CONTENTS

INTRODUCTION .......................................................... 2

I. SETTING UP THE HW-12 TORCH TO WELD ................... 3
   A. Equipment Required ...................................... 3
   B. Hose Connections ......................................... 5
   C. Electrical Setup .......................................... 5
   D. Metal Nozzles, Ceramic Cups, Electrodes, Collet Bodies and Electrode Collets ............................... 7
   E. Final Steps Before Welding .............................. 8

II. GENERAL NOTES ON TORCH OPERATION .................... 8
   A. Torch Cooling System .................................... 8
   B. Torch Hose .................................................. 8
   C. Do Not Let the Nozzle Touch the Work .................. 9
   D. Keep the Electrode Clean ................................ 9
   E. Conservation of Tungsten ................................ 9

III. SAFETY PRECAUTIONS ........................................... 9

IV. DISASSEMBLY ....................................................... 9

REPLACEMENT PARTS LIST ........................................ 10
   Hose Repair and Replacement ............................... 11

Be Sure this Booklet Reaches the Operator. You Can Get Extra Copies Through Any LINDE Office.
Introduction

The "HELIARC" HW-12 Torch ........

...is a heavy-duty, water-cooled hand torch for use with straight-polarity direct current (DCSP), reverse-polarity direct current (DCRP), or high-frequency stabilized alternating current (ACHF).

...has a rated current capacity of 500 amp. in continuous service. Higher currents may be used at reduced duty cycles.

...uses either metal nozzles for longer service life, or ceramic cups (see Sec. I-D for recommendations).

Design Features ........

...Efficient water-cooling system cools outer surface of collet body directly with flowing water. Metal nozzles are cooled by heat transfer to the torch body across a tapered seat and threaded connection.

...Enclosure of water flow passages within torch prevents flow constriction or leakage through accidental damage. Elimination of bulky external cooling tubes to nozzle improves operator's visibility, torch maneuverability, and access to confined spaces.

...Torch parts are readily disassembled for cleaning of water-cooling components. Straight internal flow passages are easily cleared with a cleaning rod.

...Quick-release collets require only a quarter turn of the torch cap to release the electrode for adjustment or replacement. No wrench is required, and adjustment of the electrode through the torch cap rather than through a hot gas cup prevents burning of the operator's fingers.

...Electrode stub loss is minimized by decreasing the distance between the end of the metal nozzle and the bottom of the electrode to the shortest length for which satisfactory water-cooling can be provided.

...Molded nylon torch body insulation has excellent heat resistance, and requires no additional asbestos shielding for protection for melting due to reflected heat.

...Uniform shielding gas distribution pattern requires less argon for good shielding. In many cases, a smaller nozzle can be substituted for the nozzle ordinarily required at a given current, permitting better access to confined spaces.

...Small post-weld electrode cooling time is required, due to efficient water-cooling and minimized exposed electrode length. This reduces the argon volume required to prevent oxide contamination of the electrode while cooling, and is especially important where the operation consists primarily of short welds.

...Either 3-in. or 7-in. electrodes may be used by mounting short or long interchangeable torch caps.
I. Setting Up The HW-12 Torch To Weld

A. Equipment Required

1. THE "HELIARC" HW-12 TORCH is furnished with 12-1/2-ft. power cable and hose assembly, 12-1/2-ft. argon and water hose assemblies, 1/8-in. and 1/4-in. collet bodies, collet body wrench, and a Power Cable Adaptor Assembly (Part No. 64287) for connection of standard 4/0 welding cable lug to the power cable.

2. Basic accessories required to place the torch in operation:
   (a) Pressure Switch and Hose Assembly (Part No. 54Y45) (Optional) to protect the torch from overheating, where water supply pressure may fluctuate.

   (b) Either a metal nozzle or ceramic cup (see recommendations in Sec. 1-D). A Cup Adaptor (Part No. 19261) is required when standard HW-10 ceramic cups are used.

