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INTRODUCTION

The HELIARC HW-13 is a heavy-duty torch designed for machine welding. It has a maximum current capacity of 500 amperes, and can be used with either high-frequency-stabilized alternating current, or with straight-polarity direct current. When using high-frequency starting or when welding with high-frequency-stabilized current, the H-F HW-13 torch, Part No. 16X43, is used. This H-F torch is the same as the regular HW-13 torch, Part No. 16X38, except that its power cable is shielded to prevent high-frequency radiation (see page 9). All other references to the HW-13 torch apply to both the regular and H-F models.

Both ceramic cups and metal nozzles can be used with the HW-13. The nozzles are cooled through the main torch body by conduction. The torch body, water jacket, and power cable are cooled by internal water flow passages. Torch body passages are readily accessible for cleaning.

Quick-release collets are used for gripping the electrode. Adjustment of the electrode is performed by hand-turning the torch cap; no wrenches or special tools are needed. Standard electrodes from .040-in. to 1/4-in. diameter are accommodated.

I. SETTING UP THE HW-13 TORCH

A. Equipment Required

Before setting up to weld, be sure that the following essential equipment is on hand:

1. HELIARC HW-13 Torch which includes:
   a. Water inlet hose assembly.
   c. Argon hose assembly.

2. An electrode and collet of corresponding size. (See Table I for selection of proper electrode size 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). If a ceramic cup is to be used, a cup adaptor (Part No. 10271) will be required.

4. A nozzle insulating sleeve 85299. This insulating sleeve is inserted between the torch body and the nozzle or the cup adaptor. (See Figure 4.)

5. 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.)

6. A source of cooling water. (See Part IV, Section A, for information on cooling water requirements.)

7. An OXWELD Adaptor (Part No. 10230) for connecting the water inlet hose to the water supply line.

NOTE: It is recommended that a pressure switch (Part No. 54Y45) be installed in the water-cooling system at the torch water outlet to protect equipment against over-heating or burning out in the event of fluctuation or failure of the cooling water supply.

8. An additional 1/4-in. water hose assembly (10Y93 or an appropriate substitute) for connecting the water outlet of the power cable adaptor to the water drain.

9. A drain for disposal of cooling water.

10. A source of electric power. (See Section I-C, for information on electric power requirements.)

11. A welding transformer and a high-frequency generator, if welding is with alternating current; a welding generator or rectifier, if welding is with direct current.

12. Suitable lengths of 4/0 welding cable for making the necessary electrical connections.

13. A clamp to ground the welding cable to the work.

14. A welder's helmet with the correct 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>
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<tr>
<td>8</td>
<td>30 to 75 amperes</td>
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<tr>
<td>10</td>
<td>75 to 200 amperes</td>
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<tr>
<td>12</td>
<td>200 to 400 amperes</td>
</tr>
<tr>
<td>14</td>
<td>Above 400 amperes</td>
</tr>
</tbody>
</table>

B. Hose Connections

1. Connect the water inlet hose assembly to the water supply line, using the adaptor (Part No. 10230) if required.

2. Connect one end of the additional 1/4-in. water hose assembly (10Y93 or appropriate substitute) to the water outlet of the power cable adaptor (84287). Connect the other end to a suitable water drain.

3. If a pressure switch (54Y45) is used, connect it into the water outlet system. (See the instructions supplied with the switch.)

4. Connect the regulator to the argon cylinder (see the instructions supplied with the regulator).

The terms "Heliarc" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.
5. Connect the torch argon hose to the outlet of the R-502 regulator. If an OXWELD R-64 regulator or any other standard oxygen cylinder regulator is used with an L-23 flowmeter, connect the flowmeter inlet to the outlet of the regulator (see instructions supplied with the flowmeter). Then connect the torch argon hose to the flowmeter outlet.

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 or rectifier 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, rectifier 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 diagrams for alternating current and direct current welding setups (Figs. 1, 2 and 3). Note that a foot switch is connected in the control circuit to interrupt welding current. If no foot switch is used, the arc can be broken by lifting the torch from the work. However, this method is a poor one for use in machine welding. A foot switch also enables 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). In an ACHF setup, the use of a foot switch cuts out the high-frequency generator whenever you are not actually welding. This eliminates the radio interference caused by open circuit operation.

CONNECTIONS FOR A.C. WELDING (FIG. 1)

   a. Connect the torch power cable adaptor (1) to the "torch" terminal (2) of the high-frequency generator with a suitable length of 4/0 welding cable.
   b. Connect the workpiece (3) to the "work" terminal (4) of the high-frequency generator with a suitable length of 4/0 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 (5) of the high-frequency generator to the output terminals (6) of the transformer secondary with suitable lengths of 4/0 cable.

