Instructions and Parts Data

HW-10

FORM 9243-G

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HELIARC
Trade-Mark

HW-10
300-AMPERE HAND-WELDING TORCH
INCLUDES SIGMA CONVERSION INSTRUCTIONS

Be sure this information reaches the operator. You can get extra copies through any Linde office.
INTRODUCTION

The HELIARC HW-10 Torch is designed for hand-welding. It can be used with high-frequency stabilized alternating current, or with straight-polarity direct current. Its current capacity is 300 amperes at a normal welding cut cycle. Tungsten electrodes from .040-in. to 1/8-in. diameter are accommodated in the rated current capacity. The torch is available with either a 12-1/2-ft. or 25-ft. length of cable and hose assembly.

Both metal nozzles and ceramic gas cups can be used with the HW-10. The metal nozzles are cooled through their screwed connection to a water-cooled jacket. The water jacket, torch body, and power cable are water-cooled by internal passages to eliminate cumbersome hose and fittings which interfere with maneuverability and visibility during welding. Because of this, the torch is lightweight and well balanced for convenient and easy handling. Water-cooling also protects essential parts from excessive heat, thereby giving the torch durability.

Another important feature is quick-release collets for gripping electrodes. These collets make changing or adjusting the electrode a simple operation. To adjust an electrode, the operator merely loosens the torch cap a quarter-turn, positions the electrode, and retightens the cap. This method of electrode adjustment is convenient and time-saving, and does not require the use of any wrenches or special tools.

The torch body passages are accessible for cleaning by simply removing the water-jacket adaptor and collet body from the torch head, and disconnecting the handle and water hose.

The HW-10 Torch may also be converted for Sigma welding. See Section V.

I. SETTING UP THE HW-10 TORCH

A. Equipment Needed

Check to be sure you have the following before setting up the equipment:

1. HELIARC HW-10 Torch, which includes the necessary hose and power cable.
2. An electrode and collet of corresponding size. (See Table I for recommended electrode diameters for different welding current ranges.)
3. A metal nozzle or ceramic cup of the correct size for the welding current you intend to use. (See Table I for recommended nozzle and cup sizes for different welding currents.)
4. Fuse assembly, Part No. 56Y48, (optional) to prevent the torch from overheating if the water supply should fail. It is strongly recommended for use where the water flow fluctuates widely. If a fuse assembly is not used, a power cable adaptor (Part No. 84Z84) is necessary for connecting the standard 3/8" welding cable to the water-cooled torch cable. One or the other of these accessories must be used to place the torch in operation.
5. Silicone Boot, Part No. 86Z14 (optional). When high-frequency current is used, either for starting or for arc stabilization, the Silicone Boot is slipped over the front end of the torch to prevent high-frequency leakage when the torch is brought close to a grounded metal surface while working in confined areas.
7. An OXWELD R-502 Argon Regulator and Flowmeter (Part No. 03X90). (An OXWELD L-23 flowmeter, together with any standard oxygen cylinder regulator, such as an OXWELD R-64, may be substituted for the R-502.)
8. An OXWELD V-30 Double Shut-off Valve (Part No. 10X21).
9. A source of cooling water. (See Part II, Section A, for information on cooling water requirements.)
10. A drain for disposal of cooling water.
11. Additional hose assemblies.
   (a) A 1/4-in. argon hose assembly of suitable length for connecting the regulator to the V-30 valve.
      Part No.  Length
      10Y72     12 1/2-ft.
      10Y68     25-ft.
   (b) A 1/4-in. water hose assembly for connecting the V-30 valve to the water supply line. (A 1/4-in. pipe can be used if desired)
      Part No.  Length
      10Y93     12-1/2-ft.
      10Y94     25-ft.
12. An OXWELD adaptor (Part No. 10230) for connecting the water inlet hose to the water supply line.
13. A source of electric power. (See Part I, Section C, for information on electric power requirements.)
14. A welding transformer and a high-frequency generator, if welding is with alternating current; a welding generator, if welding is with direct current.
15. Suitable lengths of 3/8" welding cable to connect the welding generator to the torch and to the work.
16. A clamp to ground the welding cable to the work.
17. A welder's helmet with the proper shade of glass for the welding current you intend to use.

<table>
<thead>
<tr>
<th>Glass No.</th>
<th>Welding Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Up to 30 amperes</td>
</tr>
<tr>
<td>8</td>
<td>30 to 75 amperes</td>
</tr>
<tr>
<td>10</td>
<td>75 to 200 amperes</td>
</tr>
<tr>
<td>12</td>
<td>200 to 250 amperes</td>
</tr>
</tbody>
</table>
FIG. 1 - Schematic Diagram of Water and Argon Connections for "Heliarc" HW-10 Torch

* For 23⁄₄- or 35-ft., respectively.
FIG. 2 – Schematic Diagram for HELIARC A.C. Welding

NOMENCLATURE

- ASV: ARGON SOLENOID VALVE
- F1, F2: FUSES
- FS: FOOT SWITCH
- MLS: MAIN LINE SWITCH
- T: TORCH
- TDR: TIME DELAY RELAY
- TRI: TRANSFORMER
- TSR: TRIGGER SWITCH RELAY
- W: WORKPIECE
- WC: WELDING CONTAC TOR
- WSV: WATER SOLENOID VALVE
B. Hose Connections

Fig. 1 indicates the correct method of assembling the accessories used to supply argon and cooling water to the HW-10 Torch. Detailed instructions covering the mounting and use of each individual accessory are packed with the equipment.