   (c) Electrode and Collet of corresponding size. Table I indicates the correct electrode size for each welding current range. A 1/8-in. accessory Collet Body (Part No. 85Z15) is supplied with the torch for use with .040-, 1/16-, 3/32- and 1/8-in. HW-10 collets, (Standard 1/4-in. collet body assembled in the HW-12 as furnished holds 1/8-, 5/32-, 3/16- and 1/4-in. HW-12 collets.) A Collet Body Wrench (Part No. 60Y04) for changing collet bodies is supplied with the torch.

   (d) Short Torch Cap (Part No. 56Y45), used with 3-in. electrodes, especially where access to confined spaces is required.

3. Other equipment required when assembling a complete HELIARC welding setup:
   (a) An OXWELD R-502 Regulator with 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. In some cases, this alternate arrangement may require an Adaptor (Part No. 18X55) as indicated in Fig. 1.

   (b) An OXWELD V-30 Double Shutoff Valve (Part No. 16X21) (Optional).

   (c) A 1/4-in. Argon Hose Assembly (Optional), either 12-1/2-ft. long (Part No. 10Y72) or 25-ft. long (Part No. 10Y68), for connecting the regulator to the V-30 valve.

   (d) A source of cooling water (see Sec. II-A for information on cooling water requirements) and a disposal drain.

   (e) Two 1/4-in. Water Hose Assemblies, either 12-1/2-ft. long (Part No. 10Y93) or 25-ft. long (Part No. 10Y94), for connecting the V-30 valve to the water supply line (optional) and for connecting the water outlet of the power cable adaptor (or water outlet of pressure switch, if used) to the drain. Lengths of 1/4-in. pipe may be used instead of hose, if desired.

   (f) For extension of the 12-1/2-ft. hose supplied with the HW-12, additional hose assemblies (like those listed above in Secs. 3(c) and 3(e)) will be required, as well as an Argon Hose Coupling (Part No. 6978) and a Water Hose Coupling (Part No. 11Z15).

   (g) Two Adaptors (Part No. 10Z30, 1/4-in. N.P.T., to Air Water Hose Connection) are required, to connect the water inlet hose to the water supply line, and the water outlet hose to the drain line. If an actual threaded connection to a drain pipe is not required (for example, where the water outlet hose empties into a sink) only one adaptor is needed.

   (h) OXWELD Wrenches No. 83 (Part No. 71Z49) and No. 84 (Part No. 71Z50) for assembling equipment.

   (i) A source of electric power. (See Sec. 1-C for information on electric power requirements.)

   (j) A welding transformer and a high-frequency generator, if ACHF is used for welding; a welding generator, if DCSP or DCRP is used.

   (k) Suitable lengths of 4/0 welding cable to connect the welding transformer or generator to the torch and work.

   (l) A clamp to ground the welding cable to the work.

   (m) A welder's helmet with the correct glass for the welding current to be used:

<table>
<thead>
<tr>
<th>Glass No.</th>
<th>Welding Current, amps.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Up to 30</td>
</tr>
<tr>
<td>8</td>
<td>30 to 75</td>
</tr>
<tr>
<td>10</td>
<td>75 to 200</td>
</tr>
<tr>
<td>12</td>
<td>200 to 400</td>
</tr>
<tr>
<td>14</td>
<td>Above 400</td>
</tr>
</tbody>
</table>

(Continued on page 5.)
FIG. 1 - Schematic Diagram of Water and Argon Connections for "Heliarc" HW-12 Torch
B. Hose Connections

Fig. 1 indicates the correct method of assembling the accessories used to supply argon and cooling water to the HW-12 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 220- or 440-volt, alternating current supply is generally used.

(b) For d.c. welding, a motor-generator unit powered by a 220- or 440-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 8067) giving descriptions of the circuits, and specifications for the equipment needed will be sent to you without charge.

3. Electrical Connections

Before making any connections, refer to the schematic wiring diagrams (Figs. 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 enables you to protect the weld puddle at the end of a seam with argon and thus control crater cracking. This is especially important in the welding of high-temperature alloys. As used in a.c.h.f. setup, a foot switch cuts out the high-frequency generator whenever you are not actually welding, thus eliminating the radio interference caused by open circuit operation. If a foot switch is not used the arc can be broken by simply lifting the torch from the work, but the advantages provided by a foot switch will be lost.