---

**Fig. 1** - Schematic Diagram for "Heliarc" A.C. Welding
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 60 c 24 volts is recommended for safety reasons.)

NOTE: If pressure switch 54Y45 is to be used, it should be connected between the auxiliary contactor coil and the control circuit supply as shown.

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 (FIGS. 2 & 3)

A. MOTOR-GENERATOR POWER SUPPLY

1. Connect a suitable length of 4/0 welding cable between the torch power 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 4/0 welding cable for these connections. Secure the ground connection to clean bright metal of the workpiece with a clamp for good contact.

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

3. If you use a generator of the separately-excited type shown in Figure 2 you can shut off welding current remotely without lifting the torch from the work by means of a foot or hand switch connected as shown. For all other types of generators, obtain the manufacturer's recommendations on installing a remote current shutoff.

NOTE: If pressure switch 54Y45 is to be used, it should be connected between the field relay coil and the control circuit supply as shown.

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FIG. 2 – Schematic Diagram for "Heliarc" D.C. Welding with Motor-Generator Power Supply
4. 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).

B. RECTIFIER-TYPE POWER SUPPLY

1. Make all power connections as shown in Fig. 3. Secure the ground connection to clean bright metal of the workpiece for good contact.

2. If pressure switch 54Y45 is to be used, it should be connected between the auxiliary contactor and the control circuit supply as shown.

D. Metal Nozzles, Ceramic Cups, Collet Bodies and Electrode Collets

1. Metal Nozzles and Ceramic Cups: Three sizes of metal nozzles and five sizes of ceramic cups are available for use with the HW-13. For the most effective argon protection, select the proper nozzle or cup size according to the recommendations in Table I. A nozzle insulating sleeve (Part No. 85Z99) must be inserted in the torch body as shown in Figure 4. If ceramic cups are to be used, a cup adaptor (Part No. 19Z71) will also be required.

2. Collet Bodies: A 1/8-in. collet body (for .040-in. through 1/8-in. collets) is supplied with the torch. A 1/4-in. collet body (for 5/32-in. through 1/4-in. collets) is available as an accessory. To change or replace a collet body, see appropriate steps in Section VI.

3. Electrode Collets: Collets are available for seven standard electrode sizes (.040 in. to 1/4-in. diameter). To install a collet and an electrode, proceed 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 collet body.
   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 or cup 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 just enough to hold the electrode firmly.

FIG. 3 – Schematic Diagram for "Heliarc" D.C. Welding with Rectifier-Type Power Supply

FIG. 4 – Nozzle and Ceramic Cup Assembly for HW-13 Torch
II. MOUNTING THE HW-13 FOR MACHINE WELDING

The HW-13 has a smooth, straight barrel section that permits the torch to be readily mounted for mechanized welding. You can devise your own method of mounting or you may make use of a Torch Holder Assembly which is available as an accessory. The rack and tube assembly employed with the torch is designed to fit standard OXWELD blowpipe holders, and is offered in three lengths (8-in., 12-in., and 16-in.). The plug on the rack and tube assembly clamps into the torch holder, as does the torch. A third clamp is provided for mounting a wire guide attachment on the torch holder when it is desired to guide cold filler wire into the weld puddle.

![FIG. 5 - Torch Holder Assembly Showing Mounting of Rack and Tube Assembly, HW-13 Torch, and Wire Guide Attachment](Image)

III. FINAL STEPS BEFORE WELDING

1. If you are using an R-502 Regulator:
   a. With the regulator flow-adjusting valve closed, slowly open the argon cylinder valve (to prevent a sudden rush of gas into the regulator); then fully open the argon cylinder valve.
   b. Open the regulator flow-adjusting valve until the desired flow is obtained.

2. If you are using an R-64 Regulator and an L-23 Flowmeter:
   a. Back off on the regulator pressure-adjusting screw.
   b. Slowly open the argon cylinder valve; then open it fully.
   c. Adjust the regulator to a 20-lb. delivery pressure.
   d. Open the flowmeter valve to the desired flow.

3. Turn on the cooling water supply. Check to see that the water flows at recommended pressure, volume and temperature (see Sec.IV-A).