C. Electrical Setup

1. POWER REQUIREMENTS

(a) For a.c. welding, a single-phase transformer requiring a 230- or 460-volt, alternating current supply, is generally used.

(b) For d.c. welding, a motor-generator unit powered by a 230- or 460-volt, 3-phase alternating current supply is generally used.

NOTE: Be sure to obtain manufacturer's recommendations on power requirements for your transformer or generator.

2. SPECIAL CONTROL CIRCUITS Several special control circuits have been developed to automatically control various phases of the welding process. By use of these circuits, you can conserve argon and water, reduce radio interference when using high-frequency current, and provide greater convenience of operation. For specific details, call or write your nearest LINDE office. A booklet (Form 9067) giving descriptions of the circuits, and specifications for the equipment needed will be sent to you without charge upon request.

3. ELECTRICAL CONNECTIONS Before making any connections, refer to the schematic wiring diagram in Figures 2 and 3 for alternating current and direct current welding setups. Note that a foot switch is connected in an external circuit to interrupt welding current. Its use is recommended because it provides a convenient method of control. It also allows you to shut off welding current without removing the argon protection at the end of a seam, thus controlling crater cracking especially when welding high-temperature alloys. If you have an alternating current setup, radio interference caused by high-frequency current will be greatly reduced since no high-frequency current flows when the welding current is shut off. If no foot switch is used, the arc can be broken by lifting the torch from the work. However, this method of control is not as satisfactory for high-temperature alloys.

CONNECTIONS FOR A.C. WELDING (FIG. 2)

(a) Connect the fuse assembly or cable adaptor (1) to the "torch" terminal (3) of the high-frequency generator with a suitable length of 3/0 welding cable.

(b) Connect the workpiece (3) to the "work"...
terminal 4 of the high-frequency generator with a suitable length of 3/0 welding cable. Fasten the cable to a clean surface of the workpiece with a clamp. This will give you a good contact.

(c) Connect the input terminals 7 of the high-frequency generator to the output terminals 8 of the transformer secondary with suitable lengths of 3/0 cable.

(d) Connect the input terminals 7 of the transformer primary to one set of terminals 8 of the main contactor. Then connect the other terminals 9 of the main contactor to the 230- or 460-volt main power supply 10. Be sure to select a conductor which will carry the maximum current you will use.

(e) Connect the high-frequency generator 11 to the lines 12 leading from the main contactor to the transformer primary. This connection is made so that power to the high-frequency generator is shut off when the main contactor is open.

(f) Connect one terminal 13 of the main contactor coil to one terminal 14 of the auxiliary contactor. Connect the remaining terminals 15 of the main contactor coil and the auxiliary contactor to opposite sides 16 of the 230- or 460-volt main power supply.

(g) Connect one terminal 17 of the auxiliary contactor coil to one terminal 18 of the foot switch. Connect the remaining terminals 19 of the auxiliary contactor coil and the foot switch to opposite sides 20 of the low voltage a. c. supply. (A control circuit supply of 6 to 24 volts is recommended for safety reasons.)

(h) Make a ground connection 21 from the "work" terminal 4 of the high-frequency generator. MAKE NO OTHER GROUND CONNECTION. Connect the case 22 of the high-frequency generator and the case 23 of the transformer to the "work" terminal 4 of the high-frequency generator.

**Connections for D.C. Welding (Fig. 2)**

(a) Connect a suitable length of 3/0 welding cable between the fuse assembly or cable adaptor 1 and the "negative" generator terminal 2 for straight-polarity welding. Connect the "positive" terminal 3 of the generator to the work 4. Use suitable lengths of 3/0 welding cable for these connections. Secure the ground connection to clean bright metal of the workpiece with a clamp for good contact.

(b) Make separate ground connections 5 to the work 4 and to the generator case 6.

(c) If you use a generator of the separately-excited type shown in Figure 3 you can shut off welding current remotely without lifting the torch from the work by means of a foot or hand switch which actuates a field relay. Parallel the field coil contacts with a 0.25 Mfd, 600-volt discharge condenser. For all other types of generators, obtain the manufacturer's recommendations on installing a remote control shutoff. Connect one terminal 7 of the foot switch to one terminal 8 of the field relay coil. Connect the remaining terminals 9 of the switch and of the field relay coil to opposite sides 10 of the separate control circuit power supply.

(d) Connect the input terminals 11 of the motor side of the welding generator to the 230- or 460-volt alternating current main power supply 12.