4. Connections for A. C. Welding (Fig. 2)

(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 provide a good contact.

---

**FIG. 2 - Schematic Diagram for HELIARC A.C. Welding**
(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.

(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 220- or 440-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 220- or 440-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.) 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.

5. Connections for D.C. Welding (Fig. 3)

(a) 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.

(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 Fig. 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 manu-
facturer's recommendations on installing a remote current 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.

**NOTE:** If pressure switch 54145 is to be used, it should be connected between the field relay coil and the control circuit supply as shown.

(d) Connect the input terminals (11) of the motor side of the welding generator to the 220- or 440-volt alternating current main power supply (12).

**D. Metal Nozzles, Ceramic Cups, Electrodes, 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-12. For the most effective argon protection, select the proper nozzle or cup size according to the recommendations in Table I. Metal nozzles provide longer service life than ceramic cups, and should be used wherever possible in preference to the ceramics. Despite their higher initial cost, they will almost always prove more economical over any appreciable service period. In ACHF service, however, metal nozzles can be damaged by accidental grounding before the arc is established. Where occasional grounding cannot be avoided with reasonable care, ceramic cups should be used. Ceramic cups should not be used with welding currents over 250 amps, and should be used in d.c. service only where definitely preferred for a specific purpose.

2. **Electrodes:** Table I indicates the correct electrodes for various welding ranges. Note that 2 per cent thoriated electrodes are required to obtain rated capacity with ACHF currents. The HW-12 can be used for applications above the 500 amp. range only at reduced duty cycles.

| Table I: Electrode, Metal Nozzle, and Ceramic Cup Sizes for Various Welding Currents |
|---|---|---|---|
| | | | ACHF | DCSP | DCERP |
| | | | (using pure tungsten electrodes) | (using 2% thoriated tungsten electrodes) | (using pure tungsten or thoriated electrodes) |
| .040 | 6 | 4 | 10-60 | 15-80 | 10-80 |
| 1/16 | 6 | 4-5 | 40-120 | 60-150 | 60-150 |
| 3/32 | 6-8 | 6-7 | 100-160 | 140-250 | 150-250 |
| 1/8 | 8 | 6-7-8 | 150-210 | 225-350 | 250-400 |
| 5/32 | 8 | - | 190-275 | 300-450 | 400-500 |
| 3/16 | 8-10 | - | 250-350 | 400-550 | 500-800 |
| 1/4 | 10 | - | 300-490 | 500-800 | ** | 80-125 |

* Cup Adaptor (Part No. 59261) is required to adapt ceramic cups to torch water jacket.
** Exceeds capacity of HW-12 Torch.

**NOTE 1:** The current values in this table are metered readings, and do not correspond to transformer or generator settings unless they have been specifically calibrated for HELIARC welding.

**NOTE 2:** Because of the electrical characteristics of HELIARC welding, transformers not specifically designed for HELIARC welding should not be operated at more than 70% of their rated capacity; the manufacturer's recommendations should be obtained regarding the use of such transformers for HELIARC welding.

3. **Collet Bodies:** A collet body for 1/8-in. to 1/4-in. collet is supplied assembled in the torch. An accessory collet body for .040-in. to 1/8-in. HW-10 collets is also supplied with the torch. To change or replace a collet body, see appropriate steps in Section IV.

4. **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.

(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.

**E. 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. II-A).

4. Set the welding transformer 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.


---

### II. 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 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 9069) 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, a dark gray deposit on or beside the weld, or a cloudy weld puddle, 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. To avoid this "arc flash-over" which can ruin a metal nozzle, do not allow the nozzle to touch the work or any grounded metal surface.

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. 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 pilers 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 stub ends to make electrodes of usable length. Welding can be done with a RELIARC Torch, using either DCSP or ACHF, currents from 30 to 100 amperes, argon flow of 6-8 liters per minute.

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

III. Safety Precautions

A. Use a standard welder's helmet with the proper shade of glass for the welding current to be used (see Table in Sec. 1-A).

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 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.