4. Set the welding transformer, rectifier or generator 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.


<table>
<thead>
<tr>
<th>Electrode Diameter (inches)</th>
<th>Metal Nozzle No.</th>
<th>Ceramic Cup No.</th>
<th>Welding Current (Amperes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A.C.</td>
</tr>
<tr>
<td>.040</td>
<td>6</td>
<td>4</td>
<td>10-50</td>
</tr>
<tr>
<td>1/16</td>
<td>6</td>
<td>4,5</td>
<td>40-120</td>
</tr>
<tr>
<td>3/32</td>
<td>6,8</td>
<td>6,7</td>
<td>100-160</td>
</tr>
<tr>
<td>1/8</td>
<td>8</td>
<td>6,7,8</td>
<td>150-210</td>
</tr>
<tr>
<td>5/32</td>
<td>8</td>
<td>-</td>
<td>190-275</td>
</tr>
<tr>
<td>3/16</td>
<td>8,10</td>
<td>-</td>
<td>250-350</td>
</tr>
<tr>
<td>1/4</td>
<td>10</td>
<td>-</td>
<td>300-490</td>
</tr>
</tbody>
</table>

*Exceeds capacity of HW-13 Torch
IV. GENERAL NOTES ON TORCH OPERATION

A. Torch Cooling System

1. Use Clean Cooling Water.
   a. The cooling water which circulates through the torch body and power cable must be clean and free from dirt and other solid material. Otherwise the torch passages may become clogged, thereby cutting off or greatly reducing the flow of cooling water.

    b. If torch water passages become clogged, first remove lower torch-end parts and collet body so that foreign particles may emerge freely. Then flush torch with water, or clean flow passages by inserting a 3/32-in. diameter wire through the hose-connection fittings.

    c. If you cannot avoid using dirty water, install a suitable strainer at the cooling water inlet to prevent further clogging. (A satisfactory strainer is the 1/4-in., Type 340, semi-steel, 60-mesh brass screen, available from Kiely and Mueller, Inc., 2013 43rd St., North Bergen, New Jersey. Any other equivalent strainer can be used.)

2. Cooling Water Volume, Inlet Pressure and Temperature Requirements.
   a. For adequate cooling of the torch body, nozzle, and torch power cable, a minimum of one quart of cooling water should pass through the cooling system in 35 seconds. (For purposes of calculating water consumption, this volume of cooling water amounts to about 25-1/2 gallons per hour.)

   b. The inlet temperature of the cooling water must not be higher than 60 deg. F.

   c. An inlet water pressure of about 25 psi will generally be sufficient to pass the necessary volume of cooling water.

   d. If inlet water pressure is above 50 psi, a water regulator should be installed to prevent possible damage to the hose. (A satisfactory regulator is the Type 463, 1/4 in. water regulator available from Kiely and Mueller Inc., 2013 43rd St., North Bergen, New Jersey. Any other equivalent regulator can be used.)

   e. If less than one quart of cooling water passes through the cooling system in 35 seconds, or if the cooling water inlet temperature is more than 60 deg. F., do not operate the torch at its full 500-ampere capacity. All restrictions which reduce the flow must be removed and the water inlet temperature must be lowered to 60 degrees to utilize the full torch current rating.

3. Pressure Switch and Hose Assembly, Part No. 54Y45. This accessory should be used to protect the torch from overheating in case of water supply fluctuation or failure. When water pressure falls below a safe limit, the pressure switch shuts off the welding current until the pressure is restored. Instructions for installation and operation (Form 9068) are packed with each assembly. Additional copies are available without charge from your nearest LINDE office.

B. Torch Hose

1. Make certain that all argon hose connections and the nozzle or 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 hoses off hot metal. Plastic hose softens and begins to lose strength when heated to about 125 deg. F.

3. For instructions on hose repair and replacement, refer to page 11.

C. Do Not Let the Nozzle Touch the Work

If a nozzle touches the work, the arc may jump the gap from the electrode to the nozzle rather than to the work because of the conductivity of the hot gases. For this reason, hold the torch so that the nozzle does not touch at any point of the work.

D. 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.

E. Conservation of Tungsten

Tungsten is in short supply. Conserve tungsten electrode wherever possible. Here's how:

1. Avoid contamination of electrodes caused by unnecessary contact with the workpiece.

2. Weld stud ends to make electrodes of usable length. Welding can be done with a HELIARC Torch, using either DCSP or ACHF current, from 30 to 190 amperes, argon flow of 13-17 cfh.

3. Don't scrap stud ends. The tungsten in them can be reclaimed for continued use in the defense effort.
V. SAFETY PRECAUTIONS

A. Use a standard weldor's helmet with the proper shade of glass for the welding current to be used (See Table on Page 2).

B. Wear suitable clothing to protect exposed skin from arc burns.

C. Be sure to shut off power before adjusting or replacing electrodes.

D. When welding copper, lead or zinc indoors, provide good ventilation or use a respirator.

E. If you use chlorinated solvents for degreasing or cleaning the workpiece, do not weld near degreasing tanks.

F. When high frequency is used for starting the weld, or when welding with high-frequency-stabilized current, use the H-F HW-13 torch, Part No. 16X43, which has a copper braid around the power cable and hose assembly to suppress radiation. HW-13 torch, Part No. 16X38, does not have this protection.

