' (2.4 m)
	59U308.5	59U508.5	CABLE ASSEMBLY - 8.5' (2.6 m)
	59U309	59U509	CABLE ASSEMBLY - 9' (2.7 m)
	59U309.5	59U509.5	CABLE ASSEMBLY - 9.5' (2.9 m)
	59U310	59U510	CABLE ASSEMBLY - 10' (3.0 m)
	59U310.5	59U510.5	CABLE ASSEMBLY - 10.5' (3.2 m)
	59U311	59U511	CABLE ASSEMBLY - 11' (3.4 m)
	59U311.5	59U511.5	CABLE ASSEMBLY - 11.5' (3.5 m)
	59U312	59U512	CABLE ASSEMBLY - 12' (3.7 m)
	59U312.5	59U512.5	CABLE ASSEMBLY - 12.5' (3.8 m)
2	414-600	414-600	ADAPTOR DETAIL
3			**POWER PIN**
	214	214	TWECO #4 POWER PIN
	214-12	214-12	TWECO #5 POWER PIN
	214-1	214-1	MILLER POWER PIN (SHORT ROBOTIC)
	214-7	214-7	LINCOLN POWER PIN (SHORT ROBOTIC)
	214-30	214-30	PANASONIC POWER PIN (WITH PUSH-LOCK FITTING)
	214-39	214-39	OTC POWER PIN
	418-14	418-14	FEEDER ADAPTOR FOR OTC (USE WITH 417 OR 417-60)
	418-39	418-39	FEEDER ADAPTOR FOR OTC D-SERIES WIRE FEEDERS
	417	417	QUICK ADAPTOR BLOCK #4
	417-60	417-60	QUICK ADAPTOR BLOCK #5

	PART #		DESCRIPTION
	300 AMP	500 AMP	
4	AS-714-22	AS-714-22	VOLTAGE SENSE EXTENSION SUB-ASSEMBLY
5	AS-714-16	AS-714-16	JUMPER CABLE
	AS-714-20	AS-714-20	CLUTCH CABLE
	AS-708-21	AS-708-21	JUMPER CABLE FOR OTC ROBOTS
	AS-708-22	AS-708-22	JUMPER CABLE FOR PANASONIC ROBOTS
	AS-708-23	AS-708-23	JUMPER CABLE FOR MOTOMAN ROBOTS
6	AS-707-40	AS-707-40	VELCRO WRAP KIT (INCLUDES 8 WRAPS)
			QUICK LOAD™ LINERS
7	415-26	415-26	LINER RETAINER FOR QUICK LOAD LINER (QLL)
8	415-35-6Q	415-35-6Q	QLL - .035 (0.9mm) & .045 (1.2mm) WIRE - 6' (1.8 m)
	415-116-6Q	415-116-6Q	QLL - .035 (0.9mm) & .045 (1.2mm) WIRE - 6' (1.8 m)
9			**LEATHER WRAP**
	590-3-2	590-3-2	LEATHER WRAP 2'
	590-3-2.5	590-3-2.5	LEATHER WRAP 2.5'
	590-3-3	590-3-3	LEATHER WRAP 3'
	590-3-4	590-3-4	LEATHER WRAP 4'
	590-3-5	590-3-5	LEATHER WRAP 5'
	590-3-6	590-3-6	LEATHER WRAP 6'
	590-3-7	590-3-7	LEATHER WRAP 7'
	590-3-8	590-3-8	LEATHER WRAP 8'
	590-3-9	590-3-9	LEATHER WRAP 9'
	590-3-10	590-3-10	LEATHER WRAP 10'
	590-3-12	590-3-12	LEATHER WRAP 12'
	590-3-15	590-3-15	LEATHER WRAP 15'
10	591-15	591-15	WATER LINES KIT 15'