**D. Metal Nozzles, Ceramic Cups, and Electrode Collets**

1. **Metal Nozzles and Ceramic Cups.** Five metal nozzles and five ceramic cups are available for general purpose use with the HW-10. Each nozzle or cup size is intended for use with a different welding current range. For the most effective argon protection, select the nozzle or cup size according to the recommendations in Table I.

**Table I**

<table>
<thead>
<tr>
<th>Electrode, Nozzle and Cup Sizes for Different Welding Currents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrode</strong></td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>ACHF* (using pure tungsten electrodes)</td>
</tr>
<tr>
<td>10-60</td>
</tr>
<tr>
<td>50-100</td>
</tr>
<tr>
<td>100-160</td>
</tr>
<tr>
<td>150-210</td>
</tr>
</tbody>
</table>

* Maximum values for unbalanced wave transformers. Balanced wave reduces maximum by about 10 per cent.

** Exceeds capacity of HW-10 Torch.

**NOTE:** All current values are metered readings. Transformers designed for metal-arc welding deliver about 15 per cent more current than shown on their scale readings.
Two larger bore nozzles are recommended for the HELIARC welding of titanium. The No. 10 Nozzle, Part No. 105Z24, is recommended for most applications within the current range covered by the torch. The No. 12 Nozzle, Part No. 105Z26, is recommended for titanium applications which do not receive adequate shielding when a No. 10 nozzle is used.

2. ELECTRODE COLLETS. The electrode collets are designed for quick and simple adjustment of the electrode. They are available in four different electrode sizes (.040-in. to 1/8-in. diameter). Install the collet and electrode as follows:
   (a) Remove the torch cap from the torch.
   (b) Insert a collet for the electrode size you intend to use into the top of the torch head. Mate the tapered end of the collet with the tapered seat in the torch head.
   (c) Insert an electrode of corresponding size into the top of the collet. Allow the electrode to protrude 1/8 to 3/16-in. beyond the end of the nozzle for butt welding, and 1/4 to 3/8-in. for fillet welding. Then screw the torch cap onto the torch head and tighten it to hold the electrode firmly.

E. Final Steps Before Welding
   1. Check all argon and water connections for tightness. Turn on the cooling water supply, making certain that the flow is adequate. (See Part II, Section A below for recommended pressure, volume, and temperature.)
   2. With the R-502 regulator flow-adjusting valve closed, open the argon cylinder valve.
   3. Remove the torch from the V-30 valve arm; then turn the regulator flow-adjusting valve handle counter-clockwise to obtain the desired flow.
   4. Set the welding generator, or transformer for the desired welding current.
   5. Close the foot or hand switch.
   6. Draw a test arc on a heavy piece of scrap steel or copper. (Do not use a carbon pencil or carbon block for starting an arc.)

NOTE: When high-frequency current is used, either for starting or arc stabilization, Silicone Boot Part No. 84Z16 is slipped over the front end of the torch to prevent high-frequency leakage when the torch is brought close to a grounded metal surface while working in confined areas. The boot protects the water jacket and water adaptor "O" ring seals from damage due to arcing through these joints. It is not intended to protect the nozzle. The boot will withstand temperatures in excess of 500°F for continuous periods, without burning. However, if an HW-10 torch head should be inserted into a confined pocket, the radiant heat would probably destroy the silicone boot in a relatively short time.

II. GENERAL NOTES ON TORCH OPERATION

A. Cooling Water Requirements
   1. USE CLEAN COOLING WATER. The cooling water that circulates through the torch body, water jacket, and cable and hose assembly should be clean and free from dirt or other solid material which might clog the water passages.

   If the torch becomes clogged, it can sometimes be flushed out by reversing the connections to reverse the water flow. CAUTION: BE SURE NOT TO WELD WITH WATER FLOW REVERSED. The water should cool the torch body and water jacket before it flows through the cable and hose assembly. If the water flow is reversed when a fuse assembly is used, (1) the inlet water will first cool the fuse and render it inoperative at the temperature for which it was designed, and (2) the temperature of the water flowing to the torch body is too high for effective protection of the torch.

   To prevent further clogging, install a strainer, such as the 1/4-in. type 340 semi-steel, 60-mesh brass screen available from Kiely and Mueller, Inc., 2013 43rd Street, North Bergen, N.J., or equivalent.

   2. COOLING WATER INLET PRESSURE, VOLUME AND TEMPERATURE. The 300-ampere capacity rating of the torch is based on cooling water flow of one quart per minute at an inlet temperature of 60 deg. F., with 25 psig inlet pressure using 12-1/2 feet of hose and 35 psig inlet pressure using 25 feet of hose. Water pressures up to 50 psi at the inlet of the torch hose can be used. If the inlet water pressure exceeds 50 psi, a regulator should be installed to prevent damage to the plastic hose. A suitable regulator is the type 463, 1/4-in. water regulator available from Kiely and Mueller, Inc., 2013 43rd Street, North Bergen, N.J. (Any equivalent regulator can also be used.)

B. Leakage in the Torch Head
   1. "O" ring 84W85 serves as a compression seal between the collet body and the argon gas chamber to prevent water leakage into the argon gas. If this "O" ring becomes damaged, cracked, nicked or flattened, replace it with a new part.