IV. Disassembly

(See HW-12 Assembly Drawing, Fig. 4)

1. Unscrew torch cap (56Y44). 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 (56Y62).

4. Hold the water jacket adaptor (84Z92) with a strap wrench to keep it from turning, and unscrew the water jacket (56Y62). Inspect insulator gasket (84Z94) and "O" ring (lower 85W55). Replace if defective.

5. Using wrench (60Y04) supplied with the torch, unscrew collet body (85Z14 or 85Z15) 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 (85Z14 or 85Z15) 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 the water jacket (56Y62) is sufficiently tightened for a leakproof connection,
FIG. 4 - HELIARC HW-12 500-Ampere Hand-Welding Torch - Part No. 16X37

PARTS LIST

FOR

HW-12 "HELIARC" HAND-WELDING TORCH
PART NO. 16X37

<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 (one spare supplied)</td>
<td>85Z14</td>
<td>Collet Body (for 1/8-, 5/32-, 3/16-, 1/4-in. collets)</td>
</tr>
<tr>
<td>85W50</td>
<td>&quot;O&quot; Ring</td>
<td>85Z15</td>
<td>Collet Body (for .040-, 1/16-, 3/32-, 1/8-in. HW-10 collets)</td>
</tr>
<tr>
<td>85W55</td>
<td>&quot;O&quot; Ring (2 used) (two spare rings supplied)</td>
<td>60Y04</td>
<td>Collet Body Wrench</td>
</tr>
<tr>
<td>54Y65</td>
<td>Power Cable and Hose Assembly</td>
<td>54Y94</td>
<td>(Not Supplied in HW-12 Torch package, Part No. 16X37)</td>
</tr>
<tr>
<td>54Y94</td>
<td>Argon Inlet Hose Assembly (12-1/2 ft.)</td>
<td>10Y72</td>
<td>Argon Inlet Hose Extension Assembly (12-1/2 ft.)</td>
</tr>
<tr>
<td>54Y95</td>
<td>Water Inlet Hose Assembly (12-1/2 ft.)</td>
<td>10Y93</td>
<td>Water Inlet and Outlet Hose Extension Assembly (12-1/2 ft.)</td>
</tr>
<tr>
<td>56Y65</td>
<td>Torch Body Assembly Includes:</td>
<td>54Y45</td>
<td>Pressure Switch and Hose Assembly</td>
</tr>
<tr>
<td>79Z40</td>
<td>Inlet Connection (2 used)</td>
<td>56Y45</td>
<td>Cup Adaptor (for Ceramic Cups)</td>
</tr>
<tr>
<td>79Z63</td>
<td>Water Outlet Connection</td>
<td>19Z61</td>
<td>Torch Cap (short)</td>
</tr>
<tr>
<td>56Y82</td>
<td>Water Jacket</td>
<td>56Y45</td>
<td>Argon Hose Coupling</td>
</tr>
<tr>
<td>56Y44</td>
<td>Torch Cap (long)</td>
<td>6978</td>
<td>Water Hose Coupling</td>
</tr>
<tr>
<td>84Z287</td>
<td>Power Cable Adaptor Assembly</td>
<td>11Z15</td>
<td>Water Hose Coupling</td>
</tr>
<tr>
<td>84Z294</td>
<td>Water Jacket Adaptor (one spare supplied)</td>
<td>84Z95</td>
<td>Sheathing</td>
</tr>
<tr>
<td>84Z95</td>
<td>Insulator Gasket (one spare supplied)</td>
<td>85Z13</td>
<td>Handle</td>
</tr>
</tbody>
</table>
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 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 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>76Z22</td>
<td>Nut and Nipple Assembly 54Y92</td>
<td>Nut 3380</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nipple 03Z73</td>
</tr>
<tr>
<td>Water Hose Assembly 54Y95</td>
<td>76Z22</td>
<td>Nut and Nipple Assembly 54Y92</td>
<td>Nut 36Z40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nipple 03Z73</td>
</tr>
</tbody>
</table>
LINDE Supplies These Quality Products
to the Nation's Industries