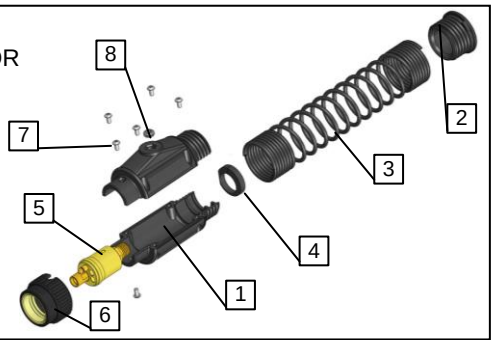
7.4 OPTIONS AND KITS

A - AIR BLAST KIT (590-A)

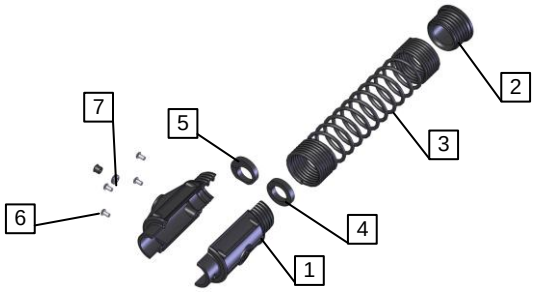
B - WIRE BRAKE OPTION
(ONLY FOR GUNS ORIGINALLY EQUIPPED WITH WIRE BRAKE)



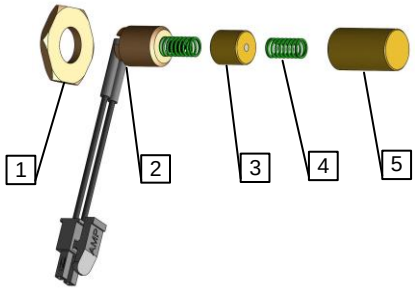
C - EURO CONNECTOR KIT (678-E)



D - SHORT ROBOTIC REAR HANDLE KIT (678-H)



E - MICRO SWITCH REPLACEMENT KIT (AS-715-10)



	PART #		DESCRIPTION
	300 AMP	500 AMP	
A	**590-A**	**590-A**	**AIR-BLAST KIT (INC. ALL ITEMS BELOW)**
1			AIR FITTING (SMC # KJS04-M5)
2			AB INSULATING SLEEVE
3			4MM AIR LINE (SMC # TU0425W)
B			**WIRE BRAKE OPTION (INC. ALL ITEMS BELOW)** (ONLY FOR GUNS ORIGINALLY EQUIPPED WITH WIRE BRAKE)
1	599	599	WIRE BRAKE PUSHING UNIT
2	598G2	598G2	G2 WIRE GUIDE FOR 0.35" - 0.045" WIRE
	598G2-116	598G2-116	G2 WIRE GUIDE FOR 0.052" - 1/16" WIRE
3	499-9-15	499-9-15	AIR LINE 15'
4	495-18-35	495-18-35	JUMP LINER FOR 0.045" WIRE (OR SMALLER)
	495-18-116	495-18-116	JUMP LINER FOR 0.052" - 1/16"
C	**678E**	**678E**	**EURO CONNECTOR KIT (INC. ALL ITEMS BELOW)**
1			SHORT ROBOTIC REAR HANDLE SUB-ASSY
2			ROBOTIC REAR SPRING BUSHING
3			ROBOTIC SMALL REAR HANDLE SPRING
4			500A OFFSET CABLE SEAL
5	425-20E	425-20E	EURO POWER PIN ASSY
6	425-11	425-11	EURO HAND NUT ASSEMBLY
7			SBHCS - M4 x 0.7 x 8mm LONG
8			GROMMET- BUNA (MCMASTER-CARR #9307K11)

	PART #		DESCRIPTION
	300 AMP	500 AMP	
D	**678H**	**678H**	**SHORT ROBOTIC REAR HANDLE KIT**
1			SHORT ROBOTIC REAR HANDLE SUB-ASSY
2			ROBOTIC REAR SPRING BUSHING
3			ROBOTIC SMALL REAR HANDLE SPRING
4			500A CENTERED CABLE SEAL
5			500A OFFSET CABLE SEAL
6			SBHCS - M4 x 0.7 x 8mm LONG
7			GROMMET- BUNA (MCMASTER-CARR #9307K11)
E	**AS-715-10**	**AS-715-10**	**REPLACEMENT MICRO SWITCH KIT**
1			WASHER - FOR MICRO SWITCH
2			MICROMINI SWITCH ASSEMBLY
3			INNER SLEEVE ASS'Y
4			STATIC TENSION SPRING
5			OUTER SLEEVE