   2. "O" ring 85W51 serves as a radial seal between the water jacket adaptor and the threaded section
of the torch body (see Figs. 4 and 5) to prevent internal and external water leakage. External leakage will occur if the outer seal fails; internal leakage will occur if the inner seal fails. Failure of the inner seal may result in water finding its way between the insulation and the torch-body casting in the torch body. Such a leak may then by-pass the torch cap "O"-ring seal (85W50) and find its way into the argon "well" in the upper section of the torch body. External leakage would show up at the joint formed by the water-jacket adaptor and the torch-body insulation.

3. "O" ring 85W80 serves as a radial seal between the water jacket and the water-jacket adaptor, to prevent external water leakage. If this "O" ring becomes damaged, nicked, cracked or flattened, replace it with a new part.

4. The insulator gasket seals the cooling water from the argon gas. Any leakage of water that can be noticed in the torch head is due to the failure of this gasket seal. Inspect the gasket for nicks, cracks or excessive distortion and replace with a new part, if necessary. Make certain the torch-head parts are reassembled as outlined in Section IV, page 10.

NOTE: In order to protect the insulator gasket from rupturing, DO NOT tighten the Water Jacket excessively. A non-leaking seal can be obtained by moderate tightening of the Water Jacket.

5. "O" ring 85W50 serves as a radial seal between the torch cap and the torch body. It prevents external leakage of argon gas or aspiration of atmospheric air. Inspect this "O" ring for nicks, cracks or excessive wear and replace with a new part, if necessary.

NOTE: Refer to the proper disassembly and assembly procedures outlined in Section IV, Page 10.

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**D. Fuse Installation and Replacement**

1. To install a fuse assembly, simply connect the power cable nut to the fuse assembly coupling. Then connect the standard 5/0 welding cable to the fuse assembly lug and lead the water outlet hose to an open drain.

2. To insert a new fuse, proceed as follows:

   (a) Bend the fuse link to a 90-deg. angle about 1/4-in. from one end.
   (b) Insert the fuse link in one of the fuse-centering disks and place it into one end of the fuse body.
   (c) Replace the lock screw.
   (d) Place the other fuse-centering disk at the opposite end of the body, taking care to insert the end of the fuse link through the slot in the disk. Then press the centering disk down into the groove in the fuse body.
   (e) Bend the end of the fuse link against the disk and replace the lock screw, tightening it firmly.
   (f) Replace the two large end nuts.

3. To replace or inspect a fuse, proceed as follows:

   (a) Remove the large nut and lock screw from each end.
   (b) If the fuse link is centered properly, a round impression from the lock screw should be visible.
   (c) If the fuse link has been caught in the lock screw threads, remove the centering disks and the fuse link. Then replace with a new fuse link, making sure that it is seated properly.
   (d) The fuse link (Part No. 84W30) is brass-plated for corrosion resistance. Its use is recommended when replacement becomes necessary. Standard 30-ampere 250-volt links may be used in an emergency but are not recommended for regular operation.

4. Two fuse links must be used to accommodate the 300-ampere capacity rating of the torch.

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**D. Torch Hose**

1. Make certain that all argon hose connections and the gas-cup connections are gas-tight. If they are not, the argon may become diluted by air due to leakage, resulting in incomplete arc protection. The electrode should be silvery in color when it cools. A bluish color denotes air leakage. When welding aluminum, the presence of a dark gray deposit on or beside the weld, or a cloudy weld puddle also indicates air leakage.

2. Keep hose off hot metal. Plastic hose softens and begins to lose strength when heated to about 125 deg. F.
A: For instructions on hose repair and replacement, refer to page 15.

E. Do Not Let the Nozzle Touch the Work

If the nozzle touches the work, the arc may jump to another part of the work instead of the test point. For this reason, hold the torch so that the nozzle does not touch at any point of the work.

F. Keep the Electrode Clean

1. If weld spatter sticks to the electrode, a black soot may appear when welding aluminum; or a reddish deposit may appear when you weld stainless steel. To clean the electrode, simply draw an arc for a few seconds on a heavy piece of scrap steel or copper (do not use a carbon block).
2. Should contamination of the electrode occur, due to contact with the weld puddle, shut off the power and remove the electrode from the torch. Break off a small piece from the end, and then replace the electrode. Always remove the electrode before breaking it off, to minimize waste of electrodes.
3. It is advisable to nick the electrode slightly with a grinding wheel at the point where the break is to be made. Then remove the contaminated end with pliers gripped close to the nick.

G. Conservation of Tungsten

Conserve tungsten electrodes wherever possible. Here's how:

1. Avoid contamination of electrodes caused by unnecessary contact with the workpiece.
2. Weld stub ends to make electrodes of usable length. Welding can be done with a HELIARC torch, using either DCSP or ACHF, currents from 30 to 100 amperes, argon flow of 13 to 17 cu. ft. per hr.