INDUSTRIAL GASES
LINDE Oxygen, Nitrogen, Argon, Neon, Helium, Krypton, Xenon, Hydrogen
PREST-O-LITE Acetylene

CALCIUM CARBIDE
UNION Carbide
CARBIC Processed Carbide

OXY-ACETYLENE EQUIPMENT
OXWELD Apparatus for Cutting, Joining, Treating, and Forming Metals
Acetylene Generators
Manifolds, Regulators and Valves
Welding Rods and Supplies
PREST-O-WELD Welding and Cutting Apparatus
PUROX Welding and Cutting Apparatus
PREST-O-LITE Air-Acetylene Apparatus and Small Tanks
CARBIC Acetylene Flood Lights
Acetylene Generators

ELECTRIC WELDING EQUIPMENT
UNIONMELT Automatic Welding Apparatus and Supplies
HELIARC Welding Torches
LINDE Sigma Welding Equipment

SPECIAL EQUIPMENT
LINDE Jet-Piercing Equipment
Plate-Edge Preparation Equipment
Polyethylene Powder and Flame-Spraying Equipment
Steel-Conditioning Machines
Sub-Zero Cold Treatment Equipment
OXWELD Oxy-Acetylene Cutting Machines
Pressure-Welding Machines

OXYGEN THERAPY SUPPLIES
LINDE Oxygen U.S.P.
Oxygen Therapy Regulators
Oxygen Therapy Manifolds and Valves

SYNTHETIC CRYSTALS
LINDE Synthetic Sapphire, Ruby, Spinel, and Titania
Synthetic Calcium- and Cadmium Tungstates
Fine Alumina Abrasive

ORGANOSILICONS
LINDE Silane Monomers
Polysiloxane Polymers and Resins


LINDE AIR PRODUCTS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

DOMINION OXYGEN COMPANY, LIMITED, TORONTO

General Office
30 East 42nd Street, New York 17, N. Y.

Eastern States
Baltimore 18, MD.
532 East 25th Street
Boston 16, Mass.
441 Stuart Street
Buffalo 2, N. Y.
250 Delaware Ave.
Charleston 1, W. Va.
2 Virginia Street
New York 7, N. Y.
205 East 42nd Street
Philadelphia 22, Pa.
3421 North Broad Street
Pittsburgh 19, Pa.
511 Ross Street

Central States
Chicago 1, Ill.
230 North Michigan Avenue
Cincinnati 29, Ohio
709 Melish Avenue
Cleveland 14, Ohio
1513-17 Superior Avenue
Detroit 2, Mich.
6-200 General Motors Building
Indianapolis 4, Ind.
720 North Pennsylvania Street
Milwaukee 46, Wis.
1623 South 38th Street
Minneapolis 2, Minn.
527 Second Avenue, South
St. Louis 8, Mo.
4228 Forest Park Boulevard

Southern States
Atlanta 2, Ga.
310 Peachtree Street, N. L.
Birmingham 4, Ala.
1001-13 South 22nd Street
Jacksonville 3, Fla.
2410 Dennis Street
Memphis 9, Tenn.
48 West McLemore Avenue
New Orleans 13, La.
928-92 Howard Avenue

Southwestern States
Dallas 1, Texas
2636 Commerce Street
Denver 5, Colo.
685 South Broadway
Houston 11, Texas
6129 Harvard Boulevard
Kansas City 6, Mo.
910 Baltimore Avenue
Tulsa 3, Okla.
614 National Bank of Tulsa Bldg.

Western States
El Paso, Texas
510 Texas Street
Los Angeles 58, Calif.
2770 Lenox Boulevard
Phoenix, Ariz.
401 East Buchanan Street
Portland 5, Ore.
1205 Northwest Marshall Street
Salt Lake City 3, Utah
362 Pierpont Avenue
San Francisco 6, Calif.
22 Battery Street
Seattle 4, Wash.
2501 First Avenue, South
Spokane 12, Wash.
2023 West Maxwell Avenue

In Canada
Dominion Oxygen Company, Limited
Toronto • Montreal • Winnipeg • Vancouver

Lithographed in U.S.A.
F-8312 IMD J-2280-52