VI. DISASSEMBLY

(See Parts Picture on Opposite Page)

1. Unscrew torch cap (56Y63). Inspect “O” ring (85W50) for nicks, cracks, excessive distortion and flatness. Replace with a new part if defective. This “O” ring acts as a seal against argon leakage and air entrainment.

2. Remove the electrode and electrode collet.

3. Unscrew the nozzle from the water jacket (85Z98).

4. Hold the water jacket adaptor (84Z92) with a strap wrench to keep it from turning, and unscrew the water jacket (85Z98). Inspect insulator gasket (84Z94) and “O” ring (lower 85W55). Replace if defective.

5. Using wrench (80Y04) supplied with the torch, unscrew collet body (84Z90 or 84Z99) from the torch body. Inspect “O” ring (85W07) without removing it from the torch body (use a beam of light). This “O” ring acts as an important seal between gas and water, but does not normally require replacement.

6. Unscrew water jacket adaptor (84Z92) from the torch body. Inspect “O” ring (upper 85W55). Replace if defective. THIS STEP IS NOT NECESSARY TO CHANGE OR REPLACE A COLLET BODY.

7. To reassemble, follow the preceding steps in reverse order. Moisten the upper end of collet body (84Z90 or 84Z99) before screwing into torch body (this assists passage through “O” ring 85W07). The shoulder on the collet body should fit tightly against the lower end of the torch body to assure good electrical contact. Be certain that water jacket (85Z98) is sufficiently tightened for a leakproof connection.
# VII. REPLACEMENT PARTS LIST

FOR

"HELIARC" HW-13 MACHINE TORCH

PART NO. 16X38 (STANDARD)
PART NO. 16X43 (HIGH-FREQUENCY)

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>85W07</td>
<td>Collet Body Gasket</td>
<td>39V34</td>
<td>8-in. Rack and Tube Assembly</td>
</tr>
<tr>
<td>85W50</td>
<td>&quot;O&quot; Ring</td>
<td>39V35</td>
<td>12-in. Rack and Tube Assembly</td>
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<td>85W55</td>
<td>&quot;O&quot; Ring (2 used)</td>
<td>39V36</td>
<td>16-in. Rack and Tube Assembly</td>
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<tr>
<td>54Y65</td>
<td>Power Cable and Hose Assembly (16X38 only)</td>
<td>(see Fig. 8)</td>
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<tr>
<td>56Y90</td>
<td>Shielded Power Cable and Hose Assembly (16X43 only)</td>
<td>Cup Adaptor (for ceramic cups)</td>
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<tr>
<td>54Y94</td>
<td>Argon Inlet Hose Assembly</td>
<td>84Z90</td>
<td>1/4-in. Collet Body (for 5/32-in. through 1/4-in. collets)</td>
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<tr>
<td>54Y95</td>
<td>Water Inlet Hose Assembly</td>
<td>85Z74</td>
<td>.040-in. Collet</td>
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<td>56Y61</td>
<td>Torch Body Assembly</td>
<td>85Z01</td>
<td>1/16-in. Collet</td>
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<td>Includes:</td>
<td>85Z02</td>
<td>3/32-in. Collet</td>
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<td></td>
<td>Adapter Connection (2 used)</td>
<td>85Z03</td>
<td>1/8-in. Collet</td>
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<td>56Y63</td>
<td>Torch Cap</td>
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<td>5/32-in. Collet</td>
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<tr>
<td>84Z87</td>
<td>Power Cable Adaptor</td>
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<td>3/16-in. Collet</td>
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<td>84Z82</td>
<td>Water Jacket Adaptor</td>
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<td>1/4-in. Collet</td>
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<td>84Z93</td>
<td>Insulation Sleeve</td>
<td>85Z07</td>
<td>No. 4 Ceramic Cup</td>
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<tr>
<td>84Z94</td>
<td>Insulation Gasket</td>
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<td>No. 5 Ceramic Cup</td>
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<td>84Z95</td>
<td>Sheathing</td>
<td>85Z09</td>
<td>No. 6 Ceramic Cup</td>
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<tr>
<td>84Z99</td>
<td>1/8-in. Collet Body (for .040-in. through 1/8-in. collets)</td>
<td>No. 7 Ceramic Cup</td>
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<td>85Z98</td>
<td>Water Jacket</td>
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<td>No. 8 Ceramic Cup</td>
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<td>85Z11</td>
<td>Nozzle Insulating Sleeve (see Fig. 4)</td>
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<td></td>
<td></td>
<td>85Z99</td>
<td>No. 6 Nozzle</td>
</tr>
<tr>
<td></td>
<td>SYMBOL</td>
<td>86Z01</td>
<td>No. 8 Nozzle</td>
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<tr>
<td>S-R-42</td>
<td>DESCRIPTION</td>
<td>86Z02</td>
<td>No. 10 Nozzle</td>
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<td>PART NO.</td>
<td>Accessory</td>
<td>86Z03</td>
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<tr>
<td>38V37</td>
<td>Clamp Assembly (see Fig. 7)</td>
<td>60Y04</td>
<td>Collet Body Wrench</td>
</tr>
</tbody>
</table>