III. PRECAUTIONARY INFORMATION

A. General Information

Virtually every industrial operation has certain potential hazards. This is just as true of HELIARC welding as it is with other welding methods. Operators should be aware of the potential hazards and observe the necessary precautions for their protection as well as that of their fellow employees and property.

B. Fire Protection

Sparks, spatter, and the heat of welding operations are a potential fire hazard if welding is done near combustible materials. If the work location cannot be moved away from combustible materials, the logical alternatives are to move the combustible materials to a safe location or to protect them from all sources of ignition by non-combustible tarpaulins, partitions or shields.

1. Welding should be done preferably in an area having a concrete floor. Avoid the use of wet sand or metal floor covering since these materials would only create an electric shock hazard.
2. Avoid welding in areas susceptible to infiltration of combustible vapors or dust.
3. Where welding must be done near wooden construction, be sure that the structure is adequately protected.
4. Welding cables and external electrical connections should be of size approved to carry the maximum load without overheating. Frayed or worn cables should be repaired or replaced immediately to prevent fires caused by short circuiting.

C. Electric Shock Hazards

1. Always shut off power to the welding power supply before cleaning, adjusting, or replacing an electrode, electrode holder, welding head or wire reel. Do not touch any uninsulated torch parts when the power supply is turned on.
2. Overloaded welding cables will overheat and burn the insulation. Eventually, the cable may become exposed and create not only a shock hazard, but a fire hazard as well.
3. Repair or replace leaking water hose immediately.
4. Never wear cotton, asbestos, or other cloth-type gloves when using high-frequency current. Kid, chrome leather, or rubber gloves, when clean and in good condition will give the necessary protection against high-frequency puncture wounds.

D. Burn Hazards

1. Wear a standard arc-welding helmet to protect the eyes, face, and neck from the effects of ultraviolet radiation. The helmet should have the correct shade of lens to avoid eye strain. The recommended shade of lens for various current ranges is given in the Table in Section II.
2. Protect all exposed skin surfaces from arc burn. Operators' sleeves should be rolled down at all times. Wear flameproof gauntlet gloves except in cases where low current values are used. If sweating of the hands is excessive, wear rubber gloves underneath the flameproof gloves to afford protection against accidental electric shock.

E. Potential Hazards of Toxic or Noxious Fumes and Gases

1. Toxic Materials

Do not weld copper, lead, zinc, beryllium copper, or cadmium in a closed or poorly ventilated room.

2. Chlorinated Solvents

Special precautions must be taken when certain chlorinated solvents (such as carbon tetrachloride, trichloroethylene, and tetrachloroethylene) are used for degreasing metals prior to welding. The vapors of these solvents are harmful. When they are exposed to the heat of the welding arc they break down chemically to form highly toxic fumes (phosgene). Make certain that the material is thoroughly dry before welding. It is also important that welding operations be remote from degreasing tanks containing chlorinated solvents since these solvents vaporize readily and the vapors may reach the arc. It has been demonstrated that intense ultra-violet rays will break down trichloroethylene into phosgene.

F. Ventilation

An effective control of fumes and vapors is a local exhaust system which will remove the contaminants before they become mixed with air throughout the work area. An important consideration of an adequate method of ventilation for HELIARC or SIGMA welding is that it must not disturb the shielding gas stream and thereby result in weld contamination. When highly toxic materials, such as lead-, cadmium-, or beryllium-bearing metals are welded, the operator should use a filter type respirator approved for the specific fume (by the U.S. Bureau of Mines), or an air supplied respirator. The use of an air supplied respirator is also advisable when welding in a closely confined space.

IV. DISASSEMBLY

(Refer to Figures 4 and 7)

A. To Disassemble

1. Unscrew the torch cap (56Y44) to inspect the "O" ring (85W50).
2. Remove the electrode and collet.
3. Unscrew the cup or nozzle from the water jacket (56Y59).
4. Hold the water jacket adapter (84Z63) with a suitable wrench to keep it from turning. Be careful not to damage the plastic water jacket adapter. Unscrew the water jet (56Y59) to inspect the insulator gasket (86Z22) and "O" ring (85W80).
5. Using a 5/16-in. Allen wrench, turn the nut (84Z66) counter-clockwise from the torch body.
6. Pull the collet body (84Z65) out from the front end of the collet body. Inspect the collet body. From the rear of the torch body remove the "O" ring (84W85) and the metal washer (84Z67). Examine the "O" ring and the metal washer for distortion. It is generally recommended that both the "O" ring and the washer should be replaced each time the collet body is removed from the torch body.
7. Unscrew the water jacket adapter (84Z63) from the torch body to inspect the "O" ring (85W51). Replace if defective.