8.0 – ORDERING INFORMATION

STEP A: TOUGH GUN™ G2 Series Robotic MIG Guns

Class	Type	Gen	Amps	Neck Angle	Option 1	Option 2	Cable Length	Nozzle, Tip & Wire Size			Power Pin
R	A	2	5	A	C	1	A	B	1	B	M
			3 300	**Air-Cooled**	C - Clutch	0 - No Options	A 3’	A 401-6-62	1 403-20-XX	**QLL**	D OTC/Daihen
			5 500	22 Degrees	S - Solid	1 - Wire Brake	B 3.5’	B 401-81-62	4 403-27-XX	B .030”	E Euro
				A 22			C 4’	C 401-4-62		C .035”	F Fronius
				J 22L			D 4.5’	D 401-8-62		D 1.0 mm	L Lincoln
				K 22L1			E 5’	E 401-42-50		E .045”	M Miller
				35 Degrees			F 5.5’	F 401-48-50		F 3/64”	P Panasonic
				B 35			G 6’	G 401-48-62		G .052”	T #4 Tweco
				45 Degrees			H 6.5’	H 401-44-50		J 1/16”	W #5 Tweco
				D 45L			J 7’	J 401-49-50		**Aluminum**	
				L 45L1			K 7.5’	K 401-71-62		R .035”	
				M 45L2			M 8’	M 401-87-62		S 3/64”	
				I.C.E.			N 8.5’	N 401-44-62		T 1/16”	
				22 Degrees			P 9’	P 401-91-62			
				E 22			Q 9.5’	Q 401-56-62			
				35 Degrees			R 10’	R 401-54-50			
				F 35			S 10.5’				
				45 Degrees			T 11’				
				H 45L			U 12’				
							V 13’				
							W 14’				
							Y 15’				