**PART SUPPLIED**

60Y04 COLLET BODY WRENCH
Replacement Parts List

FOR
CLAMP ASSEMBLY

<table>
<thead>
<tr>
<th>PART NO.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>07N51</td>
<td>Torch Clamp</td>
</tr>
</tbody>
</table>

HARDWARE

S-C-96  5/16-in.-18 x 1-in. Lg. Socket-Head, Steel Cap Screw (4 used)
S-C-97  5/16-in.-18 x 1-1/4-in. Lg. Socket-Head, Steel Cap Screw (2 used)

Replacement Parts List

FOR
RACK AND TUBE ASSEMBLIES

<table>
<thead>
<tr>
<th>Description</th>
<th>39V34 (8-in.)</th>
<th>39V35 (12-in.)</th>
<th>39V36 (16-in.)</th>
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<tbody>
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<td>Collar</td>
<td>07N69</td>
<td>07N69</td>
<td>07N69</td>
</tr>
<tr>
<td>Rack Plug</td>
<td>07N70</td>
<td>07N70</td>
<td>07N70</td>
</tr>
<tr>
<td>Rack Assembly, includes:</td>
<td></td>
<td>39V50</td>
<td>39V51</td>
</tr>
<tr>
<td>Screw</td>
<td>35Z11 (2 used)</td>
<td>35Z11 (2 used)</td>
<td>35Z11 (4 used)</td>
</tr>
</tbody>
</table>

HARDWARE

#6-32 x 3/8-in. Lg. Flat-Head Steel Machine Screw S-FL-105 (2 used) S-FL-105 (2 used) S-FL-105 (2 used)

*Listed individually for each rack and tube assembly.*
A. Hose Repair and Replacement

**POWER CABLE-AND-HOSE ASSEMBLY**

If the power cable-and-hose assembly becomes damaged, we recommend that you (1) purchase a new assembly, or (2) turn the damaged cable-and-hose assembly over to your LINDE office, where it will be repaired. The only charge will be for parts, if such repair is advisable. **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 the argon or water hose assemblies become 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 REPAIRS 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:

Cut off the aluminum ferrule. Re-use the original nipple and nut, if undamaged. Before re-inserting the nipple, apply 3M-711 adhesive (Minn. Mining and Mfg., Co.). Secure tubing to nipple with four turns of 18-gauge copper wire. If nut or nipple are damaged, and must be replaced, use parts as follows:

<table>
<thead>
<tr>
<th>HOSE ASSEMBLY</th>
<th>HOSE</th>
<th>TORCH END</th>
<th>SUPPLY END</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argon Hose Assembly 54Y94</td>
<td>76222</td>
<td>Nut and Nipple Assembly 54Y92</td>
<td>Nut 3380</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nipple 03273</td>
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<tr>
<td>Water Hose Assembly 54Y95</td>
<td>76222</td>
<td>Nut and Nipple Assembly 54Y92</td>
<td>Nut 36Z40</td>
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<td></td>
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<td>Nipple 03273</td>
</tr>
</tbody>
</table>

**B. Modernizing Series 1 Torches**

The Series 1 HW-13 Torch uses Nozzles No. 84Z96 (No. 6), 84Z97 (No. 8), and 84Z98 (No. 10), Water Jacket 56Y62, and Ceramic Cup Adaptor 19Z61. The Series 2 HW-13 Torch employs a nozzle insulating sleeve, a modified water jacket and ceramic cup adaptor, and a new style nozzle to prevent internal arcing. To convert Series 1 torches to Series 2, order Water Jacket 85Z98, Nozzle Insulating Sleeve 85Z09, and Nozzle 86Z01 (No. 6), 86Z02 (No. 8), or 86Z03 (No. 10). If the torch is to be used with ceramic cups, a new Ceramic Cup Adaptor 19Z71 should also be ordered.