B. To Reassemble

1. Insert metal washer (84Z67) into the rear of the torch body making sure that the washer rests on the shoulder and lies flat without wrinkles.
2. Insert the "O" ring and locking nut (84Z66) into the rear of the torch body. Tighten the nut until it lightly loads "O" ring (84W85).
3. Replace water jacket adapter (84Z63).
4. Carefully insert the collet body into the torch body making certain that the neck end engages "O" ring (84W85).
5. Replace the insulator gasket by inserting it into the recess of the water jacket (56Y59). Make sure that the gasket is completely retained in the recess.
6. Screw the water jacket (56Y59) on the water adapter until the insulator gasket lightly loads the collet body seat.
7. Tighten the locking nut (84Z66) snugly; do not over-tighten.
8. Return to the water jacket (56Y59) retightening until a seal is obtained. NOTE: The insulator gasket will distort if the water jacket is over-tightened.
V. CONVERSION FOR SIGMA WELDING

A. Introduction

Any HELIARC HW-10 torch can be converted for use with sigma welding apparatus accommodating .030, .040, 3/64, and 1/16-in. wire. The following parts are required to make the conversion:

(1) Collet - 85Z84
(1) Flexible Conduit Adaptor - B-319225 (includes "O" Ring 85W30)
(1) Boot - D-319244
(1) "O" Ring - 84W85
(1) Collet Body - D-319245
(1) Torch Switch and Switch Cord Assembly - D-321746
(1) Switch Boot - C-345037

You will also need a new nozzle, a wire guide tube, and a conduit and liner. Part numbers for these components are shown below.

B. Nozzles

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>84258</td>
<td>No. 8 Nozzle</td>
</tr>
<tr>
<td>105224</td>
<td>No. 10 Nozzle</td>
</tr>
<tr>
<td>105225</td>
<td>No. 12 Nozzle</td>
</tr>
</tbody>
</table>

NOTE: Nozzles intended for sigma welding are dipped in LINDE No. 65 Sigma Nozzle Compound prior to packing. This silicone coating increases the resistance of the nozzle to spatter adherence. Prevention of spatter build-up on the inside of nozzles ensures the maintenance of a complete and uniform gas shielding pattern. It is recommended that a four ounce can of LINDE No. 65 Sigma Nozzle Compound be kept on hand to maintain a protective coating on the nozzles.

C. Guide Tubes, Conduits, and Liners

Wire guide tubes, conduits, and liners for the various sizes and types of wire are listed in Table I below.

1. Wire Guide Tubes

The wire guide tubes shown in Table I are conventional style guide tubes which are satisfactory for most small wire applications. However, where continuous wire support is found to be necessary, the counterbored nylon lined wire guide tubes listed in Table II are recommended. The nylon liners which extend down to the swaged front end of the guide tube reduce friction and prevent welding current pick-up from occurring at random points throughout the inside of the tube.

In applications where neither the conventional nor the counterbored guide tubes produce satisfactory results, it may be possible to do so by using one of the positive contact guide tubes listed in Table II. Positive contact guide tubes should be considered only for those applications where conventional or standard counterbored guide tubes are inadequate.

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Type Wire</th>
<th>Guide Tube</th>
<th>Conduit Wire</th>
<th>Conduit Liner</th>
</tr>
</thead>
<tbody>
<tr>
<td>.030</td>
<td>ALL</td>
<td>D-319277</td>
<td>56Y33</td>
<td>08N70</td>
</tr>
<tr>
<td>.040</td>
<td>ALL</td>
<td>---</td>
<td>56Y33</td>
<td>08N71</td>
</tr>
<tr>
<td>3/64</td>
<td>ALL</td>
<td>C-319276</td>
<td>56Y33</td>
<td>08N72</td>
</tr>
<tr>
<td>1/16</td>
<td>II,III,IV</td>
<td>C-319273</td>
<td>56Y50</td>
<td>40V44</td>
</tr>
<tr>
<td>1/16</td>
<td>I</td>
<td>C-319276</td>
<td>56Y50</td>
<td>40V44</td>
</tr>
</tbody>
</table>

NOTES: (1) Wire types fall into the following groups:
   Group I – Aluminum and Magnesium
   Group II – Copper Base Alloys
   Group III – Stainless and Uncoated Carbon Steel
   Group IV – Copper-Coated Carbon Steel

(2) Guide tubes for 1/16-in. wires are to be used only when the welding current does not exceed 200 amperes.

2. Conduits and Liners

The conduits and liners shown in Table I will be satisfactory for most applications. Two rubber lined conduits are available for limited use in hard wire (Group II, III, and IV) applications where extreme flexibility is desired at the sacrifice of optimum wire support. The smaller minimum bending radius of the rubber lined cable tends to increase the wire feeder motor armature current above the recommended maximum levels when soft (Group I) wires are used. The rubber lined conduits are listed below.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>320314</td>
<td>Conduit and liner for .030-3/64-in. wire</td>
</tr>
<tr>
<td>320319</td>
<td>Conduit and liner for 1/16-3/32-in. wire</td>
</tr>
</tbody>
</table>
D. Conversion Procedure
(See Figures 5 and 6)