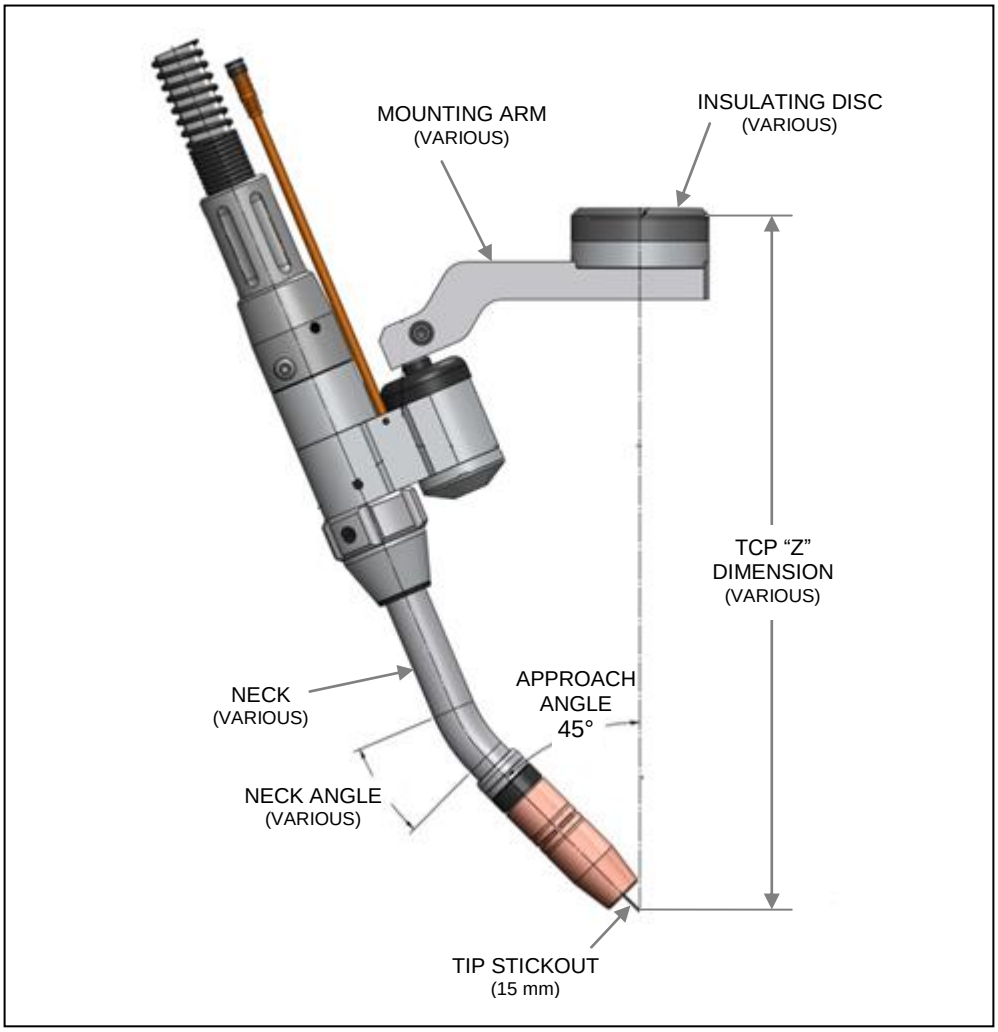
STEP B: Insulating Discs

Robot Brand	Robot Model(s)	Insulating Disc #
ABB	IRB1400, M97A, IRB 2400L	59D01
ABB	IRB 6, IRB 1400, IRB 1500, IRB 1600, IRB 2000, IRB 2400, IRB 2400L	59D02
ABB	IRB-2400/10, IRB-2400/16, IRB-440L	59D04
COMAU	SMART-SIX	59D01
FANUC	100, 100i, 100iBe, 100iB, 120i, 120iB/10L, 120iB, S-6, M710-20L, M16iB, M-710iC/20L	59D02
FANUC	ARCMATE 50iB, 50iB/3L, 50iL	59D05
KAWASAKI	JS6, JS6L, FS6, FS6N, FS6L	59D01
KUKA	KR5 ARC, KR6 ARC, KR 6 KS, KR 16 L6 ARC, KR 16 L6 KS	59D01
KUKA	KR 15 SL, KR 16, KR 16 S, KR 16 KS	59D06
MILLER	MRV-2	59D02
MOTOMAN	K5, K6, K6SB, K10, K10S, SK16X, UP20, MRV6, HP6, HP20, HP50-20	59D01
MOTOMAN	UP6, SK6, SK16, SSF2000	59D02
OTC/DAIHEN	MRV-6, EX-V6, EX-V6L, EX-V16, DR-2000, DR-4400, DR-4000, DR-4200, AX-H3, R-4000, DR-500	59D02
PANASONIC	AW-005 MODELS, AW006A, AW-010A, AW-8010AW, VR-005 MODELS, VR-006 MODELS, VR-008 MODELS, TW MODELS, TA MODELS	59D03

STEP C: Mounting Arms

STANDARD CONFIGURATIONS

Mounting Arm	Wire Stick Out (mm)	TCP "Z" Dim (mm)	Gooseneck Angle	Approach Angle	Gooseneck #
59A22	15	350	22	45	59G22
59A22-002	15	400	22	45	59G22
59A22-007	15	450	22	45	59G22L
59A22-006	15	500	22	45	59G22L1
59A22-001	15	316	22	45	59G22
59A35	15	350	35	45	59G35
59A35-002	15	400	35	45	59G35
59A45	15	350	45	45	59G45
59A45-004	15	350	45	45	59G45L
59A45-005	15	400	45	45	59G45L
59A45-009	15	400	45	45	59G45L1
59A45-009	15	450	45	45	59G45L2
TOUGH ACCESS					
59A22-003	15	350	22	45	59G22
59A35-003	15	350	35	45	59G35
59A45-007	15	450	45	45	59G45L1



NOTES:

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