1. Remove the Torch Cap 56Y44 from your HW-10 torch.
2. Remove Nut 84Z66.
3. Remove the nozzle or cup from the front end of the torch.
5. Remove the Insulator Gasket 86Z22.
6. Remove the Collet Body 84Z65.
7. Remove existing "O" Ring 84W85 on the backend of the torch and replace it with a new part. Then insert the Flexible Conduit Adaptor B-319225 and "O" Ring 85W50. Tighten the Adaptor, LIGHTLY loading "O" Ring 84W85.
8. Insert the new Collet Body D-319245 into the front end of the torch. Make sure that the collet body "bottoms" against the torch body 56Y47.
9. Replace Insulator Gasket 86Z22.
10. Replace Water Jacket 56Y59. Tighten this Jacket VERY slightly, just enough to seal against water leakage.
11. Alternately tighten the Water Jacket and the Flexible Conduit Adaptor with a wrench.
12. Drop the Collet 85Z84 into the Flexible Conduit Adaptor and then insert the proper size guide tube into the collet.
13. Slide the Insulator Boot D-319244 over the Flexible Conduit Adaptor.
14. Align the guide tube, and secure the proper conduit.
15. Screw the proper nozzle on the front of the torch.
16. The torch switch is designed to be attached to the torch handle. It is held in place by the Switch Boot, Part No. C-345037.
FIG. 7 - Type HW-10 "Heliarc" Water-Cooled Welding Torch

Replacement Parts List

FOR
HW-10 "HELIARC" HAND-WELDING TORCH

PART NO. 16X39 (12 1/2-ft. Cable)
PART NO. 16X40 (25-ft. Cable)

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>84W85</td>
<td>&quot;O&quot; Ring</td>
<td>56Y59</td>
<td>Water Jacket</td>
</tr>
<tr>
<td>85W80</td>
<td>&quot;O&quot; Ring</td>
<td>84Z53</td>
<td>Handle</td>
</tr>
<tr>
<td>85W51</td>
<td>&quot;O&quot; Ring</td>
<td>84Z63</td>
<td>Water Jacket Adaptor</td>
</tr>
<tr>
<td>54Y60</td>
<td>Water Inlet Hose Assembly (12-1/2 ft.)</td>
<td>84Z65</td>
<td>Collet Body</td>
</tr>
<tr>
<td>54Y61</td>
<td>Argon Inlet Hose Assembly (12-1/2 ft.)</td>
<td>84Z66</td>
<td>Nut</td>
</tr>
<tr>
<td>54Y62</td>
<td>Water Inlet Hose Assembly (25 ft.)</td>
<td>84Z67</td>
<td>Washer</td>
</tr>
<tr>
<td>54Y63</td>
<td>Cable and Hose Assembly (12-1/2 ft.)</td>
<td>86Z22</td>
<td>Insulator Gasket</td>
</tr>
<tr>
<td>55Y70</td>
<td>Argon Inlet Hose Assembly (25 ft.)</td>
<td>60Y04</td>
<td>Parts Supplied</td>
</tr>
<tr>
<td>55Y72</td>
<td>Cable and Hose Assembly (25 ft.)</td>
<td>84W85</td>
<td>&quot;O&quot; Ring</td>
</tr>
<tr>
<td>56Y44</td>
<td>Torch Cap (Long) Includes:</td>
<td>85W80</td>
<td>&quot;O&quot; Ring</td>
</tr>
<tr>
<td>85W50</td>
<td>&quot;O&quot; Ring</td>
<td>85W51</td>
<td>&quot;O&quot; Ring</td>
</tr>
<tr>
<td>85Y47</td>
<td>Torch Body Includes:</td>
<td>86Z22</td>
<td>Insulator Gasket</td>
</tr>
<tr>
<td>79240</td>
<td>Inlet Connection (2 Used)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>79263</td>
<td>Water Outlet Connection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FIG. 8 – Fuse and Hose Assembly, Part No. 56Y48

ACCESSORIES
(These parts must be purchased separately.)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>56Y48</td>
<td>Fuse and Hose Assembly (Fig. 8) Includes:</td>
</tr>
<tr>
<td>54Y25</td>
<td>Fuse Assembly Includes:</td>
</tr>
<tr>
<td>84W30</td>
<td>Fuse Link (4 Supplied)</td>
</tr>
<tr>
<td>75Z91</td>
<td>Fuse Body</td>
</tr>
<tr>
<td>75Z92</td>
<td>Fuse Disk (2 Used)</td>
</tr>
<tr>
<td>75Z97</td>
<td>Locking Screw (2 Used)</td>
</tr>
<tr>
<td>75Z98</td>
<td>Coupling (2 Used)</td>
</tr>
<tr>
<td>54Y77</td>
<td>Cable and Body Assembly Includes:</td>
</tr>
<tr>
<td>84W83</td>
<td>Lug</td>
</tr>
<tr>
<td>54Y27</td>
<td>Body</td>
</tr>
<tr>
<td>76Z25</td>
<td>Cable</td>
</tr>
<tr>
<td>54Y78</td>
<td>Water Outlet Hose Assembly</td>
</tr>
<tr>
<td>76Z12</td>
<td>Fuse Casing</td>
</tr>
<tr>
<td>84Z84</td>
<td>Power Cable Adaptor</td>
</tr>
<tr>
<td>84Z16</td>
<td>Silicone Boot</td>
</tr>
</tbody>
</table>

ELECTRODE COLLETS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>84Z59</td>
<td>.040-in. Collet</td>
</tr>
<tr>
<td>84Z60</td>
<td>1/16-in. Collet</td>
</tr>
<tr>
<td>84Z61</td>
<td>3/32-in. Collet</td>
</tr>
<tr>
<td>84Z62</td>
<td>1/8-in. Collet</td>
</tr>
</tbody>
</table>

NOZZLES AND CUPS

<table>
<thead>
<tr>
<th>Nozzles</th>
<th>Ceramic Cups</th>
</tr>
</thead>
<tbody>
<tr>
<td>84Z54 No. 4 Nozzle</td>
<td>85Z07 No. 4 Ceramic Cup</td>
</tr>
<tr>
<td>84Z55 No. 5 Nozzle</td>
<td>85Z08 No. 5 Ceramic Cup</td>
</tr>
<tr>
<td>84Z56 No. 6 Nozzle</td>
<td>85Z09 No. 6 Ceramic Cup</td>
</tr>
<tr>
<td>84Z57 No. 7 Nozzle</td>
<td>85Z10 No. 7 Ceramic Cup</td>
</tr>
<tr>
<td>84Z58 No. 8 Nozzle</td>
<td>85Z11 No. 8 Ceramic Cup</td>
</tr>
<tr>
<td>105Z16 No. 4 Long Ceramic Cup</td>
<td></td>
</tr>
<tr>
<td>105Z19 No. 5 Long Ceramic Cup</td>
<td></td>
</tr>
<tr>
<td>105Z17 No. 6 Long Ceramic Cup</td>
<td></td>
</tr>
<tr>
<td>105Z18 No. 8 Long Ceramic Cup</td>
<td></td>
</tr>
</tbody>
</table>

ELECTRODES

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Pure Tungsten 7 inches long</th>
<th>Pure Tungsten 3 inches long*</th>
<th>1% Thoriated Tungsten 7 inches long</th>
<th>2% Thoriated Tungsten 7 inches long</th>
</tr>
</thead>
<tbody>
<tr>
<td>.040 in.</td>
<td>7E215</td>
<td>7E216</td>
<td>8E222</td>
<td>8E218</td>
</tr>
<tr>
<td>1/16 in.</td>
<td>7E251</td>
<td>7E247</td>
<td>8E223</td>
<td>8E219</td>
</tr>
<tr>
<td>3/32 in.</td>
<td>7E257</td>
<td>---</td>
<td>8E224</td>
<td>8E220</td>
</tr>
<tr>
<td>1/8 in.</td>
<td>7E252</td>
<td>---</td>
<td>8E225</td>
<td>8E279</td>
</tr>
</tbody>
</table>

* When 3-inch electrodes are used, a short torch cap, Part No. 56Y45, is also required.

14
HOSE REPAIR AND REPLACEMENT

Power Cable-and-Hose Assembly
If the power cable-and-hose assembly becomes damaged, we recommend that you purchase a new assembly, or send the damaged cable-and-hose assembly over to your nearest LINDE repair station for possible repair. DO NOT TRY TO REPAIR IT YOURSELF. The connection fittings at each end of the assembly are crimped to the cable and insulator hose by special crimping tools at the factory to obtain a strong and completely water-tight joint. A satisfactory repair job cannot be done without these tools.

Argon and Water Hose Assemblies
If an argon or water hose assembly becomes damaged, we recommend that you purchase a new hose assembly or send the damaged hose assembly to the nearest LINDE repair station for possible repair. DO NOT ATTEMPT PERMANENT RE-

PAIRS YOURSELF. As with the power cable-and-hose assembly, the connection fittings are crimped on at the factory by special crimping tools to assure a leakproof connection. A completely satisfactory job cannot be done without these tools. Improper repair of an argon hose connection, for example, could cause argon dilution, resulting in incomplete arc protection and consequent unsatisfactory welds. If you must continue to use the torch until new or properly-repaired plastic hose can be installed, temporary repairs can be made as follows:

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
<th>Hose</th>
<th>Nut</th>
<th>Nipple</th>
</tr>
</thead>
<tbody>
<tr>
<td>54Y60</td>
<td>Water Inlet (Torch End)</td>
<td>7620</td>
<td>3382</td>
<td>03283</td>
</tr>
<tr>
<td></td>
<td>(Inlet End)</td>
<td>36240</td>
<td>03272</td>
<td></td>
</tr>
<tr>
<td>54Y61</td>
<td>Argon Inlet (Torch End)</td>
<td>7620</td>
<td>3382</td>
<td>03283</td>
</tr>
<tr>
<td></td>
<td>(Inlet End)</td>
<td>3380</td>
<td>03272</td>
<td></td>
</tr>
<tr>
<td>54Y78</td>
<td>Water Outlet</td>
<td>76210</td>
<td>36240</td>
<td>32A12</td>
</tr>
</tbody>
</table>
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